DEPARTMENT OF COMPUTER SCIENCE AND RESEARCH CENTRE

Unique Features of Syllabi

Change is constant in computer science. Computer Science is one of the youngest and most rapidly developing sciences. Updations and newer versions arise almost every day. Our syllabi have been renewed to include Outcome-Based Education. To make our students expertise in solving complex and challenging problems and to acquire greater opportunities without boundaries, we provide a lot of innovative ideas.

Our curriculum mainly focused on open source software for Office Automation (**LibreOffice Suite**), Graphics Design and Animation (**GIMP and Blender**), Statistical Analysis (**R and Python**). Innovative papers are introduced in Undergraduate courses as well as in Post Graduate courses. We offer skill enhancement courses to other departments such as B Sc Mathematics, B Com with Computer Applications, B Com FinTECH and B Sc Data Science. Some of the innovative courses introduced in our curriculum are

- **Machine Learning:**

It is introduced as it plays a major role in predicting future scenarios and enhancing automation in all aspects by using supervised and unsupervised machine learning algorithms

- **Blockchain Technology:**

It is introduced as cryptocurrencies which occupy an essential role in online secure transactions, operate on this emerging technology.

- **Ethical Hacking:**

The concept of ethical hacking should be learnt to prevent cyberattacks that are happening worldwide. Therefore it takes a place in the syllabus.

- **Malware Analysis:**

It is introduced as students need to know the behavior of suspicious files/URLs which lead to hacking.

- **Time Series Analysis and Forecasting:**

It is introduced in the syllabus as every assumption for the future based on past trends is implemented by using this technique.

- **Data Handling and Visualization:**

Being an effective tool to quickly examine large amounts of data, Data visualization is included as Data Handling and Visualization.

- **Python in Finance:**

As quantitative finance can be easily handled by using Python, Python in Finance is introduced.

- **Fintech Startups and Innovations:**

As an integration of technology in financial services is an emerging area to improve delivery to customers, Fintech Startups and Innovations are introduced.

DEPARTMENT OF COMPUTER SCIENCE AND RESEARCH CENTRE

(For Students Admitted from 2022-23)

Vision

Empowering the students to adept with the modern technologies, moral values, leadership and entrepreneurial skills with latest pedagogy and research environment to compete at the global level

Mission

- Strengthening the core competency by using latest tools and technologies
- Imparting value based quality education to promote students as renowned professionals
- Strengthening the research to advocate global technology

Programme Educational Objectives (PEO)

PEO1: To create and strengthen women leaders through disciplinary knowledge, professional skills and ethical sensitivity

PEO2: To transform students as successful entrepreneurs to face the modern challenges

PEO3: To nurture the students to invent, innovate and create solutions for current moral, ecological and economic issues

Programme Outcomes (PO)

On completion of Post Graduate and Under Graduate programmes, student will be enabled with

PO1:Disciplinary Knowledge: Acquiring knowledge of different dimensions in the related areas ofstudy and identifying the assumptions that frame thinking and actions

PO2:Effective Communication: Ability to share thoughts, ideas and applied ski11s of communications in its various perspectives through LSRW

PO3:Research Skill and Critical Thinking: Ability to plan, execute and report the results of an experiment and to draw conclusions from evidences and the capability to apply analytical thought by following scientific approach to knowledge development

PO4:Moral Ethical Awareness/ Reasoning: Ability to embrace moral/ethical values in conducting one's life, about an ethical issues from multiple perspectives, and use ethical practices in all works and appreciating environmental and sustainability

issues; and adopting unbiased and truthful actions in all aspects of work

PO5:Information /Digital Literacy: Capability to use ICT in case of need and the ability to access, evaluate and use the relevant information

PO6:Problem Solving: Ability to apply their competence to solve non-familiar everyday problems inreal life situations

PO7:Self-directed and Lifelong Learning: Acquire the ability to engage in independent and lifelong learning through self-paced and self-directed learning to meet out the change in life

MASTER OF COMPUTER APPLICATIONS (MCA)

(Two Years Regular Programme)

(For Students Admitted from 2022-23)

Program Outcomes (PO):

In completion of Master of Computer Applications (MCA) Degree programme, the students will be enabled with:

1. **Computational Knowledge:** Apply knowledge of computing fundamentals, computing specialisation, mathematics, and domain knowledge appropriate for the computing specialisation to the abstraction and conceptualisation of computing models from defined problems and requirements
2. **Problem Analysis:** Identify, formulate, research literature, and solve complex computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines
3. **Design /Development of Solutions:** Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations
4. **Conduct investigations of complex computing problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
5. **Modern Tool Usage:** Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations
6. **Professional Ethics:** Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practices
7. **Life-long Learning:** Recognise the need, and have the ability, to engage in independent learning for continual development as a computing professional
8. **Project management and finance:** Demonstrate knowledge and understanding of the computing and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
9. **Communication Efficacy:** Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions
10. **Societal and Environmental Concern:** Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practices

11. **Individual and Team Work:** Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments
12. **Innovation and Entrepreneurship:** Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large

Program Specific Outcomes (PSO):

PSO1: Utilize strong technical aptitude and domain knowledge to develop smart software solutions for the upliftment of society

PSO2: Apply research and entrepreneurial skills augmented with a rich set of communication teamwork and leadership skills to excel in their profession

PSO3: Show continuous improvement in their professional career through life-long learning, appreciating human values and ethics

PSO4: Apply the knowledge of computer application areas in modelling software applications for the industries appropriately

PSO5: Apply the knowledge of latest computing techniques with mathematical foundation to compete with real world problems

PSO6: Ability to understand and align with the prevailing cross cultural, societal, professional, legal and ethical matters in industry

PSO7: Ability to face the changing trends and career opportunities in computer application

PREAMBLE

The Board of Studies of Computer Science revamped the curriculum with the following changes

Core courses

- New Syllabus framed for the courses Java Programming, and Java Programming Lab
- Syllabus modified for the courses Data Structures and Algorithms with Python and Data Structures and Algorithms with Python Lab
- Syllabus introduced for the courses Software Development Framework, Data mining & data warehousing, Software Development Framework Lab, Data mining Lab and Data analytics Lab.
- The courses Optimization Techniques and Software Project Management have changed positions in I and IV semesters respectively
- The courses Web Technology and Web Designing lab have changed positions in II semester.
- The course Big data analytics made as Core paper

Elective Courses

- New Syllabus framed for the course Mobile Computing, Cloud & Distributed Computing, Discrete Mathematics, Cryptography and Network Security, Organization Behavior, Probability & Applied Statistics and Compiler design
- The course Open Source Technologies and Mobile Computing made as Elective paper

Extra Credit Courses

- The course Skills for Employability Development has been changed position in III Semester
- Online Course and Internship have been included

PROGRAMME STRUCTURE – PROGRAM CODE : PCA

Sem	Subject Code	Course	Subject Title	Hours / Week	Credit	CIA	ESE	Total Marks
I	IMCAC11	Core I	Java Programming	5	5	40	60	100
	IMCAC12	Core II	○Data Structures and Algorithms using Python	5	5	40	60	100
	IMCAC13	Core III	RDBMS	5	5	40	60	100
	IMCAC14	Core IV	Optimization Techniques	5	5	40	60	100
	IMCAC15P	Core V	Java Programming Lab	5	3	40	60	100
	IMCAC16P	Core VI	Data Structures and Algorithms with Python Lab	5	3	40	60	100
	IMCAX1P/ IMCAX1O	Extra Credit I	RDBMS Lab / *Online Course	-	2	-	100	100
			Total	**30**	**26+2**	**240**	**360+ 100**	**600+ 100**
II	IMCAC21	Core VII	Web Technology	5	4	40	60	100
	IMCAC22	Core VIII	Computer Organization	5	5	40	60	100
	IMCAC23P	Core IX	Web Designing Lab	5	3	40	60	100
	IMCAC24P	Core X	Data Analytics Lab	4	3	40	60	100
	IMCAE2A/ IMCAE2B/ IMCAE2C	DSE I	a. Cloud and Distributed Computing b. Probability and Applied Statistics c. Data Analytics	6	5	40	60	100

	IMCAE2D/ IMCAE2E/ IMCAE2F	DSE II	a. Compiler Design b. Cryptography and Network Security c. BlockChain Technologies	5	4	40	60	100
	IMCAX2P/ IMCAX2O	Extra Credit II	#Internship / *Online Course	-	2	-	100	100
			Total	**30**	**24+2**	**240**	**360+ 100**	**600+ 100**
III	IMCAC31	Core XI	Software Development Framework	5	5	40	60	100
	IMCAC32	Core XII	Data Mining and Warehousing	5	5	40	60	100
	IMCAC33P	Core XIII	Software Development Framework Lab	5	3	40	60	100
	IMCAC34P	Core XIV	Data Mining Lab	5	3	40	60	100
	IMCAE3A/ IMCAE3B/ IMCAE3C	DSE III	a. Artificial Intelligence and Expert Systems b. Digital Image Processing c. Organizational Behaviour	5	4	40	60	100
	IMCAE3D/ IMCAE3E/ IMCAE3F	DSE IV	a. Operating Systems b. Open Source Technologies c. Internet of Things	5	4	40	60	100
	IMCAX3/ IMCAX3O	Extra Credit III	Employability Skills / *Online Course	-	2	100	-	100
			Total	**30**	**24+2**	**240+ 100**	**360**	**600+ 100**

IV	IMCAC41	Core XV	Software Project Management	5	5	40	60	100
	IMCAC42	Core XVI	○ Machine Learning	5	5	40	60	100
	IMCAC43PW	Core XVII	Project	18	6	100	100	200
	IMCAX4P/ IMCAX4O	Extra Credit IV	Document Preparation Lab (LATEX) / *Online Course	-	2	-	100	100
			Library/Browsing	1				
			Remedial/Games	1				
			Total	**30**	**16+2**	**180**	**220 +100**	**400 + 100**
			Grand Total	**120**	**90 + 8**	**900+ 100**	**1300 + 300**	**2200+ 400**

*****For Online Course credit alone will be assigned on submission of certificate obtained by appearing for online examination from EdX, Spoken Tutorial, NPTEL or Coursera etc.

#For internship course, refer www.internshala.com

○ For online course integration, syllabus will be taken from spoken tutorial.

DSE – Discipline Specific Elective

Core I – Java Programming

(For Students Admitted from 2022-23)

Semester: I **Hours/week: 5**
Subject Code: IMCAC11 **Credit: 5**

Course Objectives:

1. To learn the basic concepts of Java to increase the ability of students in web application development using AWT and Swing
2. To develop programming knowledge to create dynamic web applications using server side technology with Java database connectivity

Unit I **(15 hours)**

Introduction – **Object Orientation an Introduction** – **Java Language Basics:** Java Program Structure – Basic Building Blocks – Variables - Data Types – Operators – Typecasting - Keyword Final – **Control Structures** – **Loops – Functions:** Functions in Java

– Recursive Functions – Parameter Passing – Method swap – In-built Methods or Library Methods – **Arrays:** Arrays in Java – Creating an Array – Array Index Checking – Multi-Dimensional Arrays.

Unit II **(15 hours)**

Introducing Classes: Class Fundamentals – Declaring and Creating Objects – Accessing Members – Access Control Parameters: Public and Private – Introducing Methods – Methods with Parameter – Methods Returning a Value – Constructors – Default Constructor – Keyword this – Garbage Collection – The finalize() Method – Overloading Methods and Constructors – Using Objects as Parameters – Keyword static – **Inheritance:** Inheritance Basics – Member Access and Inheritance – Keyword super – Use of this in Sub-Class Constructor – Creating a Multi-Level Hierarchy – Method Overriding – Using final in Inheritance – Introducing Interface – Abstract Methods and Classes – **Multi-Threaded Programming:** What are Threads? – Why use Threads? – Creating and Running a Thread – Creating Multiple Threads – Life Cycle of a Thread – Implementing Runnable Interface – Thread Priority and Thread Scheduling Policy – Synchronization – **Exception Handling:** Use of Exception Handling – Types of Exceptions – Checked and Unchecked Exceptions – Exception Handling Constructs – Keyword finally – Throw Statement – Multiple Catch Blocks.

Unit III **(15 hours)**

Java Applets: Applet Basics – The Applet Class – Applet Architecture - Applet Life Cycle - Comparison of Applet and Applications – Setting Font and Changing Style, Size, Type, Foreground and Background Colour - Using Graphics Methods in Applets- Images and Sounds in Applets – Applet Tag - **Event Handling and AWT - Introduction to Swing:** JFrame – JOptionPane – Class JButton- Class JLabel- JCheckBox – Introduction to JRadioButton – Class JTextField – JTextArea- JMenu - JComboBox - **JDBC:** JDBC Architecture – SQL-Primer – Create DB in SQL – Creating JDBC Application – JDBC Driver – Connecting to the ODBC Data Source – Database Connections – Statements – The PreparedStatement Objects – The CallableStatement Objects – ResultSet.

Unit IV **(15 hours)**

Servlets: Architecture – Life cycle – First program – Client HTTP request – Server HTTP response – HTTP status code – Writing filters – Exception handling – Cookies handling – Session tracking – Database access – File uploading – Handling date – Servlets-page redirection – Sample program – Servlets-packaging.

Unit V **(15 hours)**

Java Server Pages: An Overview – Advantages of JSP – Architecture – JSP life cycle – JSP comments – JSP syntax – Implicit objects – Control-flow statements – Client-Server JSP – Database access – Custom tags – Exception handling – JSP standard tag library.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the concepts of Java Basics, Control Structures, Loops, Functions, Arrays, Classes, Inheritance, Thread, Applet, Swing, Servlet and JSP

CO2: Utilize the techniques of AWT and Swing to create various fields

CO3: Examine an implementation of Applet with Java for setting up fonts and its style

CO4: Evaluate different types of JDBC drivers, connectivity and exceptions
CO5: Design the web application using swing, servlet, JSP and JDBC

Text Books:

1. Mahesh P. Bhave, Sunil A. Phatekar, *Programming with Java*, Dorling Kindersley Limited, 2009.
2. B Prasanalakshmi *Advanced Java Programming*, CBS Publishers & Distributors, 2015.

Reference Books:

1. Paul Deitel, Harvey Deitel, *Java How to Program***,** PHI Learning, Seventh Edition, 2010.
2. DT Editorial Services, *Java 8 Programming Black Book*, Dreamtech Press, 2015.

E - Resources:

1. https://www.youtube.com/watch?v=Ae-r8hsbPUo
2. https://www.learnvern.com/course/advanced-java-tutorial
3. https://spoken-tutorial.org/tutorial-search/?search_foss=Java&search_language=English

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	3	3	1	9	9	3	1	9	3	**68**
CO2	9	9	9	3	3	1	9	9	3	1	9	3	**68**
CO3	9	9	9	3	3	1	9	9	3	1	9	3	**68**
CO4	9	9	9	3	3	1	9	9	3	1	9	3	**68**
CO5	9	9	9	9	9	1	9	9	9	1	9	9	**92**
Total	**45**	**45**	**45**	**21**	**21**	**5**	**45**	**45**	**21**	**5**	**45**	**21**	**364**

Low-1 Medium-3 High-9

Core II - Data Structures and Algorithms using Python

(For Students Admitted from 2022-23)

Semester: I **Hours/week: 5**
Subject Code:IMCAC12 **Credit: 5**

Course Objectives:

1. To understand data structures and algorithms in computer science perspectives, algorithms analysis procedure, space and time complexity of various algorithms
2. To use existing data structures and algorithms found in python's libraries and to apply data structures and algorithms to solve real world problems

Unit I **(15 hours)**

Computational Complexity: Computer Architecture - Accessing Elements in a Python List - Big-Oh Notation- Other Asymptotic Notations for Complexity of Algorithms - More Asymptotic Notation. **Recursion:** The Run-Time Stack and the Heap – Recursion on Lists and Strings.

Unit II **(15 hours)**

Sequences: Lists- Cloning Objects - Item Ordering - Selection Sort - Merge Sort – Quicksort. **Two-Dimensional Sequences Trees:** Traversal algorithms using Stacks- The Minimax Algorithm - Linked Lists. Stacks and Queues- Radix Sort.

Unit III **(15 hours)**

Trees: Abstract Syntax Trees and Expressions - Search Spaces. **Graphs:** Graph Notation-Searching a Graph-Kruskal's Algorithm-Dijkstra's Algorithm-Graph Representations. **Heaps:** Building a Heap- The Heapsort Algorithm Version 1-Analysis of Heapsort Version 2.

Unit IV **(15 hours)**

Balanced Binary Search Trees: Binary Search Trees - AVL Trees - Splay Trees. **B-Trees:** B-Tree Organization- B-Tree Implementation- B-Tree Insert-B-Tree Delete.

Unit V **(15 hours)**

Algorithm Design Techniques: Greedy Algorithms – Divide and Conquer – Dynamic Programming– Backtracking- Complexity Theory.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the concepts of linear and Non- linear data structures
CO2: Apply linear and non-linear data structures and its algorithms in real time applications
CO3: Analyze the efficiency of algorithms with Python
CO4: Compare different sorting algorithms
CO5: Develop different algorithm design techniques

Text Books:

1. Kent D. Lee, Steve Hubbard, *Data Structures and Algorithms with Python*, Springer International Publishing Switzerland, 2015.
2. Hemant Jain, *Problem Solving in Data Structures & Algorithms*, Taran Technologies Private Limited, First Edition, 2016.

Reference Books:

1. Ellis Horowitz, Sartaj Sahni, *Fundamentals of Data Structures*, Galgotia Book Source, Second Edition, 2004.
2. Alfred V.Aho Johne, Hopcroft, *Data Structures and Algorithm*, Addison-Wesley, Third Edition, 2012.
3. Mark Allen Weiss, *Data Structures and Algorithm Analysis in C++*, Pearson Education, Fourth Edition, 2014.

E-Resources:

1. http://www.dave-reed.com/csc427.F04/
2. http://www.math.tau.ac.il/~matias/ds03.html
3. https://onlinecourses.nptel.ac.in/noc20_cs70/preview
4. https://www.tutorialspoint.com/python_data_structure/python_data_structure_tutorial.pdf
5. https://nptel.ac.in/courses/106/106/106106145/

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	3	3	9	1	9	3	3	1	3	3	56
CO2	9	9	3	3	9	1	9	3	3	1	3	3	56
CO3	9	9	3	3	9	1	9	3	3	1	3	3	56
CO4	9	9	3	3	9	1	9	3	3	1	3	3	56
CO5	9	9	3	3	9	1	9	3	3	1	3	3	56
Total	45	45	15	15	45	5	45	15	15	5	15	15	280

Low-1 Medium-3 High-9

Core III - RDBMS

(For Students Admitted from 2022-23)

Semester: I **Hours/Week: 5**

Subject Code: IMCAC13 **Credit: 5**

Course Objectives:

1. To understand the basic concepts, applications of database systems, relational database design principles and SQL queries
2. To understand the different issues involved in the design and implementation of a database system,security, integrity and concurrency

Unit I **(15 hours)**

Introduction: Database System Applications-Purpose of Database System-View of Data-Database Design- **Data Storage and Quering**-Transaction Management-Database Architechture .**Relational Databases:** Introduction to the Relational Model-Introduction to SQL-Intermediate SQL: Join Expressions-Views- Transactions-Integrity constraints-Schemas-Authorization.

Unit II **(15 hours)**

Database Design: Database design and E-R Model: Overview -ER-Model-Constraints- ER-Diagrams- Reduction to Relational Schemas – Design Issues-.Relational database model: Logical view of data- keys- integrity rules. **Relational Database design:** Features of good relational database design- Atomic domain and Normalization (1NF- 2NF- 3NF-BCNF).Database-Design Process-Modeling Temporal Data.

Unit III **(15 hours)**

Data Storage and Querying: Storage and File Structure: Overview of Physical Storage-Magnetic Disk and Floppy Disk-RAID- Organization of Records in Files-**Indexing and Hashing:** Basic Concepts-Ordered Indices-Multiple Key Access-Static Hashing-Dynamic Hashing-Bit Map Indices. **Query Processing**: Overview-Selection Operation-Sorting-Join Operation.

Unit IV **(15 hours)**

Transaction Management: Transaction: Transaction Concept-Simple Transaction Model-Storage Structure- Transaction Atomicity and Durability-Transaction Isolation-Serializablity-**Concurrency Control:** Lock- Based Protocols-Deadlock Handling-Multiple

Granularity-Time Stamp Protocols-Valuation Based Protocols. **Recovery System:** Failure Classification-Recovery and Atomicity-Recovery Algorithm-Failure Management.

Unit V **(15 hours)**

System Architechture Text: Database –System Architechture Centralisedand Client-Server Architecture- Server System Architechture-Parallel System-Distributed System-Distributed System-Network Types-**ObjectBased Databases:** Complex Data Types –Table Inheritance-Implementing O-R Features-**Advanced Topics, Advanced Application Development:** Performance Tuning-Performance Benchmarks-Standardization.

Course Outcomes:

After successful completion of this course, the student will be able to

CO1:Explore about DBMS architecture, database designs, database modeling

CO2:Extend about ER-Diagram and UML, Relational Algebra and Relational Calculus

CO3:Distinguish the normalization theory

CO4:Apply Structured query language (SQL) and Constraints

CO5:Evaluate various transaction processing, concurrency control mechanisms and database protection mechanisms

Text Book:

1. A Silberschatz , H Korth, S Sudarshan, *Database System and Concepts*, Mc Graw-Hill, Sixth Edition,2019.

Reference Books:

1. Raghu Ramakrishnan and Johannes Gehrke, *Database Management Systems (3/e)*, McGraw Hill, 2003.
2. Atul Kahate, *Introduction to Database Management Systems*, Pearson Education, Tenth Impression, 2012.
3. C.J Date, *An Introduction to Database System*, Addison- Wesley Publishing, Third Edition, 1998.

E-Resources:

1. https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm
2. https://www.coursera.org/projects/introduction-to-relational-database-and-sql
3. https://onlinecourses.nptel.ac.in/noc21_cs04/preview

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	3	1	9	1	9	3	3	1	3	1	52
CO2	9	9	3	1	9	1	9	3	3	1	3	1	52
CO3	9	9	3	1	9	1	9	3	3	1	3	1	52
CO4	9	9	3	1	9	1	9	3	3	1	3	1	52
CO5	9	9	3	1	9	1	9	3	3	1	3	1	52
Total	45	45	15	5	45	5	45	15	15	5	15	5	260

Low-1 Medium-3 High-9

Core IV – Optimization Techniques

(For Students Admitted from 2022-23)

Semester: I **Hours/week: 5**
Subject Code: IMCAC14 **Credit: 5**

Course Objectives:

1. To impart knowledge in concepts and tools of Operations Research(OR)
2. To apply OR techniques constructively to make effective business decisions

Unit I **(15 hours)**

Basics of Operations Research: Development of OR – Definition-Characteristics-Scientific Method-Necessity of OR-Scope-OR and Decision-Making-Scope of OR in Management, Financial management-Applications of various OR Techniques-Objectives –Phases-Models-Classification Schemes of Models-Role of Computers in OR – Difficulties in OR - Limitations of OR

Linear Programing: Introduction-Requirements for a Linear Programming Problem - Assumptions in Linear Programming Models – Applications of LP method- Formulation of LPP-Advantages – Limitations – Graphical Method of Solutions – Some Exceptional Cases.

Unit II **(15 hours)**

General LPP-Canonical and standard Forms of LPP-Theory of Simplex Method – Some Important Definitions –Analytical Method or Trial and Error Method – Simplex Method – Artificial Variables Techniques – Special cases in Simplex Method Applications – Solution of Simultaneous Equations by Simplex Method – Some Additional Points – Computational Efficiency of the Simplex Technique.

Unit III **(15 hours)**

Transportation Model: Introduction to the Model – Assumptions in Transportation Model – Definition – Matrix Terminology – Formulation and Solution – Variants in Transportation Problems – Additional Problems –Least-Time Transportation Problems – Post Optimality Analysis in Transportations – Trans-Shipment Problem – Dual of the Transportation Problem.

Unit IV **(15 hours)**

Assignment Model: Definition of Assignment Model – Mathematical Representation – Comparison with the Transportation Model – Solution of Assignment Models – Hungarian Method for Solution of Assignment Problems – Formulation and Solution of Assignment Models – Variations – Additional Problems- Sensitivity Analysis in Assignment Problem – Travelling Salesman Problem.

Unit V **(15 hours)**

Advanced Topics in LP: Duality in LP – Dual Simplex Method – Revised Simplex Method – Bounded Variable Problem.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain characteristics of Operational Research, Computational Efficiency of the Simplex Technique, Transportation Problems, Assignment problem and Duality

CO2: Apply Graphical, Simplex methods, Assignment Problem, Transportation Problem and Dual Simplex Method methods to get optimal solution for Linear Programming
CO3: Analyse the optimal solutions of different Linear Programming methods such as Graphical, Simplex method, Assignment Problem and Transportation Problem and Dual Simplex methods for making effective business decisions
CO4: Compare Solutions of as Graphical, Simplex and Dual Simplex method
CO5: Generate dual of LPP and dual of Transportation Problem

Text Book:

1. Er. Prem Kumar Gupta, Dr D S Hira, *Operations Research*, S Chand Publisher, Revised Edition, 2017.

Reference Books:

1. V.K.Kapoor, *Operations Research*, Sultan Chand & Sons Publishers, Fourth Edition, 2001
2. Hamdy A.Taha, *Operations Research*, Prentice Hall of India, Seventh Edition, 2005.
3. J K Sharma, *Operations Research Theory and Applications*, Macmillan Publishers India Limited, Fifth Edition, 2013.
4. Kanti Swarup , P.K. Gupta and Man Mohan, *Operations Research*, Sultan Chand & Sons Publishers,Thirteenth Edition, 2004.

E-Resources:

1. https://nptel.ac.in/courses/110/106/110106062/
2. https://onlinecourses.swayam2.ac.in/cec20_ma10/preview
3. https://www.bbau.ac.in/dept/UIET/EMER-601%20Operation%20Research%20Queuing%20theory.pdf

Course Outcomes	Programme Outcomes												
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Total**
CO1	9	9	3	3	1	3	9	1	3	1	3	1	**46**
CO2	9	9	9	3	1	3	9	1	3	1	3	1	**52**
CO3	9	9	9	3	1	3	9	1	3	1	3	1	**52**
CO4	9	9	9	3	1	3	9	1	3	1	3	1	**52**
CO5	9	9	9	3	1	9	9	1	3	1	3	1	**58**
Total	**45**	**45**	**39**	**15**	**5**	**21**	**45**	**5**	**15**	**5**	**15**	**5**	**260**

Low-1 Medium-3 High-9

Core V – Java Programming Lab

(For Students Admitted from 2022-23)

Semester: I **Hours/Week: 5**
Subject Code: IMCAC15P **Credit: 3**

Course Objectives:

1. To apply the concepts of Abstract Windowing Toolkit (AWT) and swing to design and develop GUI applications
2. To create dynamic web applications using JSP, Servlet and Java Data Base Connectivity (JDBC)

List of Programs

Formula Substitution
1. To find binomial coefficient

Array
2. To arrange numbers and names in order
3. To perform matrix multiplication & transpose
4. To perform Linear search and Binary search

OOPs Concept
5. To implement Inheritance
6. To implement Exception Handling
7. To implement multithreading

Applet
8. To handle Keyboard events
9. To handle Mouse events
10. To simulate a calculator (arithmetic operations) using GUI components
11. To implement Free hand drawing
12. To implement menus

Swing
13. To display current date & time in different format.
14. To set a foreground and background color for label

JDBC
15. To prepare a student's details with Roll-No, Name, Mark1, Mark2, Mark3, Total, Average and Grade to perform insert, update, delete and display of student information
16. To prepare an Electricity Bill to perform insert, update, delete and display Electricity bill of a particular user

Servlet
17. To display Simple Message
18. To use cookies to store the number of times a user has visited the servlet
19. To generate Random Numbers
20. Create a login page, if the username and password is correct then prints message "Hello username" else "login failed"
21. Create Student Information System to view the details of the Students

JSP
22. To print a message "hello world!"
23. To prints current date and time
24. To add and subtract two numbers.
25. Design and implement a JAVA JSP Program to get student information and display the same information through Servlet.

Note: - Questions for the external examination will be based on the concepts learnt

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Demonstrate the concepts such as OOPs, Array to implement Java code
CO2: Apply an event handling using swing and AWT components
CO3: Illustrate the concept of Applets in Java program
CO4: Discover the database access through Java code using JDBC connectivity
CO5: Create dynamic web pages using Servlet and JSP

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	3	3	1	9	9	3	1	3	1	60
CO2	9	9	9	3	3	1	9	9	3	1	3	1	60
CO3	9	9	9	3	3	1	9	9	3	1	3	1	60
CO4	9	9	9	3	3	1	9	9	9	1	9	1	72
CO5	9	9	9	3	9	1	9	9	9	1	9	1	78
Total	45	45	45	15	21	5	45	45	27	5	27	5	330

Low-1 Medium-3 High-9

Core VI - Data Structures and Algorithms with Python Lab

(For Students Admitted from 2022-23)

Semester: I **Hours/week: 5**
Subject Code: IMCAC16P **Credit: 3**

Course Objectives:
1. To identify and apply the suitable data structure for the given real world problem
2. To gain knowledge in practical applications of data structures using python

List of Programs

Display Text
1. To develop a simple calculator
2. To check given year is leap year or not

Formula Substitution
3. To find the factorial of the given number
4. To compute the GCD of two numbers.
5. To find the Distance between Two Points
6. To evaluate the Fibonacci series for n terms
7. To find given number is odd or even.
8. To find ind the square root of a number (Newton's method)
9. To find Exponentiation (power of a number)
10. To find the maximum of a list of numbers.
11. To find First n prime numbers
12. To Find Given Number is Armstrong Number or not

Algorithm substitution

13. To perform Linear search and Binary search
14. To perform Selection sort
15. Write a Python program to perform Insertion sort
16. To perform Merge sort
17. To perform Bubble Sort Algorithm

Array

18. To multiply matrices
19. To use command line arguments for counting words (word count)

File

20. To find the most frequent words in a text read from a file

Note: - Questions for Internal and External examination will be based on concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe the Python language syntax including control statements, loops and functions to write programs for a wide variety problem in mathematics.
CO2: Examine the core data structures in python to store, process and sort the data.
CO3: Basic knowledge of condition checking
CO4: Implement the structure of algorithm
CO5: Examine the file and array concept

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	3	9	1	9	3	3	1	1	1	**58**
CO2	9	9	9	3	9	1	9	3	3	1	1	1	**58**
CO3	9	9	9	3	9	1	9	3	3	1	1	1	**58**
CO4	9	9	9	3	9	1	9	3	3	1	1	1	**58**
CO5	9	9	9	3	9	1	9	3	3	1	1	1	**58**
Total	**45**	**45**	**45**	**15**	**45**	**5**	**45**	**15**	**15**	**5**	**5**	**5**	**290**

Low-1 Medium-3 High-9

Core VII - Web Technology

(For Students Admitted from 2022-23)

Semester: II **Hours/Week: 5**
Subject Code: IMCAC21 **Credit: 4**

Course Objectives:

1. To analyze a web page and identify its elements and attributes and create web pages using XHTML and Cascading Style Sheets
2. To build dynamic web pages using JavaScript (Client side programming), create XML documents and Schemas, build interactive web applications using AJAX

Unit I **(15 hours)**

Internet Protocols: Introduction- Internet Protocols-Host Names- Internet Applications and Application Protocols. **Introduction to HTML:** Introduction-SGML-Outline of an HTML Document-Head Section-Body Section- HTML Forms. **JAVA Network Programming:** Introduction- UDP/IP and TCP/IP Communications-I/O Streams- Sockets-Remote Method Invocation-Protocol Handler.

Unit II **(15 hours)**

JAVASCRIPT: Introduction-Language Elements - Objects of JavaScript - Other Objects. **Syntax:** An overview of JavaScript's syntax- Identifiers**. Consoles:** interactive JavaScript command lines. **VBSCRIPT:** Embedding VBScript code in an HTML Document-Variables-Procedures-Conditional statements-Looping Constructs-Objects and VBScript.

Unit III **(15 hours)**

Dynamic HTML(DHTML): Introduction-Cascading Style Sheets(CSS)-DHTML Document Object Model and Collections-Event Handling-Data Binding. e**Xtensible Mark-up Language (XML):** Introduction-HTML vs XML- XML Attributes- XML Validation- XML DTD -The Building Blocks of XML Documents.

Unit IV **(15 hours)**

JAVA SERVER PAGES (JSP): Introduction -Advantages of JSP-Components of JSP - Cookies. **Active Server Pages (ASP):** Introduction- Advantages of Using ASP-First ASP Script-Processing of ASP Scripts with Forms-Variables and Constructs-Subroutines-ASP Cookies-ASP Objects-Connecting to Data with ASP.

Unit V **(15 hours)**

Introduction to PHP: Introduction-Installing PHP-PHP Tags-Comments-Print and Echo Statements-Data Types-Constants-Operators-Control Statements-Looping Constructs-String Fuctions-Numeric Fuctions-Arrays-User Defined Functions-Working with Forms-**MYSQL:** Introduction Database Systems-Accessing the Database with PHP.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the fundamentals of web development technologies
CO2: Apply the different tags to develop a dynamic webpage using JavaScript, JSP and ASP
CO3: Able to write a well formed /valid XML document
CO4: Justify best technologies for solving web client/server problems
CO5: Build web pages using various web design languages

Text Books:

1. N.P.Gopalan, J.Akilandeswari, *Web Technology, A Developer's Perspective*, PHI Learning Private Limited, Second Edition, 2016.
2. Dr. Axel Rauschmayer, *JavaScript for Impatient Programmers*, ECMA Script, 2022.

Reference Books:

1. Jeffrey C. Jackson, *WEB TECHNOLOGIES A Computer Science Perspective*, Pearson Education, 2007.

2. Thomas A. Powell, *HTML & CSS: The Complete Reference*, McGraw-Hill, Fifth Edition, 2010.

E - Resources:

1. https://www.ecyrd.com/JSPWiki/attach/JSPWikiFileAttachments/Intro%20to%20ASP.pdf
2. https://link.springer.com/content/pdf/bbm%3A978-1-4302-1097-9%2F1.pdf
3. https://www.coursera.org/learn/html-css-javascript-for-web-developers
4. coursera.org/lecture/service-oriented-architecture/4-1-5-html-xml-json-rK9X5

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	3	1	1	9	3	3	1	3	3	3	3	42
CO2	9	3	9	1	9	3	3	3	3	3	3	3	52
CO3	9	3	3	3	9	3	3	3	3	3	3	3	48
CO4	9	3	3	3	9	9	3	3	3	9	9	3	66
CO5	9	9	9	9	9	3	3	3	3	3	9	9	78
Total	45	21	25	17	45	21	15	13	15	21	27	21	286

Low-1 Medium-3 High-9

Core VIII - Computer Organization

(For Students Admitted from 2022 -23)

Semester: II **Hours/Week: 5**
Subject Code: IMCAC22 **Credit: 5**

Course Objectives:

1. To understand the structure, function and characteristics of computer systems and understand the design of the various functional units and components of computers
2. To identify the elements of modern instructions sets and their impact on processor design

Unit I **(15 hours)**

Basic Computer Organization and Design: Instruction Codes-Computer Registers-Computer Instructions-Timing and Control-Instruction Cycle-Memory Reference Instructions -Input-Output and Interrupts.

Unit II **(15 hours)**

Micro programmed Control: Control Memory- Address Sequencing- Micro program Examples- Design of Control Unit.

Unit III **(15 hours)**

Central Processing Unit: Introduction- General Register Organization - Instruction Formats -Addressing Modes-Data Transfer and Manipulation-Program Control-**RISC Pipeline and Vector Processing:** Parallel Processing-Pipeline-Arithmetic Pipeline-Instruction Pipeline-Vector Processing.

Unit IV **(15 hours)**

Input-Output Organization: Peripheral Devices- /O interface-Asynchronous Data Transfer -Modes of Transfer -Direct Memory Access- Input Output Processor (Excluding IBM and Intel IOPs).

Unit V **(15 hours)**

Memory Organization: Memory-Main Memory- Auxiliary Memory -Associative Memory-Cache Memory -Virtual Memory-Memory Management Hardware.

Course Outcomes:

After successful completion of this course, students will be able to

CO 1: Define the fundamental organization of a computer system
CO 2: Explain the concept of sequencing, designing, pipeline and vector processing methods
CO 3: Examine the function of input-output organization
CO 4: Compare various pipeline concepts
CO 5: Distinguish the organization of various parts of a system memory hierarchy

Text Book:

1. Morris Mano M, *Computer System Architecture*, Prentice Hall of India ,2011.

Reference Books:

1. William Stallings, *Computer Organization and Architecture*, Pearson Publication, Eighth Edition, 2010.
2. Morris Mano, *Digital Login and Computer Design*, Prentice Hall of India, 2001.

E-Resources:

1. NPTEL: https://nptel.ac.in/courses/106/105/106105163/

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	9	9	1	9	3	3	1	3	1	66
CO2	9	9	9	9	9	1	9	3	3	1	3	1	66
CO3	9	9	9	9	9	1	9	3	3	1	3	1	66
CO4	9	9	9	9	9	1	9	3	3	1	3	1	66
CO5	9	9	9	9	9	1	9	3	3	1	3	1	66
Total	45	45	45	45	45	5	45	15	15	5	15	5	330

Low-1 Medium-3 High-9

Core IX - Web Designing Lab

(For Students Admitted from 2022-23)

Semester : II **Hours/week: 5**
Subject Code: IMCAC23P **Credit: 3**

Course Objectives:

1. To analyze a web page and identify its elements and attributes and create web pages using XHTML and Cascading Style Sheets

2. To build dynamic web pages using JavaScript (Client side programming) and create XML documents and Schemas

List of Programs

HTML

1. To illustrate all basic tags
2. To display study time table for end semester examination
3. To display a menu list for bakery
4. To use all style sheets
5. To demonstrate frame
6. To use hyperlink for both text and image
7. To demonstrate forms

Java Script

8. Leap year checking
9. To convert temperature from Fahrenheit to Celsius
10. To create login form
11. Create a HTML page to demonstrate validation for gmail registration
12. Build college website
13. Build website for online shopping

Note: - Questions for the Internal/External examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the basics of all HTML tags to create the static web page
CO2: Apply the concepts of table and list in HTML
CO3: Examine the use of style sheets, frames and hyperlinks
CO4: Evaluate the concept of validation using JavaScript
CO5: Create a dynamic website

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	3	9	3	9	9	9	1	9	9	9	1	80
CO2	9	9	9	9	9	9	9	1	9	9	9	1	92
CO3	9	9	9	9	9	9	9	1	9	3	9	1	86
CO4	9	9	9	9	9	9	9	1	9	9	9	1	92
CO5	9	9	9	9	9	9	9	1	9	9	9	1	92
Total	45	39	45	39	45	45	45	5	45	39	45	5	442

Low-1 Medium-3 High-9

Core X - Data Analytics Lab

(For Students Admitted from 2022-23)

Semester: II **Hours/week: 4**
Subject Code: IMCAC24P **Credit: 3**

Course Objectives:

1. To know the modern quantitative tools to data analysis in a business context and identify datasets and explain how they are organized and manipulate data
2. To apply the tools to transform the data into useful information and use functions for data visualization

List of Programs

Using Spread sheet

1. Perform Basic Functions in Spread sheets
2. Perform Formatting and Proofing
3. Perform Mathematical & Text Functions
4. Implement Date and Time Functions
5. Implement Sorting & Filtering Techniques
6. Perform Logical Functions
7. To perform Data Validation
8. Display Pivot Tables
9. Display Charts and Slicers
10. Perform Lookup Functions

Using R

11. Get the input from user and perform numerical operations (MAX, MIN, AVG, SUM, SQRT, ROUND)
12. Perform data import/export (.CSV, .XLS, .TXT) operations using data frames
13. Get the input matrix from user and perform Matrix addition, subtraction, multiplication, inverse transpose and division operations using vector concept
14. Perform statistical operations (Mean, Median, Mode and Standard deviation)
15. Perform data pre-processing operations i) Handling Missing data ii) Min-Max normalization
16. Perform Simple Linear Regression
17. Perform K-Means clustering operation and visualize for iris data set

Using SciLab

18. Implement the basic matrix operations
19. Find the Eigenvalues and eigenvectors
20. Solve equations by Gauss elimination, Gauss Jordan Method and Gauss Seidel
21. Find the reduced row echelon form of a matrix

Note: - Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Outline Excel functions to solve mathematical, text, date and time operations, R functions for numerical operations and Scilab functions for matrix operations

CO2: Demonstrate the concepts of sorting, filtering using Excel

CO3: Illustrate statistical operations using R

CO4 Evaluate the Regression and Clustering

CO5: Develop programs to solve equations by Gauss elimination, Gauss Jordan Method and Gauss Seidel

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	9	9	1	9	9	3	3	3	1	74
CO2	9	9	9	9	9	1	9	9	3	3	3	1	74
CO3	9	9	9	9	9	1	9	9	3	3	3	1	74
CO4	9	9	9	9	9	1	9	9	3	3	3	1	74
CO5	9	9	9	9	9	1	9	9	3	3	3	1	74
Total	45	45	45	45	45	5	45	45	15	15	15	5	370

Low-1 Medium-3 High-9

DSE I - a) Cloud and Distributed Computing

(For Students Admitted from 2022-23)

Semester: II **Hours / Week: 6**
Subject code: IMCAE2A **Credit: 5**

Course Objectives:

1. To identify the technical foundations of cloud systems architectures and analyse the problems and solutions to cloud application problems
2. To apply principles of best practice in cloud application design and management and identify and define technical challenges for cloud applications and assess their importance

Unit I **(18 hours)**

Introduction to Cloud, Virtualization, and Virtual Machine: Introduction to Cloud Computing - Features of Today's Cloud - Introduction to Virtualization - Mitigation Techniques for VM Migration. **Network Virtualization and Geo-Distributed Clouds:** Introduction - Cloud Computing and Server Virtualization - Networking of Virtual Machines Inside the Hypervisor – Docker - Software-Defined Network - Network Virtualization in Multi-Tenant Data Centers: VL2 - Network Virtualization in Multi-Tenant Data Centers: NVP - Geo-Distributed Cloud Data Centers.

Unit II **(18 hours)**

Leader Election in Cloud, Distributed Systems, and Industry Systems: Introduction - Leader Election in Rings (Classical Distributed Algorithms) - Ring Leader Election and Bully Leader Election Algorithms - Classical Algorithm: Ring Election Algorithm - Classical Algorithm: Bully Election - Industry Systems: Google Chubby and Apache ZooKeeper - Design of ZooKeeper. **Cloud-Native Computing:** Introduction – Micro services – Docker – Kubernetes - Introduction to Edge Computing - Classification of Edge Computing.

Unit III **(18 hours)**

Cloud Asset Management and Protection: Differences from Traditional IT - Types of Cloud Assets - Compute Assets - Storage Assets - Network Assets - Asset Management Pipeline - Procurement Leaks - Processing Leaks - Tooling Leaks - Findings Leaks - Tagging

Cloud Assets. **Software-Defined Networking and Network Function Virtualization:** Introduction - Software-Defined Networking - Applications and Use Cases - Software-Defined NFV - Network Slicing - Ongoing Research Opportunities.

Unit IV **(18 hours)**

Cloud Storage: Key-Value Stores/NoSQL Stores and HBase: Design of Key-Value Stores - Design of HBase. **Identity and Access Management:** Differences from Traditional IT - Life Cycle for Identity and Access - Request - Approve - Create, Delete, Grant, or Revoke - Authentication - Cloud IAM Identities - Business-to-Consumer and Business-to-Employee - Multi-Factor Authentication - Passwords and API Keys - Shared IDs - Federated Identity - Single Sign-On - Instance Metadata and Identity Documents - Secrets Management - Authorization - Centralized Authorization - Roles - Revalidate - Putting It All Together in the Sample Application.

Unit V **(18 hours)**

Classical Distributed Algorithms and the Industry Systems: Introduction - Time and Clock Synchronization in Cloud Data Center - Key Challenges - Clock Synchronization - Algorithms for Recording Global State and Snapshot - Mutual Exclusion Algorithms for Distributed Systems. **Cloud Applications:** MapReduce, Spark, and Apache Kafka – MapReduce – Spark – Kafka.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Identify the features of Cloud Computing and Virtualization

CO2 Demonstrate the leader election and cloud native computing

CO3: Classify types of cloud assets, Software-Defined Networking and Network Function Virtualization

CO4: Justify cloud storage, Identity and Access Management

CO5: Generate the Classical Distributed Algorithms, the Industry Systems and Cloud applications

Text Books:

1. Rajiv Misra and Yashwant Singh Patel, *Cloud and Distributed Computing: Algorithms and Systems*, Wiley Emerging Technology Series, 2020.
2. Chris Dotson, *Practical Cloud Security: A Guide for Secure Design and Deployment*, O'Reilly Media, First Edition, 2019.

Reference Books:

1. Rajkumar Buyya, Christian Vecchiola, Thamarai Selvi, *Mastering Cloud Computing*, Tata McGraw Hill, 2017.
2. Rajkumar Buyya, James Broberg, Andrzej Goscinski, *Cloud Computing Principles and Paradigms*, John Wiley & Sons Limited, 2011.
3. Toby Velte, Anthony Velte, Robert Elsenpeter, *Cloud Computing-A Practical Approach*, Tata McGraw Hill, 2010.

E - Resources:

1. https://nptel.ac.in/courses/106/104/106104182/

2. https://www.amazon.in/Cloud-Distributed-Computing-Algorithms-Systems/dp/8126520272?asin=B086V7Q2KW&revisionId=&format=4&depth=1

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	3	1	1	1	9	9	9	9	3	9	3	9	66
CO2	9	1	3	9	3	3	3	9	9	3	3	3	58
CO3	3	9	3	1	9	9	9	9	9	9	9	9	88
CO4	1	1	9	3	3	3	9	9	9	9	9	9	74
CO5	9	3	9	9	9	9	9	9	9	9	9	9	102
Total	25	15	25	23	33	33	39	45	39	39	33	39	388

Low-1 Medium-3 High-9

DSE I – c) Data Analytics

(For Students Admitted from 2022-23)

Semester: I **Hours/week: 6**
Subject Code: IMCAE2C **Credit: 5**

Course Objectives:

1. To understand the Big Data Platform and its Use cases and Map Reduce Jobs
2. To provide an overview of Apache Hadoop, HDFS Concepts and Interfacing with HDFS and Apply analytics on Structured, Unstructured Data

Unit I **(18 hours)**

Introduction to Big Data: Introduction – understanding Big data-capturing bigdata-Volume-velocity-variety-veracity-Benefiting Big Data –Management of big data- organizing big data-Technology challenges**.**

Unit II **(18 hours)**

Big data Sources and Architecture: Big data sources-people to people communication-m2m- big data applications- Examining big data types- structured data – unstructured data-semi structured data-integrating data type into big data environment-Big data Architecture.

Unit III **(18 hours)**

Hadoop: Big Data – Apache Hadoop & Hadoop EcoSystem – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization- Hadoop Architecture, Hadoop Storage. Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers-: HDFS- Hive Architecture and Installation, Comparison with Traditional Database, HiveQL - Querying Data - Sorting and Aggregating, Map Reduce Scripts, Joins & Subqueries, HBase.

Unit IV **(18 hours)**

Analytics and Big Data: Basic analytics-Advanced analytics-operationalized analytics-Monetizing analytics-modifying business intelligence products to handle big data- big data analytics solution-understanding text analytics-tools for Big data**.**

Unit V **(18 hours)**

Data Visualization & R: Introduction-excellence in visualization- types of chart-Business Intelligence: Tools-skills applications – Health care- Education-retail - E- Governance - Working with R- Import a dataset in R Plotting a histogram-Big data mining.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe Data sources, generations, data formats, Data Evolution, Data from various domains

CO2: Determine Big Data Characteristics, Frameworks, components and Limitation of traditional approaches and map Big Vs to Data Domains

CO3: Analyse various domains of Data Characteristics, Platform, Programming Model and Design Data Analytic ecosystem, and data processing framework

CO4: Evaluate the Concepts of Data Analytics Phases and Techniques

CO5: Formulate Data Analytics Techniques practically using R environment

Text Books:

1. Anil Maheshwari, *Data Analytics Made Accessible*, Kindle Edition, 2017.
2. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman , *Big Data for Dummies*, Wiley India Private Limited, 2014.

Reference Books:

1. Boris lublinsky, Kevin T. Smith, Alexey Yakubovich, *Professional Hadoop Solutions*, Wiley, India Private Limited, 2015.
2. Chris Eaton, Dirk deroos, Understanding *Big data*, McGraw Hill, 2012.
3. Tom White, *HADOOP: The definitive Guide*, O Reilly, 2012.
4. Tom Plunkett, Brian Macdonald, Oracle *Big Data Handbook*, Oracle Press, 2014.
5. JyLiebowitz, *Big Data and Business analytics*, CRC press, 2013.
6. VigneshPrajapati, *Big Data Analytics with R and Hadoop*, Packet Publishing, 2013.

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc20_cs92/preview
2. https://nptel.ac.in/courses/110/106/110106072/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	1	9	3	9	**49**
CO2	9	9	9	1	9	3	9	**49**
CO3	9	9	9	1	9	3	9	**49**
CO4	9	9	9	1	9	3	9	**49**
CO5	9	9	9	1	9	3	9	**49**
Total	**45**	**45**	**45**	**5**	**45**	**15**	**45**	**245**

Low-1 Medium-3 High-9

DSE II – a) Compiler Design

(For Students Admitted from 2022-23)

Semester: II **Hours/ Week: 5**
Subject code: IMCAE2D **Credit: 4**

Course Objectives:

1. To provide an understanding of the fundamental principles in compiler design
2. To learn the process of translating a modern high-level language to executable code required for compiler construction

Unit I **(15 hours)**

Introduction: The structure of a compiler –Evolution of programming languages-Applications of compiler technology-A Simple Syntax Directed Translator: Syntax definition-syntax-directed translation.

Unit II **(15 hours)**

Parsing: Lexical Analysis-Symbol Tables-Lexical Analysis: The role of the lexical analyser-Input Buffering- Specification of Tokens-Recognition of tokens-The lexical analyser generator Lex-Finite Automata.

Unit III **(15 hours)**

Design of lexical analyser generator: DFA for lexical analyser - Important states of an NFA, Converting a regular expression directly to a DFA-Minimizing the number of states of a DFA-**Syntax Analysis:** Syntax error handling-error recovery strategies-Context free grammars-Top down parsing: FIRST and FOLLOW –LL(1) Grammars-Bottom Up Parsing.

Unit IV **(15 hours)**

LR Parsing: More Powerful LR Parsers-Using Ambiguous Grammars-Parser Generators-Syntax-Directed Translation: Evaluation orders for SDD's – application of SDT-Syntax Directed Translation Schemes- Intermediate Code Generation: Variants of Syntax Trees-Three address code.

Unit V **(15 hours)**

Run time environment: Heap Management- Code Generation: The target language-Address in the Target Code-A Simple code generator-Peephole Optimization-Optimal Code generation for Expression-Dynamic Programming code-Generation-Machine-Independent Optimization: Semantics preserving Transformations-Copy Propagation-Dead –Code Elimination-Code Motion.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Define common forms of parsers
CO2: Illustrate compiler construction tools and describes the Functionality of each stage of compilation process
CO3: Construct Grammars for Natural Languages and find the Syntactical errors/Semantic errors during the compilations using parsing techniques
CO4: Analyze different representations of intermediate code
CO5: Design to construct new compiler for new languages

Text Book:

1. Alfred V Aho, Monica S Lam, Ravi Sethi, Jeffrey D Ullman, *Compiler Principles, Techniques & Tools*, Pearson Addison Wesley, Second Edition, 2007.

Reference Books:

1. Alfred V. Aho, Jeffrey D. Ullman, *Principles of compiler design*, Pearson Education, Indian student Edition, 2001.
2. Kenneth C. Louden, *Compiler Construction– Principles and Practice*, PWS Publishing, First edition, 1997.
3. K. L. P Mishra, N. Chandrashekaran, *Theory of computer science- Automata Languages and Computation*, Prentice Hall of India, Second edition, 2003.
4. Andrew W. Appel, *Modern Compiler Implementation C*, Cambridge University Press, 2004.

E- Resources:

1. https://www.geeksforgeeks.org/compiler-design-tutorials/
2. https://nptel.ac.in/courses/106/108/106108113/

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	3	9	9	1	9	3	9	3	9	3	76
CO2	9	9	3	9	9	1	9	3	9	3	9	3	76
CO3	9	9	3	9	9	1	9	3	9	3	9	3	76
CO4	9	9	3	9	9	1	9	3	9	3	9	3	76
CO5	9	9	3	9	9	1	9	3	9	3	9	3	76
Total	45	45	15	45	45	5	45	15	45	15	45	15	380

Low-1 Medium-3 High-9

DSE II – b) Cryptography and Network Security

(For Students Admitted from 2022-23)

Semester: II **Hours / Week: 5**
Subject code: IMCAE2E **Credit: 4**

Course Objectives:

1. To understand the basics of Cryptography and Network Security and secure a message over insecure channel by various means
2. To learn about how to maintain the Confidentiality, Integrity and Availability of data and various protocols for network security to protect against the threats in the networks

Unit I **(15 hours)**

Computer and Network Security concept: Computer security concepts-The OSI security Architecture-Security Attacks- Security Services-Security Mechanisms. **Number Theory:** The Euclidean Algorithm-Modular Arithmetic-Prime Numbers- Fermat's Euler's Theorem-Discrete Logarithms.

Unit II **(15 hours)**

Symmetric Ciphers: Classical Encryption Techniques: Symmetric Chippers Model-Substitution Techniques-Transposition Techniques-Traditional Block Cipher Structure-Block Cipher Design Principles. **Finite Fields:** Groups-Rings-Fields-Finite Fields of the FormGF(p).

Unit III **(15 hours)**

Advanced Encryption Standard: Finite Field Arithmetic-AES Structure-AES Transformation Functions-AES Key Expansion. **Asymmetric Ciphers:** Principles of public – key cryptosystems-The RSA Algorithm.

Unit IV **(15 hours)**

Other Public-Key Cryptosystem: Diffie-Hellman Key Exchange-Elgamal cryptographic system-Elliptic curve arithmetic- Elliptic curve Cryptography. **Digital Signature:** Digital signature - Elgamal Digital Signature Scheme-Schnorr Digital Scheme-NIST Digital signature algorithm.

Unit V **(15 hours)**

Wireless Network Security: Wireless Security-Mobile Device Security-IEEE802.11 Wireless LAN Overview- IEEE802.11 Wireless LAN Security. **Electronic Mail Security:** Internet Mail Architecture-Email Formats-Email Threats and compressive Email Security-S/MIME –DNSSEC-Sender policy Framework-Domain Keys Identify Mail.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Define various Cryptographic Techniques
CO2: Demonstrate various data encryption techniques
CO3: Explain the encryption standard and asymmetric ciphers
CO4: Analyze Hashing and Digital Signature techniques
CO5: Discuss various Security Applications

Text Book:

1. William Stallings, *Cryptography and Network Security Principles and Practice*, Pearson Education, Seventh Edition, 2017.

Reference Books:

1. Wade Trappe, Lawrence C Washington, *Introduction to Cryptography with Coding Theory*, Pearson Education, Second Edition, 2007.
2. William Stallings, *Cryptography and Network security Principles and Practices*, Pearson Education, Fourth Edition, 2006.
3. W.Mao, *Modern Cryptography – Theory and Practice*, Pearson Education, Second Edition, 2007.

E- Resource:

1. https://nptel.ac.in/courses/106/105/106105162/

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	3	1	9	1	9	3	3	1	3	1	52
CO2	9	9	3	1	9	1	9	3	3	1	3	1	52
CO3	9	9	3	1	9	1	9	3	3	1	3	1	52
CO4	9	9	3	1	9	1	9	3	3	1	3	1	52
CO5	9	9	3	1	9	1	9	3	3	1	3	1	52
Total	45	45	15	5	45	5	45	15	15	5	15	5	260

Low-1 Medium-3 High-9

DSE II – c) BlockChain Technologies

(For Students Admitted from 2022-23)

Semester: II **Hours/ week: 5**
Subject Code: IMCAE2F **Credits: 4**

Course Objectives:

1. To assess block chain applications in a structured manner and impart knowledge in block chain techniques and able to present the concepts clearly and structured
2. To get familiarity with future currencies and to create own crypto token

Unit I **(15 hours)**

Introduction of Block chain: Block chain 101-Distributed Systems-Consensus-The history of block chain-Introduction of block chain-Features of block chain-Applications of block chain technology-Tiers of Block chain technology-Consensus in block chain-CAP theorem and block chain-Benefits and limitations of Block chain. **Decentralization:** Introduction of Decentralization using block chain-Methods of Decentralization-Routes of Decentralization-Block chain and full ecosystem decentralization-Decentralization Organizations.

Unit II **(15 hours)**

Cryptography and Technical Foundations: Introduction- Mathematics- Cryptography-Confidentiality- Integrity - Authentication - Non repudiation -Accountability-Block Ciphers-DES- AES- Public and Private keys- RSA- hash Functions- Secure hash algorithms -Merkle trees- Patricia trees- DHT- ECDSA-Financial markets and trading-Trading-Exchanging.

Unit III **(15 hours)**

Bitcoin: Bitcoin-Bitcoin definitions-transactions-types of transactions-What is UTXO-Block chain-The genesis of Block-The bitcoin network-wallets. **Alternative coins:** Theoretical Foundations-Alternatives of Proof of Work-Proof of stake-Name coin- Bitcoin- Prime coin-Zcash.

Unit IV **(15 hours)**

Ethereum101: Introduction-Ethereum Block chain-The consensus mechanism-The world state-the account state-Transactions-Contract creation transaction-Message call transaction-Elements of ethereum block chain-EVM-Execution Environment-Opcodes and their meaning-Accounts-Block-Block header-The genesis block-Transaction receipts-Transaction

validation and execution-Block validation mechanism-Block finalization-Ether-Gas-Mining-Ethash-CPU Mining.

Unit V **(15 hours)**

Block Chain – Outside of Currencies: Internet of things-IoT Block chain experiment-Government-Health-Finance-Scalability and other Challenges: Scalability-Proof of Stake-Privacy-**Emerging Trends:** ABC's-Enterprise-grade bloc kchains-Private Block chains-startups-standardization-Enhancements-Real world Implementations-Consortia-Education in block chain technologies-Employment-Crypto Economics.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Illustrate the Fundamental Concepts of Block chain and uses of Bitcoin
CO2: Apply Cryptography Algorithms in block chain
CO3: Classify a transactions in Bitcoin
CO4: Explain the concept Decentralization, BitCoin, Ethereum in Block chain
CO5: Develop Private block chain environment and smart contracts in recent trends by using Ethereum

Text Book:

1. Imran Bashir, *Mastering Block chain: Deeper insights into Decentralization, Cryptography, Bitcoin and Popular Block chain Frameworks*, Packt Publishing, 2017.

Reference Books:

1. Andreas Antonopoulos, Satoshi Nakamoto, *Mastering Bitcoin*, O'Reilly, 2014.
2. Roger Wattenhofer, *The Science of the Block chain*, Create Space Independent Publishing, 2016.
3. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, *Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction*, Princeton University Press, 2016.

E-Resources:

1. https://nptel.ac.in/courses/106/104/106104220/#
2. https://www.udemy.com/course/build-your-blockchain-az/

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	3	9	9	1	9	3	3	3	9	9	76
CO2	9	9	3	9	9	1	9	3	3	3	9	9	76
CO3	9	3	3	9	9	1	9	3	3	3	9	9	70
CO4	9	3	3	9	9	1	9	3	3	3	9	9	70
CO5	9	3	3	9	9	1	9	3	3	3	9	9	70
Total	45	27	15	45	45	5	45	15	15	15	45	45	362

Low-1 Medium-3 High-9

Core XI - Software Development Framework

(For Students Admitted from 2022-23)

Semester: III **Hours/week: 5**
Subject Code: IMCAC31 **Credit: 5**

Course Objectives:

1. To understand code solutions and compile C# projects within the .NET Framework
2. To design and develop professional console and window based .NET Application

Unit I **(15 hours)**

The .NET Framework: .Net programming Framework-VB.NET,C#.NET and the .NET Languages-The Common Language Runtime-The .NET Class Library-ASP.NET-Visual Studio .NET. **Learning the .NET Languages:** The .NET Languages-Data Types-Declaring Variables-Scope and Accessibility-Variable Operations-Object-Based Manipulation-Conditional Structures-Loop Structures-Functions and Subroutines.Types, **Objects and Namespaces:** The Basics about classes –Value Types and Reference Types-Advanced Class Programming-Understanding Namespaces and Assemblies.

Unit II **(15 hours)**

ASP.NET APPLICATIONS: ASP.NET Applications-Code-Behind-The Global.asax Application File-Understanding ASP.NET Classes-ASP.NET Configuration. **Web Form Fundamentals:** A Simple Page Applet-A Deeper Look at HTML Control Classes-The Page Class-Accessing HTML Server Controls. Web Controls: Stepping Up to Web Controls-Web control Classes-AutoPostBack and Web Control Events.

Unit III **(15 hours)**

Using Visual Studio .NET: The promise of Visual Studio.NET-Starting a Visual Studio.Net Project – The Web form Designer-Writing Code-Visual Studio.NET Debugging-Working Without Visual Studio.NET. **Validation and Rich Controls:** Validation-A simple Validation Example-Understanding Regular Expressions-A Validated Customer Form-Other Rich Controls State Management: The Problem of State-Viewstate-Transferring Information-CustomCookies-Session State.

Unit IV **(15 hours)**

Tracing, Logging and Error Handling: Common Errors-The .NET Exception Object-Handling exceptions-Throwing Your Own Exceptions-Logging Exceptions-Error Pages-Page Tracing. **Overview of ADO.NET:** Introducing ADO.NET and Data Management-Characteristics of ADO.Net-The ADO.NET Object Model. ADO.NET Data Access: About the ADO.NET Examples-SQL Basics-The SQL Select Statement-Update-Insert-Delete-Accessing Data the Easy Way-Creating a connection-Defining a Select Command-Using a Command with a DataReader-Updating Data-Accessing Disconnected Data-Selecting Multiple Tables.

Unit V **(15 hours)**

Data Binding: Introduction-Single-Value Data Binding-Repeated-Value Data Binding-Data Binding with Databases. The DataList, DataGrid and Repeater: Introducing Templates-Using Templates with the DataList-Data Binding with Multiple Templates-Comparing the Template Controls-Selecting Items-Editing Items-Paging with the DataGrid- **Sorting with the**

DataGrid Using XML: XML's Hidden Role in .NET-XML Explained- The XMLClasses-XML Validation-XML Display and Transforms-XML in ADO.NET.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Interpret the basic concepts of .NET, Problem of the state, data, Management Validation and Rich controls

CO2: Determine types, objects and namespaces, Enumerators and Iterators and Error Handling

CO3: Illustrate Table Controls, ASP.Net Applications and the Web Server, Interfaces and Structures

CO4: Evaluate on Exception Handling, Serializing objects, Direct Data Access

CO5: Develop XML classes and XML Validation, web forms and use web controls

Text Book:

1. Matthew MacDonald, *The Complete Reference ASP.NET*, Tata McGraw-Hill Publishing, 2017.

Reference Books:

1. Dino Esposito, *Programming Microsoft ASP.NET*, Tata McGraw Hill, 2003.
2. Chris Ullman , John Kauffman, Chris Hart, David Sussman, *Beginning ASP.Net 1.1 with VB.NET*, Wiley Publishing, First Edition, 2003.
3. Elliotte Rusty Harold, *XML 1.1 Bible*, Wesley Publications, Third Edition, 2004.

E-Resources:

1. https://nptel.ac.in/courses/106/104/106104220/#
2. https://nptel.ac.in/courses/110/105/110105033/

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	3	3	1	9	9	1	1	3	1	58
CO2	9	9	9	3	3	1	9	9	3	1	3	1	60
CO3	9	9	9	3	3	1	9	9	3	1	3	1	60
CO4	9	9	9	3	3	1	9	9	3	1	9	1	66
CO5	9	9	9	9	9	1	9	9	9	1	9	1	84
Total	45	45	45	21	21	5	45	45	19	5	27	5	328

Low-1 Medium-3 High-9

Core XII - Data Mining and Warehousing

(For Students Admitted from 2022-23)

Semester: III **Hours/week: 5**

Subject Code: IMCAC32 **Credit: 5**

Course Objectives:

1. To understand and implement classical models and algorithms in data warehouses and data mining

2. To understand data mining techniques in various applications like social, scientific and environmental context and Develop skill in selecting the appropriate data mining algorithm for solving practical problems

Unit I **(15 hours)**

Data Mining: Data Mining-Kinds of Data-Kind of Patterns can be mined-Technologies used- Kinds of Application Targeted-Major Issues in Data Mining - **Data Preprocessing:** Data Cleaning-Data Integration -Data Reduction – Data Transformation and Data Discretization.

Unit II **(15 hours)**

Data Warehouse and OLAP Technology for Data Mining: Data Warehouse: Basic Concepts-A Multidimensional Data Modeling: Data Cube and OLAP Data Warehouse Implementation. **Data Cube Technology:** Data Cube Computation: Preliminary Concepts-Data Cube Computation Methods-Mining Frequent Patterns- **Associations and Correlations:** Basic Concepts-Frequent Itemset Mining Methods-Advanced Pattern Mining-Pattern Mining Multilevel, Multidimensional Space Various Kinds of Association Rules-From Association Mining to Correlation Analysis.

Unit III **(15 hours)**

Classification and Prediction: Issues Regarding Classification and Prediction-Classification by Decision Tree Induction-Bayesian Classification-Classification by Backpropagation–Support Vector Machines-**Associative Classification**: Classification by Association Rule Analysis-Other Classification Methods-Prediction- Accuracy and Error Measures.

Unit IV **(15 hours)**

Cluster Analysis: Basic Concepts, Methods and Advanced Cluster Analysis : What is Cluster Analysis-Types of data in Cluster Analysis-A Categorization of Major Clustering Methods-Partitioning Methods-Hierarchical Methods-Density based Methods-Grid based Methods-**Evaluation of Clustering-** Methods-Clustering high dimensional data-Clustering Graph and Network Data-Clustering with Constraints.

Unit V **(15 hours)**

Outlier Detection: Outlier and Outlier analysis-Outlier Detection Methods-Statistical Approaches-Proximity Based Approaches-Outlier Detection in high-Dimensional Data - **Data Mining Trends and Research Frontiers:** Mining Complex Data Types-Other Methodologies of Data Mining-Data Mining Applications-Data Mining Applications.

Course Outcomes:

After Successful completion of the course, student will be able to

CO1: Explore the Basic Concepts of Data Mining
CO2: Analyze the Classification algorithm and Error Prediction
CO3: Improve the knowledge about Types of Classification Methods in Data Mining
CO4: Determine the types of Data clustering methods and Types of Data Mining
CO5: Evaluate Data Mining Application with Latest Trends

Text Book:

1. Jiawei Han, Micheline Kamber, *Data Mining: Concept and Technique*, Morgan Kaufmann Publishers, Third Edition, 2013.

Reference Books:

1. Pieter Adriaans, Dolf Zantinge, *Data Mining*, Pearson Education, Ninth Indian Reprint, 2003.
2. Anand Rajaraman, Jeffrey David Ullman, *Mining of Massive Datasets*, Cambridge University Press, 2012.
3. Pete Warden, *Big Data Glossary*, O'Reilly, 2011.

Journals:

1. ACM SIGKDD International Conference on Knowledge Discovery & Data Mining
2. ACM International Conference on Web Search and Data Mining

E-Resources:

1. https://www.javatpoint.com/data-mining-cluster-vs-data-warehousing
2. https://onlinecourses.nptel.ac.in/noc21_cs06/preview

Course Outcomes	Programme Outcomes												
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Total**
CO1	9	1	1	1	1	1	1	3	1	3	3	1	**26**
CO2	9	3	3	1	3	1	1	3	1	3	3	3	**34**
CO3	9	3	1	3	3	1	1	1	9	9	3	3	**46**
CO4	9	1	1	3	3	3	1	3	9	9	1	9	**52**
CO5	9	3	3	3	3	3	1	3	3	9	3	9	**52**
Total	**45**	**11**	**9**	**11**	**13**	**9**	**5**	**13**	**23**	**33**	**13**	**25**	**210**

Low-1 Medium-3 High-9

Core XIII - Software Development Framework Lab

(For Students Admitted from 2022-23)

Semester: III **Hours/week: 5**
Subject Code: IMCAC33P **Credit: 3**

Course Objectives:

1. To introduce to .Net IDE Component Framework and programming concepts in .Net Framework
2. To create website using ASP.Net Controls

List of Programs

Console Application

1. Calculate the area of a floor given its length and width
2. Calculate the factorial of a number N, assuming the number is more than zero
3. Check the given numbers (prime, perfect, Armstrong etc.)
4. Generate the numbers (prime, perfect, Armstrong etc.)

5. Calculate age for a person using properties
6. Sort a given list of numbers and find out the average of a list of numbers.
7. Display how many days are in a given month(check for leap years also)
8. Demonstrate Events, Delegates, and Interfaces

Windows Application

9. Build a simple calculator
10. Calculate the arithmetic operations using functions
11. Do String manipulation
12. Write a function that will return a approximate count of the number of words in a string
13. Create notepad
14. Create a greeting card generator

Web Application

15. Design an E-mail application form using standard controls and store these details in SQL tables
16. Create a login page and personal webpage. Enter the username and password in the login page. If the username and password are correct, the personal web page should be loaded otherwise the error page should be loaded.
17. Create a student details form and validate the details using validation controls
18. Display employee details using data grid control
19. Display an Electricity bill using data list control
20. Display employee details using repeater control

Note: - Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Build console applications
CO2: Perform Windows and web Applications
CO3: Demonstrate validation controls in web form
CO4: Illustrate Data Grid control to database in Web application
CO5: Compose Data Repeater and Datalist Controls

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	3	3	1	9	1	3	3	3	1	54
CO2	9	9	9	3	3	1	9	1	3	3	3	1	54
CO3	9	9	9	3	3	1	9	1	3	3	3	1	54
CO4	9	9	9	3	3	1	9	1	9	9	9	1	72
CO5	9	9	9	3	9	1	9	1	9	9	9	1	78
Total	45	45	45	15	21	5	45	5	27	27	27	5	312

Low-1 Medium-3 High-9

Core XIV – Data Mining Lab

(For Students Admitted from 2022-23)

Semeste: III **Hours/week: 5**
Subject Code: IMCAC34P **Credit: 3**

Course Objectives:

1. To understand data mining process and important issues around data cleaning, pre-processing and integration
2. To get exposure to real life data sets for analysis and prediction and learn performance evaluation of data mining algorithms in a supervised and an unsupervised learning

List of Programs

1. Implement of measures of proximity
2. Demonstrate of preprocessing on dataset student.arff
3. Demonstrate of preprocessing on dataset labor.arff
4. Demonstrate of Association rule process on dataset contact lenses.arff using apriori algorithm
5. Develop Association rule process on dataset test.arff using apriori algorithm
6. Implement classification rule process on dataset student.arff using j48 Algorithm
7. Implement classification rule process on dataset employee.arff using j48 algorithm
8. Implement classification rule process on dataset employee.arff using id3 algorithm
9. Implement classification rule process on dataset empl.arff using Decision Trees classifier
10. Implement classification rule process on dataset student.arff using Naïve Bayesian modelling.
11. Demonstrate of clustering rule process on dataset iris.arff using simple k-means algorithm
12. Demonstrate of clustering rule process on dataset student.arff using simple k means algorithm
13. Implement outlier detection algorithms

Note: Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Recall the basic concepts of data mining
CO2: Apply data mining techniques
CO3: Analyze new data mining tools.
CO4: Evaluate recent trends in data mining such as web mining, spatial-temporal mining
CO5: Predict the output of different types of algorithms

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	9	3	1	9	3	9	9	9	1	80
CO2	9	9	9	9	3	1	9	3	9	9	9	1	80

CO3	9	9	9	9	3	1	9	3	9	9	9	1	**80**
CO4	9	9	9	9	3	1	9	3	9	9	9	1	**80**
CO5	9	9	9	9	3	1	9	3	9	9	9	1	**80**
Total	**45**	**45**	**45**	**45**	**15**	**5**	**45**	**15**	**45**	**45**	**45**	**5**	**400**

Low-1 Medium-3 High-9

DSE III - a) Artificial Intelligence and Expert Systems

(For Students Admitted from 2022-23)

Semester: III **Hours/week: 5**
Subject Code: IMCAE3A **Credit: 4**

Course Objectives:

1. To describe the modern view of AI as the study of agents that receive percepts from the Environment and perform actions and AI techniques for knowledge representation, planning and uncertainty Management
2. To develop knowledge of decision making and learning methods and explain the concept of Knowledge Representation

Unit I **(15 hours)**

Introduction to Artificial Intelligence-Intelligent Agents, Approaches in Artificial Intelligence, Definitions of Artificial Intelligence, AI problems, Features of AI Programs, Importance of AI, Advantages and Disadvantages of AI.

Unit II **(15 hours)**

Applications of Artificial Intelligence- Finance, Hospitals and Medicine, Robotics, Expert systems, Diagnosis, Pattern Recognition, Natural Language Processing, Game Playing, Image Processing, Data mining, Big Data Mining. Introduction to the state space search- State space search, search techniques, Types of searching techniques.

Unit III **(15 hours)**

Heuristic Search Strategies-Types of Heuristic Search techniques, Hill Climbing Search, Simulated Annealing search, A* Algorithm, AND-OR Graphs, Properties of the Heuristic Search Algorithm, Adversary Search, The MINIMAX Algorithm.

Unit IV **(15 hours)**

Expert Systems-Definitions of Expert Systems, Features of Good Expert systems, Architecture and Components of Expert systems, Roles of the Individuals who interact with the system, Advantages of Expert systems, Disadvantages of Expert Systems.

Unit V **(15 hours)**

Knowledge Representation-Definitions of Knowledge Representation, Characteristics of Good Knowledge Representation, Basics of Knowledge representation, Properties of the Symbolic representation of knowledge, Properties of the Good knowledge representation systems, Categories of knowledge representation schemes, types of knowledge representation schemes.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Illustrate knowledge on Artificial Knowledge concepts
CO2: Apply all searching algorithms and Hill-climbing procedures
CO3: Analyze their gaming skills and learn about Expert system
CO4: Evaluate the learners for aspiring careers in the field of Artificial Intelligence
CO5: Develop the game playing and planning of expert systems

Text Book:
1. I.Gupta, G.Nagpal, *Artificial Intelligence and Expert Systems*, Laxmi Publications, 2018.

Reference Books:
1. V.S. Jankiraman, *Foundations of Artificial Intelligence and Expert Systems*, Laxmi Publications, 2017.
2. Joseph C.Giarratano, Gary D.Riley, *Expert Systems: Principles and Programming*, Brooks/Cole Publications, Fourth Edition, 2018.
3. Lavika Goel, *Artificial Intelligence: Concepts and Applications*, Wiley India Private Limited, 2015.

E-Resources:
1. https://nptel.ac.in/courses/106/102/106102220/
2. https://nptel.ac.in/courses/112/103/112103280/

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	1	9	9	3	9	3	9	9	9	9	**88**
CO2	9	9	3	9	3	9	3	9	3	9	9	1	**76**
CO3	3	9	9	3	9	3	9	1	9	1	3	3	**62**
CO4	9	1	3	9	3	9	9	3	9	3	9	1	**68**
CO5	9	9	9	9	9	3	3	3	9	9	9	3	**84**
Total	**38**	**37**	**25**	**39**	**33**	**27**	**33**	**19**	**39**	**31**	**39**	**17**	**378**

Low-1 Medium-3 High-9

DSE III - b) Digital Image Processing

(For Students Admitted from 2022-23)

Semester: III **Hours / Week: 5**
Subject code: IMCAE3B **Credit: 4**

Course Objectives:
1. To explain the fundamentals of digital image and its processing
2. To perform image enhancement techniques in spatial and frequency domain, apply the concept of image segmentation and describe object detection and recognition techniques

Unit I **(15 hours)**

Introduction: Digital Image Processing-The Origins of Digital Image Processing- Examples of Fields that Use Digital Image Processing- Fundamental Steps in Digital Image Processing

-Components of an Image Processing System**. Digital Image Fundamentals:** Elements of Visual Perception- Light and the Electromagnetic Spectrum- Image Sensing and Acquisition - Image Sampling and Quantization -Some Basic Relationships between Pixels -Introduction to the Basic Mathematical Tools Used in Digital Image Processing.

Unit II **(15 hours)**

Intensity Transformations and Spatial Filtering: Background - Some Basic Intensity Transformation Functions -Histogram Processing- Fundamentals of Spatial Filtering - Smoothing (Lowpass) Spatial Filters-Sharpening (Highpass) Spatial Filters-High Pass, Bandreject, and Bandpass Filters from Lowpass Filters -Combining Spatial Enhancement Methods-Using Fuzzy Techniques for Intensity Transformations and Spatial Filtering.

Unit III **(15 hours)**

Filtering in the Frequency Domain: Background -Preliminary Concepts -Sampling and the Fourier Transform of Sampled Functions -The Discrete Fourier Transform of One Variable - Extensions to Functions of Two Variables -Some Properties of the 2-D DFT and IDFT -The Basics of Filtering in the Frequency Domain -Image Smoothing Using Low Pass Frequency Domain Filters -Image Sharpening Using High Pass Filters- Selective Filtering- The Fast Fourier Transform.

Unit IV **(15 hours)**

Image Restoration and Reconstruction: Noise Models- Restoration in the Presence of Noise Only. Wavelet and Other Image Transforms: Matrix-based Transforms- Fourier-Related Transforms- Walsh-Hadamard Transforms -Slant Transform - Haar Transform - Wavelet Transforms . **Color Image Processing**: Color Models- Basics of Full-Color Image Processing-Color Transformations-Color Image Smoothing and Sharpening-Using Color in Image Segmentation-Noise in Color Images-Color Image Compression.

Unit V **(15 hours)**

Morphological Image Processing: Erosion and Dilation-Opening and Closing-The Hit-or-Miss Transform-Some Basic Morphological Algorithms. **Image Segmentation I:** Edge Detection, Thresholding, and Region Detection: Thresholding -Segmentation by Region Growing and by Region Splitting and Merging-Region Segmentation Using Clustering and Superpixels-Region Segmentation Using Graph Cut-Segmentation Using Morphological Watersheds -The Use of Motion in Segmentation. Image Pattern Classification: Optimum (Bayes) Statistical Classifiers-Neural Networks and Deep Learning.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the origins, components, elements of visual perception, basic intensity, transformation, discrete Fourier transform, color models, noise models and morphological algorithms of image processing

CO2: Apply fundamental steps, smoothing, sharpening, segmentation and classification to the image

CO3: Analyze relationship between pixels, mathematical tools, fuzzy techniques, filters, wavelet transforms, region grouping, splitting and merging

CO4: Determine histogram, the color image compression

CO5: Solve noise for color image

Text Book:

1. Rafael C. Gonzalez, Richard E. Woods, *Digital Image Processing*, Pearson Education, Fourth Edition, 2018.

Reference Books:

1. B.Chanda, D.Dutta Majumder, *Digital Image Processing and Analysis*, Prentice Hall of India, 2003.
2. Nick Efford, *Digital Image Processing a practical Introducing using Java*, Pearson Education, 2004.

E-Resources:

1. https://www.tutorialspoint.com/dip/index.htm
2. https://onlinecourses.nptel.ac.in/noc19_ee55/preview
3. https://www.edx.org/learn/image-processing

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	9	9	1	9	9	9	1	3	3	**80**
CO2	9	9	9	3	9	1	9	9	9	1	3	3	**74**
CO3	9	9	9	9	9	1	9	9	3	1	3	3	**74**
CO4	9	9	9	9	9	1	9	9	9	1	3	3	**80**
CO5	9	9	9	9	9	1	9	9	9	1	3	3	**80**
Total	**45**	**45**	**45**	**39**	**45**	**5**	**45**	**45**	**39**	**5**	**15**	**15**	**388**

Low-1 Medium-3 High-9

DSE III – c) Organizational Behaviour

(For Students Admitted from 2022-23)

Semester: III **Hours/week: 5**
Subject Code: IMCAE3C **Credit: 4**

Course Objectives:

1. To identify the various leadership styles and the role of leaders in a decision making process and processes used in developing communication and resolving conflicts
2. To discuss the development of the field of organizational behaviour and explain the micro and macro approaches and development of the field of organizational behaviour and explain the micro and macro approaches

Unit I **(15 hours)**

Explaining organizational behavior: Introduction - Explaining organizational behavior - Research and practice: evidence-based management - Human resource management: OB in action. **Environment:** Analysing the organization's environment - PESTLE and scenario planning - Ethical behaviour - Business ethics and corporate social responsibility.

Technology: Determinism or choice - Automating knowledge work - New ways of working - Four challenges – Cybercrime.

Unit II **(15 hours)**

Culture: Rise of organizational culture - Culture: surface manifestations, values and basic assumptions - Organizational socialization - Perspectives on culture contrasted - Culture strength and organizational performance - Types of organizational culture - National cultures. **Individuals in the organization**: **Learning**: The learning process - The behaviourist approach to learning - The cognitive approach to learning - Behaviour modification versus socialization. **Communication:** Interpersonal communication - Verbal communication - Non-verbal communication - Cultural differences in communication style - Impression management -Emotional intelligence - Organizational communication.

Unit III **(15 hours)**

Perception: Selectivity and organization - Perceptual sets and perceptual worlds - Perceptual sets and assumptions - Sex, appearance, attractiveness and discrimination - Perceptual errors. **Motivation:** Drives, motives and motivation - Content theories - Process theories - The social process of motivating others - Engagement and high performance. **Groups and teams in the organization: Group formation:** Groups in organizations - Definitions of groups - Types of group tasks - Group-oriented view of organizations - Formal and informal groups - Group formation - Group development - Groups and teams.

Unit IV **(15 hours)**

Group structure: Group structure and process - Power structure - Status structure - Liking structure - Communication structure - Role structure - Leadership structure - Virtual teams - Networked individualism. **Foundation of Individual Behaviour**: Introduction - The Individual and Individual Differences – Human Behaviour and Its Causation – Models of Man - **Personality:** Concept of Personality – Determinants of Personality – Types of Personalities – Theories of Personality – How Personality Develops? – How Personality Influences Organisational Behaviour?

Unit V **(15 hours)**

Team working: The T-word and teamwork design - Types of teams - Advice teams - Action teams - Project teams - Production teams - Teamwork activities. **Elements of structure:** Organization structuring - Types of jobs - Line, staff and functional relationships - -Roles in organizations -Formalization - Centralization versus decentralization. **Leadership:** Leadership versus management - Trait-spotting - - Style-counselling - Context-fitting - Distributed leadership. **Decision making:** Models of decision making - Decision conditions: risk and programmability - Group decision making - Problems with group decision making - Organizational decision making.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe the development of the field of organizational behaviour and explain the micro and macro approaches

CO2: Demonstrate the applicability of analysing the complexities associated with management of individual behavior in the organization and how the organizational behavior can integrate in understanding the motivation (why) behind behavior of people in the organization

CO3: Analyse and compare different models used to explain individual behaviour related to motivation and rewards and the complexities associated with management of the group behavior in the organization

CO4: Evaluate the applicability of the concept of organizational behavior to understand the behavior of people in the organization

CO5: Formulate the various leadership styles and the role of leaders in a decision making process

Text Books:

1. David A. Buchanan, Andrzej A. Huczynski, *Organizational Behaviour*, Pearson Education, Ninth Edition, 2017.
2. *S. S. Khanka, Organisational* Behaviour *Text and Cases*, S Chand Ltd, New Delhi 2021.

Reference Books:

1. Prof. Dr. A. Mustafa**,** *Organisational Behaviour*, Global Professional Publishing Ltd, Second Edition, 2013.
2. L M Prasad, *Organizational Behavior*, Sultan Chand & Sons, Fifth Edition, 2011.
3. K Aswathappa, *Organizational Behavior***,** Himalaya Publishing House, Tenth Edition, 2012.
4. Mirza S Saiyadain, *Organizational Behavior***,** Tata McGraw Hill, Ninth Edition, 2010.

Journal:

1. Journal of Organizations and Human Behavior

E - Resources:

1. https://nptel.ac.in/courses/110/106/110106145/
2. https://nptel.ac.in/courses/110/105/110105033/

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	9	3	1	9	3	9	9	9	1	**80**
CO2	9	9	9	9	3	1	9	3	9	9	9	1	**80**
CO3	9	9	9	9	3	1	9	3	9	9	9	1	**80**
CO4	9	9	9	9	3	1	9	3	9	9	9	1	**80**
CO5	9	9	9	9	3	1	9	3	9	9	9	1	**80**
Total	**45**	**45**	**45**	**45**	**15**	**5**	**45**	**15**	**45**	**45**	**45**	**5**	**400**

Low-1 Medium-3 High-9

DSE IV – a) Operating Systems

(For Students Admitted from 2022-23)

Semester: III **Hours/week: 5**
Subject Code: IMCAE3D **Credit: 4**

Course Objectives:

1. To understand the services provided by and the design of an operatingsystem.
2. To understand what a process is and how processes are synchronized and scheduled

Unit I **(15 hours)**

Introduction: What is an Operating System -Mainframe systems- desktop systems- Multiprocessor Systems-Distributed systems- Clustered Systems- Real time systems- Hand held systems.**Operating System Structure:** System components- Operating System services- System calls- System structure.

Unit II **(15 hours)**

Processes: Process concept- process scheduling- operations on processes- Inter process Communication**. CPU Scheduling**: Basic Concepts- Scheduling Criteria- Scheduling algorithms **Process Synchronization**: Background- The critical section problem- Mutex Locks-semaphores- Monitors.

Unit III **(15 hours)**

Deadlock: System Model-Deadlock Characterization- Methods of Handling Deadlock- Deadlock Prevention- Deadlock Avoidance- Deadlock Detection- Recovery from Deadlock.**Memory management**: Background- Contiguous memory allocation- Swapping.

Unit IV **(15 hours)**

Virtual memory: Background- Demand paging-Copy-on-Develop -Page replacement-Thrashing.**File system interface**: File concepts- access methods- Directory structure.**Mass storage structure**: Overview of mass storage structure-HDD Scheduling-NVM Scheduling.

Unit V **(15 hours)**

Protection: Goals of protection- domain of protection- Access matrix- Implementation of Access matrix- revocation of access rights. **Security:** The security problem- User authentication- Program threats- System threats- securing systems and facilities- Intrusion detection- Cryptography.

Course Outcomes:

After successful completion of this course, student will be able to
CO1: Remember the structure of operating system and scheduling algorithms
CO2: Apply the concept of process scheduling, deadlocks and its recovery
CO3: Analyze the background of memory with segmentation and paging
CO4: Evaluate file management with file organization, and disk scheduling
CO5: Create Securing systems and facilitites

Text Book:

1. Abraham G Silberschatz, *Operating System***,** Wiley Publisher, Tenth Edition, 2017.

Reference Books:

1. Milan Milenkovic, *Operating System Concepts & Design*, Tata, McGraw Hill,Second Edition,1997.
2.Peter Baer Galvin and Robert Neilson Boyd, *Applied Operating system concepts*, John Wiley & Sons, First Edition, 2000.
3. Dhananjay M. Dhamdhere, *Operating System A Concept-Based Approach*, Tata McGraw Hill, Third Edition, 2012.
4.W. Stallings, *Operating Systems*, *Internals & Design Principles*, Prentice Hall of India, Fifth Edition, 2008.

E-Resources:

1.https://nptel.ac.in/courses/106/105/106105214/
2.https://nptel.ac.in/courses/106/106/106106144/
3.https://onlinecourses.nptel.ac.in/noc21_cs44/preview
4.https://www.udacity.com/course/introduction-to-operating-systems--ud923
5.https://onlinecourses.nptel.ac.in/noc21_cs72/preview

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	3	3	1	9	3	9	9	9	1	9	9	74
CO2	9	3	3	1	9	3	9	9	9	1	9	9	74
CO3	9	3	3	1	9	3	9	9	9	1	9	9	74
CO4	9	3	3	1	9	3	9	9	9	1	9	9	74
CO5	9	3	3	1	9	3	9	9	9	1	9	9	74
Total	45	15	15	5	45	15	45	45	45	5	45	45	370

Low-1 Medium-3 High-9

DSE IV – b) Open Source Technologies

(For Students Admitted from 2022-23)

Semester: III **Hours/week: 5**
Subject Code: IMCAE3E **Credit: 4**

Course Objectives:

1. To expose students to free open source software environment and introduce them to use open source packages
2. Implement various applications using build systems and understand the installation of various packages in open source operating systems

Unit I **(15 hours)**

PHP- Introduction-What is PHP-Why use PHP and MYSQL-PHP strengths-Key features of PHP-**Using PHP**-Accessing PHP-Creating sample application- Embedding PHP in HML – Accessing form variables-Understanding identifiers- Examining Variable types- Using Operators-Making Decisions with conditionals-Repeating actions through iteration.

Unit II **(15 hours)**

Storing and Retrieving Data-Processing files-Opening a file-Writing to a file-Closing a file-Reading from a file-Using other file functions-**Using arrays**-What is an array-Numerically indexed arrays-Arrays with different indices-array operators-multidimensional array-sorting array-String manipulation and regular expressions.

Unit III **(15 hours)**

MYSQL- SQL-Inserting Data into the Database-Retrieving Data from the Database-Updating Records in the Database-Altering Tables after creation-Deleting Records from the Database-Dropping Tables-Dropping a Whole Database-Accessing your MYSQL database from the web with PHP-Querying a database from the web-putting new information in the database-Using other PHP database interfaces.

Unit IV **(15 hours)**

PYTHON-Introduction-Algebra with Variables-variables, complex quantities, common functions with numbers, logical operators, strings and printing. Simple programs-basic program structure, flowchart, conditional operations, iterative routines. Functions and Modules-Functions-Recursion, Nested functions, Nested scope, Modules-Built-in modules, maths module.

Unit V **(15 hours)**

Sequences and Operations with Sequences-String, tuple, list, dictionary, set, operators with sequences, iterator, iterator functions, input. Classes and Objects- classes, functions with attributes, overloading, inheritance, execution from command line.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Demonstrate install and run Linux operating system
CO2: Apply the MYSQL database concepts
CO3: Develop website and control using PHP and MYSQL
CO4: Explain Install open source web technologies MySQL and PHP
CO5: Illustrate the Python software making process

Text Books:

1. Luke Welling, Laura Thomson, *PHP and MYSQL Web Development*, Pearson Education, Fifth Edition, 2017.
2. T.R. Padmanabhan, Programming *with Python*, Springer Nature, 2016.

Reference Books:

1. James Lee and Brent Ware, *Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP*, Dorling Kindersley Private Limited, 2008.
2. Eric S. Raymond, Michael Tiemann, *Open Sources: Voices from the Open Source Revolution*, O'Reilly,1999.
3. Steve Holzner, *PHP: The Complete Reference*, Tata McGraw Hill, Second Edition, 2009.

E - Resources:

1. http://www.openresources.com/documents/open-resources/

2. http://www.alexsoft.com/

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	1	3	9	3	9	3	9	9	3	9	**76**
CO2	9	9	3	9	3	9	9	9	3	9	9	3	**84**
CO3	9	9	9	3	9	3	3	9	9	1	3	9	**76**
CO4	9	1	3	9	3	9	1	3	9	3	9	9	**68**
CO5	3	9	3	9	9	3	3	3	9	9	9	3	**72**
Total	**39**	**37**	**19**	**33**	**33**	**27**	**25**	**27**	**39**	**31**	**33**	**33**	**376**

Low-1 Medium-3 High-9

DSE IV – c) Internet of Things

(For Students Admitted from 2022-23)

Semester: III **Hours/week: 5**
Subject Code: IMCAE3F **Credit: 4**

Course Objectives:

1. To understand the application areas of IoT, building blocks of Internet of Things and characteristics
2. To realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks

Unit I **(15 hours)**

Introduction to IoT: Introduction to IoT- Enabling technologies of IoT - AI and Machine Learning - Physical and logical design of IoT - IoT Reference Architecture - IoT Functional Architecture - IoT levels and deployment templates – **Application domains of IoT**: Home automation – Cities – Environment – Energy – Industry – Agriculture – Transportation - Health care & Lifestyle.

Unit II **(15 hours)**

IoT and M2M: Introduction to M2M – Difference between IoT and M2M- SDN and NFV for IoT- IoT System Management with NETCONF-YANG- Need for IoT Systems Management-SNMP- Network Operator Requirements-NETCONF- YANG- IoT Systems Management with NETCONF- YANG.

Unit III **(15 hours)**

IOT Platforms Design Methodology: Step 1 to Step 10- Case Study on IoT System for Weather Monitoring- Motivation for Using Python- IoT Systems Logical Design using Python- Introduction-Installing Python- Python Data Types and Data Structures-Control Flow-Functions-Modules- Packages-File Handling-Date/Time Operations- Classes- Python Packages of Internet for IoT.

Unit IV **(15 hours)**

IoT Physical Devices and Endpoints: What is an IoT Device- Exemplary Device: Raspberry Pi- About the board-Linux and Raspberry Pi- Raspberry Pi Interfaces- Programming Raspberry Pi with Python- Other IoT Devices.

Unit V **(15 hours)**

IoT Physical Servers and Cloud Offerings: Introduction to Cloud Storage Models and Communication API – WAMP-AutoBahn for IoT-Xively Cloud for IoT-Python Web Application Framework-Django-Designing a RESTful Web API-Amazon Web Services for IoT-Case Studies Illustrating IoT Design- Home Automation-Cities-Environment-Agriculture-Productivity Applications.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Recall the importance of smart objects and smart environment

CO2: Define IoT and M2M

CO3: Create IoT platforms using design methodology

CO4: Perform WiFi data communications, remote data storage in cloud, and handle the data using web applications

CO5: Develop potential problems and solutions using IoT

Text Book:

1. Arshdeep Bahga, Vijay Madisetti, *Internet of Things: A Hands-On Approach*, Universities Press, 2015.

Reference Books:

1. Charles Platt, *Make Electronics – Learning by Discovery*, O'Reilly Media, 2015.
2. Michael Miller, *The Internet of Things*, Pearson Education, 2015.

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105166/
2. https://www.classcentral.com/course/swayam-introduction-to-internet-of-things-10093

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	3	3	1	9	9	1	3	1	1	**58**
CO2	9	9	9	3	3	1	9	9	3	3	1	1	**60**
CO3	9	9	9	3	3	1	9	9	3	3	1	1	**60**
CO4	9	9	9	3	3	1	9	9	3	9	1	1	**66**
CO5	9	9	9	9	9	1	9	9	9	9	1	1	**84**
Total	**45**	**45**	**45**	**21**	**21**	**5**	**45**	**45**	**19**	**27**	**5**	**5**	**328**

Low-1 Medium-3 High-9

Core XV - Software Project Management

(For Students Admitted from 2022-23)

Semester: IV **Hours/week: 5**

Subject Code: IMCAC41 **Credit: 5**

Course Objectives:

1. To identify the different project contexts and suggest an appropriate management strategy and key phases of project management

2. To determine an appropriate project management approach through an evaluation of the business context and scope of the project and role of professional ethics in successful software development

Unit I **(15 hours)**

Introduction to Software Project Management: Introduction – Software projects versus other types of project – Contract Management and Technical Project Management – Plans, Methods and Methodologies – Some ways of categorizing software projects – Stakeholders – Setting Objectives – The Business Case – Project Success and Failure – Management Control – Traditional versus Modern Project Management Practices. Project **Evaluation and Programme Management:** A Business Case - Project portfolio Management – Evaluation of Individual Projects – Programme Management – Managing the allocation of resources within the programmes – Strategic programme Management.

Unit II **(15 hours)**

An overview of Project Planning: Stepwise Project Planning- Selection **of an Appropriate Project Approach:** Build or Buy -Choosing Methodologies and Technologies- Software Processes and Process Models- Choice of Process models- Structure versus speed of Delivery- Waterfall Model - The Spiral Model- Software Prototyping.

Unit III **(15 hours)**

Activity Planning: Objectives of Activity planning - Plan - Project schedules - Sequencing and Scheduling Activities -Network Planning models - Formulating a Network Model – The Forward Pass - The Backward Pass – Identifying the Critical path- Activity Float- Shortening the Project Duration – Identifying Critical Activities. **Risk Management:** Risk -Categories of Risk – Risk identification – Risk Planning – Evaluating Risks to the Schedule – Applying the PERT technique – Monte Carlo simulation – Critical Chain Concepts.

Unit IV **(15 hours)**

Monitoring and Control: Creating the Framework – Collecting the Data – Review – Project Termination Review - Cost monitoring – Earned Value Analysis – Prioritizing Monitoring – Change control -Software Configuration Management. **Managing Contracts:** Types of Contract -Stages in Contract Placement- Typical Terms of a Contract- Contract Management -Acceptance.

Unit V **(15 hours)**

Managing People in Software Environments: Selecting the Right person for the Job – Instruction in the Best Methods- Motivation - The Oldham-Hackman job characteristics model – Stress – Health and Safety- Some Ethical and Professional concerns. **Working in Teams:** Becoming a Team- Decision making-Organization and Team structures-Coordination Dependencies-Dispersed and Virtual teams-Communications genres-Communication plans- Leadership.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Summarize Software Process Models

CO2: Illustrate the steps involved in Software Project Management and activity planning, Risk Management using case studies

CO3: Apply Software effort Estimation Methods

CO4: Evaluate Software Project Management Tools
CO5: Design the modern techniques in Software Project Management like Agile, Scrum, DevOps

Text Book:
1. Bob Hughes, Mike Cotterell, Rajib Mall, *Software Project Management*, Tata McGraw Hill, Fifth Edition, 2012.

Reference Books:
1. Robert K.Wysocki, *Effective Software Project Management*, Wiley Publication, 2011.
2. Walker Royce, *Software Project Management*, Addison-Wesley, 1998.
3.Gopalaswamy Ramesh, *Managing Global Software Projects*, McGraw Hill Education, Fourteenth Reprint, 2013.

E-Resources:
1. https://nptel.ac.in/courses/106/105/106105218/
2. https://onlinecourses.nptel.ac.in/noc19_cs70/preview

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	9	9	3	9	9	9	1	9	3	**88**
CO2	9	9	9	9	9	3	9	9	9	1	9	3	**88**
CO3	9	9	9	9	9	3	9	9	9	1	9	3	**88**
CO4	9	9	9	9	9	3	9	9	9	1	9	3	**88**
CO5	9	9	9	9	9	3	9	9	9	1	9	3	**88**
Total	**45**	**45**	**45**	**45**	**45**	**15**	**45**	**45**	**45**	**5**	**45**	**15**	**440**

Low-1 Medium-3 High-9

Core XVI – Machine Learning

(For Students Admitted from 2022-23)

Semester: IV **Hours/week: 5**
Subject Code: IMCAC42 **Credit: 5**

Course Objectives:
1. To recognize the characteristics of machine learning that makes it useful to real-world problems
2. To understand the concept behind neural networks for learning non-linear functions

Unit I **(15 hours)**

Introduction: Well-Posed Learning Problems-Designing a Learning System-Perspectives and Issues in Machine Learning. Concept Learning: Introduction - A Concept Learning Task-Concept Learning as Search - Decision Tree Learning: Introduction-Decision Tree Representation-Appropriate Problems-Basic Decision Tree Learning Algorithm-Hypothesis Space Search-Inductive Bias-Issues.

Unit II **(15 hours)**

Artificial Neural Networks: Introduction-Neural Network Representations - Appropriate Problems - Perceptrons - Multilayer Networks and the Back Propagation Algorithm-An Illustrative Example: Face Recognition-Advanced Topics.

Unit III **(15 hours)**

Bayesian Learning: Introduction-Bayes Theorem-- Bayes Theorem and Concept Learning – Maximum Likelihood and Least-squared Error Hypotheses- Maximum Likelihood Hypothesis for Predicting Probabilities-Minimum Description Length Principle-Bayes Optimal Classifier-Gibbs Algorithm-Naïve Bayes Classifier-An Example: Learning to Classify Text-Bayesian Belief Networks-The EM Algorithm.

Unit IV **(15 hours)**

Instance-Based Learning: Introduction-K-Nearest Neighbor Learning-Locally Weighted Regression-Radial Basis Functions-Case-based Reasoning - Genetic Algorithms: Genetic Algorithms-An Illustrative Example-Hypothesis Space Search-Genetic programming-Models of Evolution and Learning-Parallelizing Genetic Algorithms.

Unit V **(15 hours)**

Learning Sets of Rules: Introduction-Sequential Covering Algorithms-Learning Rule Sets: Summary- Learning First-Order Rules-Learning Sets of First-Order Rules: FOIL - Induction as Inverted Deduction-Inverting Resolution - Reinforcement Learning: Introduction-Learning Task-Q Learning-Nondeterministic Rewards and Actions-Temporal Difference Learning-Generalizing from Examples-Relationship to Dynamic Programming.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand the need for machine learning for various problem solving

CO2: Demonstrate Decision Tree Learning Algorithm, Back propagation algorithm, Gibbs Algorithm, K-Nearest Neighbor Learning and Temporal Difference Learning with examples

CO3: Categorize the various supervised, semi-supervised and unsupervised learning algorithms in machine learning

CO4: Apply different classification techniques in real time examples

CO5: Design appropriate machine learning algorithms for different problems

Text Book:

1. Tom M. Mitchell, *Machine Learning*, Tata McGraw Hill, 2017.

Reference Books:

1. Jeremy Watt, Reza Borhani, Aggelos K Katsaggelos, *Machine Learning Refined Foundations, Algorithms & Applications*, Cambridge University Press, , 2016.
2. Ethem Alpaydin, *Introduction to Machine Learning*, MIT Press Cambridge, 2010.
3. Andreas C. Muller and Sarah Guido, *Introduction to Machine Learning with Python*, O'Reilly Media, First Edition, 2016.

E -Resources:

1. https://nptel.ac.in/courses/106/106/106106139/
2. https://onlinecourses.nptel.ac.in/noc22_cs58/preview

Course Outcomes	Programme Outcomes												
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Total**
CO1	9	9	3	3	3	3	9	1	1	3	1	1	**46**
CO2	9	9	3	3	3	3	9	1	1	3	1	1	**46**
CO3	9	9	3	3	3	3	9	1	1	3	1	3	**48**
CO4	9	9	9	9	3	3	9	1	1	3	1	3	**90**
CO5	9	9	9	9	3	9	9	1	3	3	1	9	**74**
Total	**45**	**45**	**27**	**27**	**15**	**21**	**45**	**5**	**7**	**15**	**5**	**17**	**274**

Low-1 Medium-3 High-9

Core XVII - Project

(For Students Admitted from 2022-23)

Semester: IV **Hours/week: 18**
Subject Code: IMCAC43PW **Credit: 6**

Course Objectives:

1. To understand the fundamental principles of Project management and be familiar with the different methods and techniques used for project development
2. To get good knowledge of the issues and challenges faced while doing the project and to do the Project Scheduling, tracking, Risk analysis, Quality management and Project Cost estimation using different techniques

Students have to undergo an individual project work either on campus or in an industry and appear for the viva voce examination with the software developed and document prepared by them

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Identify goals, constraints, deliverables, performance criteria and resource requirements in consultation with stakeholders
CO2: Implement the plan by executing the code
CO3: Integrate the various aspects of software development for the total project
CO4: Construct the entire software project according to the specific problem
CO5: Check the software project by executing with the various data

Course Outcomes	Programme Outcomes												
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Total**
CO1	9	9	9	9	9	9	9	9	9	9	9	9	**108**
CO2	9	3	9	3	9	9	3	3	9	3	9	9	**78**
CO3	9	9	9	9	9	3	9	3	9	3	9	9	**90**
CO4	9	9	3	9	9	3	3	9	9	9	9	9	**90**

CO5	9	9	3	3	9	9	9	9	9	9	9	9	**96**
Total	**45**	**39**	**33**	**33**	**45**	**33**	**33**	**33**	**45**	**33**	**45**	**45**	**462**

Low-1 Medium-3 High-9

Extra Credit I - RDBMS Lab

(For Students Admitted from 2022-23)

Semester: I
Subject Code: IMCAX1P **Credit: 2**

Course Objectives:

1. To explain basic database concepts, applications, data models, schemas and instances and emphasize the importance of normalization in databases
2. To demonstrate the use of constraints and relational algebra operations and describe the basics of SQL and construct queries using SQL

SQL DDL

1. Create an address table with fields name, doorno , street & city
   - describe its structure
   - alter the table to include pincode
   - alter the table to modify street column
   - drop the table

DML

2. Create a student table with regno, name, age and dept.
   - insert records
   - delete the students with age above 20
   - truncate and drop the table

Functions

3. Create an employee table with fields eno , ename , sex ,age & years of experience
   - find out the no. of female employees
   - find out the employees with age ranging between 30 and 35
   - list out the employees who are working more than 5 years
4. Create a library file with fields accno,title,author,cost & no of copies
   - arrange the books according to accno
   - find out the TOTAL no. of books available in the library
   - find out the book of minimum cost
5. Create a player table with fields name,sports(cricket,hockey,etc.),age & country
   - find out the eldest and youngest player
   - group players according to sports
   - list out the Indian players
6. Write the SQL queries to illustrate all number functions
7. Write the SQL queries to illustrate date functions
8. Write the SQL queries to illustrate all string functions
9. Create an item table with field's itemno, itemname, quantity & price and insert records.
10. Illustrate the comparison operators (between, like, in & isnull)
11. Create a table with the fields clientno, clientname & phoneno. Illustrate the set operators union , unionall, minus & intersect
12. Create a student table with fields' regno, name, English, Tamil, Maths and TOTAL

- insert records
- arrange all records according to TOTAL
- find the student who got first mark in Maths
- list out the students whose name starts with 'S'

13. Create an inventory table with fields' itemno, itemname, qnty, price and reorder level
    - insert records
    - update the qnty when it goes less than reorderlevel
    - list the items with price less than 100
14. Create an employee table with fields ecode, ename, age & salary and create a department table with fields ecode, designation, deptcode & dept. Illustrate joins and sub queries using the above tables.

Constraints

15. Create a vendormaster table with fields vencode,venname,place and phoneno
    Create an ordermaster table with fields item no, itemcode, vencode, qnty and orderdate.
    Illustrate the following constraints using the above tables
    - vencode as primary key in vendormaster
    - vencode as foreign key in ordermaster
    - phoneno as unique
    - place as notnull &
    - qnty > 100

Note: - Questions for the internal examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Demonstrate DDL, DML and TCL Commands
CO2: Apply the basic concepts of Database Systems and Applications
CO3: Illustrate the use of implementing constraints in tables
CO4: Implement normalization queries using SQL in database creation and interaction
CO5: Design ER-models to represent simple database application scenarios

Course Outcomes	Programme Outcomes												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Total
CO1	9	9	9	9	3	1	9	3	1	1	1	1	56
CO2	9	9	9	9	3	1	9	3	1	1	1	1	56
CO3	9	9	9	9	3	1	9	3	1	1	1	1	56
CO4	9	9	9	9	3	1	9	3	1	1	1	1	56
CO5	9	9	9	9	3	1	9	3	1	1	1	1	56
Total	45	45	45	45	15	5	45	15	5	5	5	5	280

Low- 1 Medium-3 High-9

Extra Credit II - Internship

(For Students Admitted from 2022-23)

Semester: II
Subject Code: IMCAX2P **Credit: 2**

Course Objectives:

1. To articulate and apply principles learned in and outside of the classroom to a specific internship site experience
2. To get the practical knowledge to apply programming skills for developing a project

Students have to undergo an internship in an industry and submit document prepared by them about the internship programme. It can be a group work with a group size of maximum two members. The Internship should be completed and submitted before the commencement of III Semester and viva will be conducted in the first week of III Semester.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand self-understanding, self-confidence, and interpersonal skills

CO2: Assess Strengths, Weaknesses, Opportunities and Threats (SWOT) and explore career options and gain general work experience

CO3: Examine any specific learning outcomes identified in supplemental documentation provided as part of the internship application process

CO4: Apply various soft skills such as time management, positive attitude and communication skills during performance of the tasks assigned in internship organization

CO5: Create the document which contains company profile by compiling the brief history, management structure, products / services offered, key achievements and market performance for organization of internship

Course Outcomes	Programme Outcomes												
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Total**
CO1	9	9	9	9	9	1	9	9	1	1	9	1	**76**
CO2	9	9	9	9	9	1	9	9	1	1	9	1	**76**
CO3	9	9	9	9	9	1	9	9	1	1	9	1	**76**
CO4	9	9	9	9	9	1	9	9	1	1	9	1	**76**
CO5	9	9	9	9	9	1	9	9	1	1	9	1	**76**
Total	**45**	**45**	**45**	**45**	**45**	**5**	**45**	**45**	**5**	**5**	**45**	**5**	**380**

Low-1 Medium-3 High-9

Extra Credit IV – Document Preparation Lab (LATEX)

(For Students Admitted from 2022-23)

Semester: IV

Subject Code: IMCAX4P **Credit: 2**

Course Objectives:

1. To get practical knowledge on preparing documents containing mathematical formulas
2. To prepare a technical and scientific documentation

List of Programs

1. Create a document using an input file
2. Create a document using special symbols, dashes, line breaks & footnotes
3. Create a document using the sectioning command
4. Create a document using quotations, typestyle, commands & environments
5. Create a document using the mathematical symbol
6. Create a document using arrays and table
7. Create a document using a bibliography
8. Create a document using clauses and page style
9. Create a document using pictures and colors
10. Create a document using basics of the math index
11. Create a document using fine print and bibliography database
12. Create a document using math mode, tabbing environment, and files

Note: - Questions for the External examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Identify bibliography database
CO2: Relate math mode, and fine print
CO3: Apply mathematical symbol to create the document
CO4: Select clauses, typestyle, commands, and page style
CO5: Create Latex documents

Course Outcomes	**Programme Outcomes**												
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Total**
CO1	9	9	9	9	3	1	9	3	1	1	1	1	**56**
CO2	9	9	9	9	3	1	9	3	1	1	1	1	**56**
CO3	9	9	9	9	3	1	9	3	1	1	1	1	**56**
CO4	9	9	9	9	3	1	9	3	1	1	1	1	**56**
CO5	9	9	9	9	3	1	9	3	1	1	1	1	**56**
Total	**45**	**45**	**45**	**45**	**15**	**5**	**45**	**15**	**5**	**5**	**5**	**5**	**280**

Low- 1 Medium-3 High-9

M Sc INFORMATION TECHNOLOGY

(Two Years Regular Programme)

(For Students Admitted from 2022-23)

Program Specific Outcomes (PSO):

On Completion of this programme, the student will be able to gain

PSO1: Enrich the knowledge in the areas like Artificial Intelligence, Cloud Computing, Software Project Management, Machine Learning and core computing subjects

PSO2: Apply programming and technical skills to solve real life complex problems and hence enhance employability

PSO3: Design solutions for complex problems and design processes that meet the specific needs of the society

PSO4: Apply the knowledge of latest trends to carryout research & development in modern computing environment

PSO5: Ability to apply learned skills to build optimized solution to latest technologies

PSO6: Function effectively as a team member or a leader to accomplish a common goal in a multidisciplinary team

PSO7: Engage in life-long learning, to remain up-to-date in their profession and obtain additional qualifications to enhance their career positions in IT industries

PREAMBLE

The Board of Studies of Computer Science revamped the curriculum with the following changes

Core Courses

- Data Analytics, Data Analytics Lab, Data Structures and Algorithms using Python, Cryptography and Network Security, Software Project Management, Machine Learning has been introduced
- New Syllabus framed for the course Advanced Java
- The course Open Technologies converted into Open Source Technologies and new syllabus framed and shifted from II semester to I semester
- The courses Data Mining and Warehousing and Optimization Techniques syllabus has been reframed
- Lab list modified for the course Advanced Java Lab
- The course Cloud Computing converted into Cloud & Distributed Computing and shifted from IV semester to I semester and reframed the syllabus
- The course Software Engineering converted into Software Project Management and shifted from II semester into III semester and reframed the syllabus

Discipline Specific Elective

- Internet of Things , Artificial Intelligence and Expert Systems and Compiler Design has been introduced
- The course Mobile Communications has been shifted from III semester to II semester and framed new syllabus

Extra Credit

- The course Skills for Employability renamed as Employability Skills and shifted from IV semester into III semester and reframed the syllabus

Others

- Programme Outcomes included
- Programme Specific Outcomes modified
- Elective course renamed as Discipline Specific Elective (DSE)
- Course Objectives included for all the courses
- Mapping of course outcomes to programmme outcomes table included for all the courses

PROGRAMME STRUCTURE – PROGRAM CODE : PIT

Sem	Subject Code	Course	Subject Title	Hours / week	Credit	CIA	ESE	Total Marks
I	HMITC11	Core I	Data Analytics	6	5	40	60	100
	HMITC12	Core II	Open Source Technologies	6 (T-4 P-2)	5	40 (T-20 P-20)	60	100
	HMITC13	Core III	Optimization Techniques	6	5	40	60	100
	HMITC14P	Core IV	Data Analytics Lab	6	5	40	60	100
	HMITE1A / HMITE1B	DSE I	a. Internet of Things b. Artificial Intelligence and Expert Systems	6	5	40	60	100
	HMITX1P / HMITX1O	Extra Credit I	RDBMS Lab / * Online Course	-	2	-	100	100
			Total	**30**	**25+2**	**200**	**300 + 100**	**500+ 100**
	HMITC21	Core V	Advanced Java	6	5	40	60	100
	HMITC22	Core	○ Data	6	5	40	60	100

II		VI	Structures and Algorithms using Python					
	HMITC23	Core VII	Cryptography and Network Security	6	5	40	60	100
	HMITC24P	Core VIII	Advanced Java Lab	6	5	40	60	100
	HMITE2A / HMITE2B	DSE II	a. Probability and Applied Statistics b. Mobile Communications	6	5	40	60	100
	HMITX2P / HMITX2O	Extra Credit II	#Internship / *Online Course	-	2	-	100	100
			Total	**30**	**25+2**	**200**	**300 + 100**	**500+ 100**
III	HMITC31	Core IX	Software Project Management	6	5	40	60	100
	HMITC32	Core X	Software Development Framework	6	5	40	60	100
	HMITC33	Core XI	Data Mining and Warehousing	6 (T-4 P-2)	5	40 (T-20 P-20)	60	100
	HMITC34P	Core XII	Software Development Framework Lab	6	5	40	60	100
	HMITE3A / HMITE3B	DSE III	a. Human Resource Management b. Compiler Design	6	5	40	60	100
	HMESX3	Extra	Employability	-	2	100	-	100

	/ HMITX3O	Credit III	Skills / * Online Course					
			Total	**30**	**25+2**	**200 +100**	**300**	**500+ 100**
IV	HMITC41	Core XIII	Cloud and Distributed Computing	6	5	40	60	100
	HMITC42	Core XIV	○ Machine Learning	6	5	40	60	100
	HMITC43PW	Core XV	Project	18	5	100	100	200
	HMITX4P / HMITX4O	Extra Credit IV	Document Preparation Lab (LATEX) / *Online Course	-	2	-	100	100
			Total	**30**	**15+2**	**180**	**220 + 100**	**400+ 100**
			Grand Total	**120**	**90+8**	**780+ 100**	**1120+ 300**	**1900+ 400**

*****For Online Course credit alone will be assigned on submission of certificate obtained by appearing for online examination from EdX, Spoken Tutorial, NPTEL or Coursera etc.

#For internship course, refer www.internshala.com

- For online course integration, syllabus will be taken from spoken tutorial.

DSE - Discipline Specific Elective

Core I - Data Analytics

(For Students Admitted from 2022-23)

Semester: I **Hours/week: 6**

Subject Code: HMITC11 **Credit: 5**

Course Objectives:

1. To understand the Big Data Platform and its Use cases and Map Reduce Jobs
2. To provide an overview of Apache Hadoop, HDFS Concepts and Interfacing with HDFS and Apply analytics on Structured, Unstructured Data

Unit I **(18 hours)**

Introduction to Big Data: Introduction – understanding Big data-capturing bigdata-Volume-velocity-variety-veracity-Benefiting Big Data –Management of big data- organizing big data-Technology challenges**.**

Unit II **(18 hours)**

Big data Sources and Architecture: Big data sources-people to people communication-m2m- big data applications- Examining big data types- structured data – unstructured data-semi structured data-integrating data type into big data environment-Big data Architecture.

Unit III **(18 hours)**

Hadoop: Big Data – Apache Hadoop & Hadoop EcoSystem – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization- Hadoop Architecture, Hadoop Storage. Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers-: HDFS- Hive Architecture and Installation, Comparison with Traditional Database, HiveQL - Querying Data - Sorting and Aggregating, Map Reduce Scripts, Joins & Subqueries, HBase.

Unit IV **(18 hours)**

Analytics and Big Data: Basic analytics-Advanced analytics-operationalized analytics-Monetizing analytics-modifying business intelligence products to handle big data- big data analytics solution-understanding text analytics-tools for Big data**.**

Unit V **(18 hours)**

Data Visualization & R: Introduction-excellence in visualization- types of chart-Business Intelligence: Tools-skills applications – Health care- Education-retail - E- Governance - Working with R- Import a dataset in R Plotting a histogram-Big data mining.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe Data sources, generations, data formats, Data Evolution, Data from various domains

CO2: Determine Big Data Characteristics, Frameworks, components and Limitation of traditional approaches and map Big Vs to Data Domains

CO3: Analyse various domains of Data Characteristics, Platform, Programming Model and Design Data Analytic ecosystem, and data processing framework

CO4: Evaluate the Concepts of Data Analytics Phases and Techniques

CO5: Formulate Data Analytics Techniques practically using R environment

Text Books:

1. Anil Maheshwari, *Data Analytics Made Accessible*, Kindle Edition, 2017.
2. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman , *Big Data for Dummies*, Wiley India Private Limited,2014.

Reference Books:

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, *Professional Hadoop Solutions*, Wiley, India Private Limited, 2015.
2. Chris Eaton, Dirk deroos, Understanding *Big data*, McGraw Hill, 2012.
3. Tom White, *HADOOP: The definitive Guide*, O Reilly, 2012.

4. Tom Plunkett, Brian Macdonald, Oracle *Big Data Handbook*, Oracle Press, 2014.
5. JyLiebowitz, *Big Data and Business analytics*, CRC press, 2013.
6. VigneshPrajapati, *Big Data Analytics with R and Hadoop*, Packet Publishing, 2013.

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc20_cs92/preview
2. https://nptel.ac.in/courses/110/106/110106072/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	1	9	3	9	**49**
CO2	9	9	9	1	9	3	9	**49**
CO3	9	9	9	1	9	3	9	**49**
CO4	9	9	9	1	9	3	9	**49**
CO5	9	9	9	1	9	3	9	**49**
Total	**45**	**45**	**45**	**5**	**45**	**15**	**45**	**245**

Low-1 Medium-3 High-9

Core II - Open Source Technologies

(For Students Admitted from 2022-23)

Semester: I **Hours/week: 6 (T: 4 P: 2)**
Subject Code: HMITC12 **Credit: 5**

Course Objectives:

1. To expose students to free open source software environment and introduce them to use open source packages
2. To implement various applications using build systems and understand the installation of various packages in open source operating systems

Unit I **(12 hours)**

PHP: Introduction-What is PHP-Why use PHP and MYSQL-PHP strengths-Key features of PHP-**Using PHP-**Accessing PHP-Creating sample application- Embedding PHP in HTML-Accessing form variables-Understanding identifiers- Examining Variable types- Using Operators-Making Decisions with conditionals-Repeating actions through iteration.

Unit II **(12 hours)**

Storing and Retrieving Data-Processing files-Opening a file-Writing to a file-Closing a file-Reading from a file-Using other file functions-**Using arrays-**What is an array-Numerically indexed arrays-Arrays with different indices-array operators-multidimensional array-sorting array-String manipulation and regular expressions.

Unit III **(12 hours)**

Mysql: What is SQL-Inserting Data into the Database-Retrieving Data from the Database-Updating Records in the Database-Altering Tables after creation-Deleting Records from the Database-Dropping Tables-Dropping a Whole Database-Accessing your MYSQL database

from the web with PHP-Querying a database from the web-putting new information in the database-Using other PHP database interfaces.

Unit IV **(12 hours)**

Python: Introduction-Algebra with Variables-variables, complex quantities, common functions with numbers, logical operators, strings and printing. Simple programs-basic program structure, flowchart, conditional operations, iterative routines. Functions and Modules-Functions-Recursion, Nested functions, Nested scope, Modules-Built-in modules, maths module.

Unit V **(12 hours)**

Sequences and Operations with Sequences: String, tuple, list, dictionary, set, operators with sequences, iterator, iterator functions, input. Classes and Objects- classes, functions with attributes, overloading, inheritance, execution from command line.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Demonstrate install and run Linux operating system
CO2: Apply the MYSQL database concepts
CO3: Develop website and control using PHP and MYSQL
CO4: Explain Install open source web technologies MySQL and PHP
CO5: Illustrate the Python software making process

Text Books:

1. Luke Welling, Laura Thomson, *PHP and MYSQL Web Development*, Pearson Education, Fifth Edition, 2016.
2. T.R. Padmanabhan, *Programming with Python*, Springer Nature, 2016.

Reference Books:

1. James Lee and Brent Ware, *Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP*, Dorling Kindersley, 2008.
2. Eric S. Raymond, Michael Tiemann, *Open Sources: Voices from the Open Source Revolution* , O'Reilly, 1999.
3. Martin C, *Brown, Perl: The Complete Reference*, Tata McGraw Hill, Second Edition, 2009.
4. Steve Holzner, *PHP: The Complete Reference*, Tata McGraw Hill, Second Edition, 2009.

E-Resources:

1. https://nptel.ac.in/courses/106/106/106106182/
2. https://nptel.ac.in/courses/106/105/106105182/

Open Source Technologies (Lab)

Hours/week: 2

Python:

Display Text

1. To display any given text message
2. To display Fibonacci series

Array

3. To count the number of vowel in the string

Function

4. To convert a date read from the user, given in DD/MM/YYYY format into written format. For example, Enter a date in DD/MM/YYYY Format: 16/7/2003 Output: 16 July, 2003
5. To print the contents of a file in uppercase using function

MySQL:

1. Create student database and display the data using Python
2. Create Employee database and display the employee salary data using Python

PHP:

1. To find Sum of digits of given number
2. To find factorial of a number
3. To display count, from 10 to 20 using loop
4. To check given number is prime number or not

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	1	3	9	3	9	**43**
CO2	9	9	3	9	3	9	9	**51**
CO3	9	9	9	3	9	3	3	**45**
CO4	9	1	3	9	3	9	1	**35**
CO5	3	9	3	9	9	3	3	**39**
Total	**39**	**37**	**19**	**33**	**33**	**27**	**25**	**213**

Low-1 Medium-3 High-9

Core III - Optimization Techniques

(For Students Admitted from 2022-23)

Semester: I **Hours/week: 6**
Subject Code: HMITC13 **Credit: 5**

Course Objectives:

1. To impart knowledge in concepts and tools of Operations Research and to understand mathematical models used in Operations Research
2. To apply these techniques constructively to make effective business decisions

Unit I **(18 hours)**

Basics of Operations Research: Development of OR – Definition-Characteristics-Scientific Method-Necessity of OR-Scope-OR and Decision-Making-Scope of OR in Management, Financial management-Applications of various OR Techniques-Objectives –Phases-Models-Classification Schemes of Models-Role of Computers in OR – Difficulties in OR - Limitations of OR

Linear Programing: Introduction-Requirements for a Linear Programming Problem - Assumptions in Linear Programming Models – Applications of LP method- Formulation of LPP-Advantages – Limitations – Graphical Method of Solutions – Some Exceptional Cases.

Unit II **(18 hours)**

General LPP-Canonical and standard Forms of LPP-Theory of Simplex Method – Some Important Definitions –Analytical Method or Trial and Error Method – Simplex Method – Artificial Variables Techniques – Special cases in Simplex Method Applications – Solution of Simultaneous Equations by Simplex Method – Some Additional Points – Computational Efficiency of the Simplex Technique.

Unit III **(18 hours)**

Transportation Model: Introduction to the Model – Assumptions in Transportation Model - Definition-Matrix Terminology- Formulation and Solution- Variants in Transportation Problems-Additional Problems-Least-Time Transportation Problems-Post Optimality Analysis in Transportations – Trans-Shipment Problem- Dual of the Transportation Problem.

Unit IV **(18 hours)**

Assignment Model: Definition of Assignment Model- Mathematical Representation-Comparison with the Transportation Model-Solution of Assignment Models -Hungarian Method for Solution of Assignment Problems- Formulation and Solution of Assignment Models -Variations -Additional Problems- Sensitivity Analysis in Assignment Problem-Travelling Salesman Problem.

Unit V **(18 hours)**

Advanced Topics in LP: Duality in LP - Dual Simplex Method -Revised Simplex Method - Bounded Variable Problem.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain characteristics of Operational Research, Computational Efficiency of the Simplex Technique, Transportation Problems, Assignment problem and Duality

CO2: Apply Graphical, Simplex methods, Assignment Problem, Transportation Problem and Dual Simplex Method methods to get optimal solution for Linear Programming

CO3: Analyse the optimal solutions of different Linear Programming methods such as Graphical, Simplex method, Assignment Problem and Transportation Problem and Dual Simplex methods for making effective business decisions

CO4: Compare Solutions of as Graphical, Simplex and Dual Simplex method

CO5: Generate dual of LPP and dual of Transportation Problem

Text Book:

1. Er. Prem Kumar Gupta, Dr D S Hira, *Operations Research*, S Chand Company, 2017.

Reference Books:

1. V.K.Kapoor, *Operations Research*, Sultan Chand & Sons Publishers, Fourth Edition, 2001.
2. Hamdy A.Taha, *Operations Research*, Prentice Hall of India Pvt Ltd, Seventh Edition, 2005.

3. J K Sharma, *Operations Research Theory and Applications*, Fifth Edition, Macmillan Publishers, 2013.
4. Kanti Swarup , P.K. Gupta and Man Mohan, *Operations Research*, Sultan Chand & Sons Publishers, Thirteenth Edition, 2004.

E-Resources:

1. https://nptel.ac.in/courses/110/106/110106062/
2. https://onlinecourses.swayam2.ac.in/cec20_ma10/preview
3.https://www.bbau.ac.in/dept/UIET/EMER-601%20Operation%20Research%20Queuing%20theory.pdf

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	9	1	9	9	**49**
CO2	9	3	9	9	1	9	9	**49**
CO3	9	3	9	9	1	9	9	**49**
CO4	9	1	9	9	1	9	9	**47**
CO5	9	1	9	9	3	9	9	**49**
Total	**45**	**11**	**45**	**45**	**7**	**45**	**45**	**243**

Low-1 Medium-3 High-9

Core IV - Data Analytics Lab

(For Students Admitted from 2022-23)

Semester: I **Hours/week: 6**
Subject Code: HMITC14P **Credit: 5**

Course Objectives:

1. Able to identify datasets and explain how they are organized and manipulate data
2. Able to know how to transform the data into useful information and use functions for data visualization

List of Programs

Using Spread sheet

1. To perform Basic Functions in Spread sheets
2. To perform Formatting and Proofing
3. To perform Mathematical & Text Functions
4. Implement Date and Time Functions
5. Implement Sorting & Filtering Techniques
6. To perform Logical Functions
7. To perform Data Validation
8. To display Pivot Tables
9. To display Charts and Slicers
10. To perform Lookup Functions

Using R

11. To get the input from user and perform numerical operations (MAX, MIN, AVG, SUM, SQRT, ROUND)
12. To perform data import/export (.CSV, .XLS, .TXT) operations using data frames
13. To get the input matrix from user and perform Matrix addition, subtraction, multiplication, inverse transpose and division operations using vector concept
14. To perform statistical operations (Mean, Median, Mode and Standard deviation)
15. To perform data pre-processing operations i) Handling Missing data ii) Min-Max normalization
16. To perform Simple Linear Regression
17. To perform K-Means clustering operation and visualize for iris data set

Using SciLab

18. Implement the basic matrix operations
19. Find the Eigenvalues and eigenvectors
20. Solve equations by Gauss elimination, Gauss Jordan Method and Gauss Seidel
21. Find the reduced row echelon form of a matrix

Note: - Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Outline Excel functions to solve mathematical, text, Date and time operations, R functions for numerical operations and Scilab functions for matrix operations

CO2: Demonstrate the concepts of sorting, filtering using Excel

CO3: Illustrate statistical operations using R

CO4: Evaluate the Regression and Clustering

CO5: Develop programs to solve equations by Gauss elimination, Gauss Jordan Method and Gauss Seidel

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	1	9	9	**43**
CO2	9	1	9	3	1	9	9	**41**
CO3	9	1	9	3	1	9	9	**41**
CO4	9	1	9	3	1	9	9	**41**
CO5	9	3	9	3	1	9	9	**43**
Total	**45**	**9**	**45**	**15**	**5**	**45**	**45**	**209**

Low-1 Medium-3 High-9

DSE I - a) Internet of Things

(For Students Admitted from 2022-23)

Semester: I **Hours/week: 6**

Subject Code: HMITE1A **Credit: 5**

Course Objectives:

1. To gain insight about the architecture and enabling technologies of Internet of Things
2. To develop simple IoT Applications for different domains

Unit I **(18 hours)**

Introduction & Concepts: Introduction to Internet of Things, Physical Design of IOT, Logical Design of IOT, IOT Enabling Technologies, IOT Levels.

Unit II **(18 hours)**

Domain Specific IOTs: Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Life Style.

Unit III **(18 hours)**

M2M & System Management with NETCONF-YANG: M2M, Difference between IOT and M2M, SDN and NFV for IOT, Software defined Networking, Network Function Virtualization, Need for IOT Systems Management, Simple Network Management Protocol, Limitations of SNMP, Network Operator Requirements, NETCONF, YANG, IOT Systems management with NETCONF-YANG.

Unit IV **(18 hours)**

Developing Internet of Things & Logical Design using Python: Introduction, IOT Design Methodology, Installing Python, Python Data Types & Data Structures, Control Flow, Functions, Modules, Packages, File Handling, Date/ Time Operations, Classes, Python Packages.

Unit V **(18 hours)**

IOT Physical Devices & Endpoints: What is an IOT Device, Exemplary Device, Board, Linux on Raspberry Pi, Interfaces, and Programming& IOT Devices.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe the importance of IOT, design methodology, logical design using python and IOT devices

CO2: Analyze the concept of IOT, M2M and IOT Physical devices and end points

CO3: Create IOT platforms using design methodology

CO4: Perform WiFi data communications, remote data storage in cloud, and handle the data using web applications

CO5: Develop solutions using IOT for potential problems

Text Books:

1. Arshdeep Bahga, Vijay Madisetti, *Internet of Things: A Hands-On Approach*, Universities Press, 2015.

Reference Books:

1. Charles Platt, *Make Electronics – Learning by discovery*, O'Reilly Media, 2015.
2. Michael Miller, *The Internet of Things*, Pearson Education, 2015.

E-Resource:

1. https://nptel.ac.in/courses/106/105/106105166/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	9	3	1	3	**25**
CO2	1	3	9	9	3	1	9	**35**
CO3	3	3	3	1	1	9	9	**29**
CO4	1	3	9	1	3	3	9	**29**
CO5	3	3	3	3	1	3	9	**25**
Total	**11**	**15**	**27**	**23**	**11**	**17**	**39**	**143**

Low-1 Medium-3 High-9

DSE I - b) Artificial Intelligence and Expert Systems

(For Students Admitted from 2022-23)

Semester: I **Hours/week: 6**
Subject Code: HMITE1B **Credit: 5**

Course Objectives:

1. To understand basics of Artificial Intelligence and its applications
2. To learn about Expert systems and knowledge representation schemes

Unit I **(18 hours)**

Introduction to Artificial Intelligence-Intelligent Agents, Approaches in Artificial Intelligence, Definitions of Artificial Intelligence, AI problems, Features of AI Programs, Importance of AI, Advantages and Disadvantages of AI.

Unit II **(18 hours)**

Applications of Artificial Intelligence- Finance, Hospitals and Medicine, Robotics, Expert systems, Diagnosis, Pattern Recognition, Natural Language Processing, Game Playing, Image Processing, Data mining, Big Data Mining. Introduction to the state space search- State space search, search techniques, Types of searching techniques.

Unit III **(18 hours)**

Heuristic Search Strategies-Types of Heuristic Search techniques, Hill Climbing Search, Simulated Annealing search, A* Algorithm, AND-OR Graphs, Properties of the Heuristic Search Algorithm, Adversary Search, The MINIMAX Algorithm.

Unit IV **(18 hours)**

Expert Systems-Definitions of Expert Systems, Features of Good Expert systems, Architecture and Components of Expert systems, Roles of the Individuals who interact with the system, Advantages of Expert systems, Disadvantages of Expert Systems.

Unit V **(18 hours)**

Knowledge Representation - Definitions of Knowledge Representation, Characteristics of Good Knowledge Representation, Basics of Knowledge representation, Properties of the Symbolic representation of knowledge, Properties of the Good knowledge representation systems, Categories of knowledge representation schemes, types of knowledge representation schemes.

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Illustrate knowledge on Artificial Knowledge concepts
CO2: Apply all searching algorithms and Hill-climbing procedures
CO3: Analyse their gaming skills and learn about Expert system
CO4: Evaluate the learners for aspiring careers in the field of Artificial Intelligence.
CO5: Develop the game playing and planning of expert systems

Text Book:
1. I.Gupta, G.Nagpal, Artificial *Intelligence and Expert Systems*, Laxmi Publications, 2018.

Reference Books:
1. V.S. Jankiraman, *Foundations of Artificial Intelligence and Expert Systems*, Laxmi Publications, 2017.
2. Joseph C.Giarratano, Gary D.Riley, *Expert Systems: Principles and Programming*, Fourth Edition, 2018.
3. Lavika Goel, *Artificial Intelligence: Concepts and Applications*, Wiley India Private Limited, 2018.

E-Resources:
1. https://nptel.ac.in/courses/106/102/106102220/
2. https://nptel.ac.in/courses/112/103/112103280/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	1	9	9	3	9	**49**
CO2	9	9	3	9	3	9	1	**43**
CO3	3	9	9	3	9	3	3	**39**
CO4	9	1	3	9	3	9	1	**35**
CO5	9	9	9	9	9	3	3	**51**
Total	**39**	**37**	**25**	**39**	**33**	**27**	**17**	**217**

Low-1 Medium-3 High-9

Extra Credit I– RDBMS Lab

(For Students Admitted from 2022-23)

Semester: I
Subject Code: HMITX1P **Credit: 2**

Course Objectives:
1. The Students get practical knowledge on designing and creating Relational Database Management
2. To understand various advanced queries such as relational constraints, joins, set operations, aggregate functions, trigger, views and embedded SQL

SQL DDL
1. Create an address table with fields name , doorno , street & city
   - describe its structure

- alter the table to include pincode
- alter the table to modify street column
- drop the table

DML

2. Create a student table with regno, name, age and dept.
   - insert records
   - delete the students with age above 20
   - truncate and drop the table

Functions

3. Create an employee table with fields eno , ename , sex ,age & years of experience
   - find out the no. of female employees
   - find out the employees with age ranging between 30 and 35
   - list out the employees who are working more than 5 years
4. Create a library file with fields accno,title,author,cost & no of copies
   - arrange the books according to accno
   - find out the TOTAL no. of books available in the library
   - find out the book of minimum cost
5. Create a player table with fields name,sports(cricket,hockey,etc.),age & country
   - find out the eldest and youngest player
   - group players according to sports
   - list out the Indian players
6. Write the SQL queries to illustrate all number functions
7. Write the SQL queries to illustrate date functions
8. Write the SQL queries to illustrate all string functions
9. Create an item table with field's itemno, itemname, quantity & price and insert records.
10. Illustrate the comparison operators (between, like, in & isnull)
11. Create a table with the fields clientno , clientname & phoneno Illustrate the set operators union , unionall, minus & intersect
12. Create a student table with fields' regno, name, English, Tamil, Maths and TOTAL
    - insert records
    - arrange all records according to TOTAL
    - find the student who got first mark in Maths
    - list out the students whose name starts with 'S'
13. Create an inventory table with fields' itemno, itemname, qnty, price and reorder level
    - insert records
    - update the qnty when it goes less than reorderlevel
    - list the items with price less than 100
14. Create an employee table with fields ecode,ename,age & salary and create a department table with fields ecode, designation, deptcode & dept. Illustrate joins and sub queries using the above tables

Constraints

15. Create a vendormaster table with fields vencode,venname,place and phoneno
    Create an ordermaster table with fields item no, itemcode,vencode,qnty and orderdate .
    Illustrate the following constraints using the above tables
    - vencode as primary key in vendormaster
    - vencode as foreign key in ordermaster

- phoneno as unique
- place as notnull
- qnty > 100

Note: Questions for the external examinations will be based on concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Build DDL, DML and TCL Commands
CO2: Make use of implementing constraints in tables
CO3: Apply to create block structure programming language
CO4: Create the concepts of functions
CO5: Develop the procedures, exceptions, triggers in PL/SQL block

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	1	9	9	3	9	**49**
CO2	9	9	3	9	3	9	1	**43**
CO3	3	9	9	3	9	3	3	**39**
CO4	9	1	3	9	3	9	1	**35**
CO5	9	9	9	9	9	3	3	**51**
Total	**39**	**37**	**25**	**39**	**33**	**27**	**17**	**217**

Low-1 Medium-3 High-9

Core V - Advanced Java

(For Students Admitted from 2022-23)

Semester: II **Hours/ Week: 6**
Subject code: HMITC21 **Credit: 5**

Course Objectives:

1. Learn networking and remote method invocation using Java API and Java Bean to increase the ability of students in web application development
2. Ability to develop programming knowledge to create dynamic web applications using server side technology with Java database connectivity

Unit I **(18 hours)**

JSP- JEEE- JSF- J2ME- Struts. **Networking with Java:** Basics of Networking - Sockets in Java - Client-Server in Networking - Proxy Servers - Internet Addressing - Domain Naming Service(DNS) - Inet4 Addresses and Inet6 Addresses - The URL Class - The URI Class - TCP/IP and Datagram - Java Net APIs – InetAddresses - InetAddress Caching - Creating and Using Sockets - Creating TCP Clients and Servers - A Whois Example - Submitting an HTML Form from Java - Handling URL- Using URLConnection Objects - Working With Datagrams - Datagram Server and Client

Swing: The Java Foundation Classes - Swing- Heavyweight versus Lightweight Components- Swing Features- Graphics Programming Using Panes- Model View Controller

Architecture- Working With Swing- Preparing to Create a Swing Applet- Understanding Root Panes, Layered Pane and Content Panes- Creating a Swing Applet and Application – Closing JFrame Windows.

Unit II **(18 hours)**

Understanding RMI: Remote Method Invocation (RMI) - Client/Server Architecture- Implementing RMI - Limitation of RMI, A Model RMI Transaction -Writing an RMI Server- Designing a Remote Interface- Implementing a Remote Interface- Passing Object in RMI- Implementing the Server's Main Method- Creating a Client Program- Compiling and Running the Example – Exporting with Unicast Remote Object

Working with Java Beans: What is Java Bean - Understanding Java Beans - Designing programs Using Java Beans - Creating Applets that Use Java Beans - Creating a Java Bean - Creating a Bean Manifest File and JAR File - Using a New Bean - Adding Controls to Beans - Giving a Bean Properties- Design Patterns for Properties- Simple Properties - Design Patterns for Events - Methods and Design Patterns - Giving a Bean Methods - Giving a Bean an Icon - The JavaBeans API.

Unit III **(18 hours)**

Talking to Database: JDBC- JDBC versus ODBC and Other APIs - Two- Tier and Three - Tier Models - Introducing SQL - The JDBC Package - Types of JDBC Drivers - Javasoft Framework-Driver Interface and Driver Manager Class - The Essential JDBC Program- Using a Prepared Statement Object- The Interactive SQL Tool- Using Tables- Defining a Table Model

JDBC in Action: Data Types and JDBC – Scrollable Result Sets - Batch Updates - Mapping Relational Data into Java Objects - Basic JDBC Types - Advanced JDBC data types.

Unit IV **(18 hours)**

Servlets: Architecture – Life cycle – First program – Client HTTP request – Server HTTP response – HTTP status code – Writing filters – Exception handling – Cookies handling – Session tracking – Database access – File uploading – Handling date – Servlets-page redirection – Sample program – Servlets-packaging.

Unit V **(18 hours)**

Java Server Pages: An Overview – Advantages of JSP – Architecture – JSP life cycle – JSP comments – JSP syntax – Implicit objects – Control-flow statements – Client-Server JSP – Database access – Custom tags – Exception handling – JSP standard tag library.

Course Outcomes:

After successful completion of the course, the students will be able to

CO1: Explain the concepts of JSP, JEEE, JSF, J2ME, Struts, Swing, RMI, Java Bean and Servlet

CO2: Utilize the technique of swing and RMI to create various fields and invoke client/ server communication

CO3: Examine an implementation of networking with Java, RMI and Java Bean

CO4: Evaluate different types of JDBC drivers and connectivity

CO5: Design the web application using swing, servlet, JSP and database

Text Books:

1. DT Editorial Services, *Java 8 Programming Black Book*, Dreamtech Press, 2015.
2. B Prasanalakshmi *Advanced Java Programming*, CBS Publishers & Distributors d, 2015.

Reference Books:

1. Steven Holzner et al, *Java 2(JDK 5 Edition) Programming Black Book*, Dreamtech press, 2006.
2. Herbert Schildt, *Java: The Complete Reference*, Eleventh Edition, McGraw Hill, 2020.
3. James Gosling, David Holmes, Ken Arnold, *The Java Programming Language*, Addison-Wesley Professional, Fourth Edition, 2005.

E - Resources:

1. Advanced Java, https://www.youtube.com/watch?v=Ae-r8hsbPUo
2. Java Programming, https://www.learnvern.com/course/advanced-java-tutorial

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	3	3	9	**29**
CO2	9	3	1	1	3	3	9	**29**
CO3	9	3	1	1	3	3	9	**29**
CO4	9	3	3	3	3	3	9	**33**
CO5	9	3	3	3	3	3	9	**33**
Total	**45**	**15**	**9**	**9**	**15**	**15**	**45**	**153**

Low-1 Medium-3 High-9

Core VI- Data Structures and Algorithms using Python

(For Students Admitted from 2022-23)

Semester: II **Hours/week: 6**
Subject Code: HMITC22 **Credit: 5**

Course Objectives:

1. To understand data structures and algorithms in computer science perspectives, algorithms analysis procedure, space and time complexity of various algorithms
2. To use existing data structures and algorithms found in python's libraries and to apply data structures and algorithms to solve real world problems

Unit I **(18 hours)**

Computational Complexity: Computer Architecture - Accessing Elements in a Python List - Big-Oh Notation- Other Asymptotic Notations for Complexity of Algorithms - More Asymptotic Notation. **Recursion:** The Run-Time Stack and the Heap – Recursion on Lists and Strings.

Unit II **(18 hours)**

Sequences: Lists- Cloning Objects - Item Ordering - Selection Sort - Merge Sort – Quicksort. **Two-Dimensional Sequences Trees:** Traversal algorithms using Stacks- The Minimax Algorithm - Linked Lists. Stacks and Queues- Radix Sort.

Unit III **(18 hours)**

Trees: Abstract Syntax Trees and Expressions - Search Spaces. **Graphs:** Graph Notation- Searching a Graph - Kruskal's Algorithm - Dijkstra's Algorithm -Graph Representations **Heaps:**Building a Heap- The Heapsort Algorithm Version 1- Analysis of Heapsort Version 2.

Unit IV **(18 hours)**

Balanced Binary Search Trees: Binary Search Trees - AVL Trees - Splay Trees. **B-Trees:** B-Tree Organization- B-Tree Implementation- B-Tree Insert-B-Tree Delete.

Unit V **(18 hours)**

Algorithm Design Techniques: Greedy Algorithms – Divide and Conquer – Dynamic Programming– Backtracking- Complexity Theory.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the concepts of linear and Non- linear data structures
CO2: Apply linear and non-linear data structures and its algorithms in real time applications
CO3: Analyze the efficiency of algorithms with Python
CO4: Compare different sorting algorithms
CO5: Develop different algorithm design techniques

Text Books:

1. Kent D. Lee, Steve Hubbard, Data *Structures and Algorithms with Python*, Springer International Publishing Switzerland, 2015.
2. Hemant Jain, *Problem Solving in Data Structures & Algorithms*, Taran Technologies Private Limited, First Edition, 2016.

Reference Books:

1. Ellis Horowitz, Sartaj Sahni, *Fundamentals of Data Structures*, Galgotia Book Source, Second Edition, 1992.
2. Alfred V.Aho Johne, Hopcroft , *Data Structures and Algorithm*, Addison-Wesley, Third Edition, 2008 .
3. Mark Allen Weiss, *Data Structures and Algorithm Analysis in C++*, Pearson Education, Fourth Edition, 2014.

E - Resources:

1. http://www.dave-reed.com/csc427.F04/
2. http://www.math.tau.ac.il/~matias/ds03.html
3. https://onlinecourses.nptel.ac.in/noc20_cs70/preview
4. https://www.tutorialspoint.com/python_data_structure/python_data_structure_tutorial.pdf
5. https://nptel.ac.in/courses/106/106/106106145/

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total

CO1	9	3	1	1	3	3	9	**29**
CO2	9	3	1	1	3	3	9	**29**
CO3	9	3	1	1	3	3	9	**29**
CO4	9	3	3	3	3	3	9	**33**
CO5	9	3	3	3	3	3	9	**33**
Total	**45**	**15**	**9**	**9**	**15**	**15**	**45**	**153**

Low-1 Medium-3 High-9

Core VII- Cryptography and Network Security

(For Students Admitted from 2022-23)

Semester: II **Hours/week: 6**
Subject Code: HMITC23 **Credit: 5**

Course Objectives:

1. To understand basics of Cryptography and Network Security and able to secure a message over insecure channel by various means
2. To learn about how to maintain the Confidentiality, Integrity and Availability of a data and understand various protocols for network security to protect against the threats in the networks

Unit I **(18 hours)**

Computer and Network Security concept: Computer security concepts-The OSI security Architecture-Security Attacks- Security Services-Security Mechanisms. **Number Theory:** The Euclidean Algorithm-Modular Arithmetic-Prime Numbers- Fermat's Euler's Theorem-Discrete Logarithms.

Unit II **(18 hours)**

Symmetric Ciphers: Classical Encryption Techniques: Symmetric Chippers Model-Substitution Techniques-Transposition Techniques-Traditional Block Cipher Structure-Block Cipher Design Principles. **Finite Fields:** Groups-Rings-Fields-Finite Fields of the FormGF(p).

Unit III **(18 hours)**

Advanced Encryption Standard: Finite Field Arithmetic-AES Structure-AES Tranformation Functions-AES Key Expansion. Asymmetric Ciphers : Principles of public – key cryptosystems-The RSA Algorithm.

Unit IV **(18 hours)**

Other Public-Key Cryptosystem: Diffie-Hellman Key Exchange-Elgmal cryptographic system-Elliptic curve arithmetic- Elliptic curve Crptography. **Digital Signature:**Digital signature-Elgmal Digital Signature Scheme-Schnorr Digital Scheme-NIST Digital signature algorithm.

Unit V **(18 hours)**

Wireless Network Security: Wireless Security-Mobile Device Security-IEEE802.11 Wireless LAN Overview- IEEE802.11 Wireless LAN Security. **Electronic Mail Security**: Internet Mail Architecture-Email Formats-Email Threats and compressive Email Security-S/MIME –DNSSEC-Sender policy Framework-Domain Keys Identify Mail.

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Compare various Cryptographic Techniques
CO2: Applying various data encryption techniques
CO3: Classify the encryption standard and asymmetric ciphers
CO4: Implement Hashing and Digital Signature techniques
CO5: Explain the various Security Application

Text Book:
1. William Stallings, *Cryptography and Network Security Principles and Practice*, Pearson Education, Seventh Edition, 2017.

Reference Books:
1. Wade Trappe, Lawrence C Washington, *Introduction to Cryptography with coding theory*, Pearson Education, Second Edition, 2007.
2. William Stallings, *Cryptography and Network security Principles and Practices*, Pearson Education, Fourth Edition, 2006.
3. W. Mao, *Modern Cryptography – Theory and Practice*, Pearson Education, Second Edition, 2007.

E-Resource:
1. https://nptel.ac.in/courses/106/105/106105162/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	3	9	3	9	**45**
CO2	9	9	3	9	9	3	9	**51**
CO3	3	9	3	9	9	3	9	**45**
CO4	9	9	3	3	9	3	9	**45**
CO5	9	9	3	9	9	3	9	**51**
Total	**39**	**45**	**15**	**33**	**45**	**15**	**45**	**237**

Low-1 Medium-3 High-9

Core VIII - Advanced Java Lab

(For Students Admitted from 2022-23)

Semester: II **Hours/week: 6**
Subject Code: HMITC24P **Credit: 5**

Course Objectives:
1. To apply the concept of RMI to invoke Client/Server Communication and AWT, Swing to design and develop GUI applications
2. To build dynamic web applications using JSP, Servlet and Java Data Base Connectivity (JDBC)

List of Programs

Networking
1. Do one and two way communication(s)
2. Implement TCP Socket

Swing
3. Display current date & time in different format
4. Set a foreground and background color for label
5. Create simple calculator

Bean
6. Create button
7. Create text box which accepts only characters
8. Create text box which accepts only integer value

JDBC
9. Prepare a student's details with Roll-No, Name, Mark1, Mark2, Mark3, Total, Average and Grade to perform insert, update, delete and display of student information
10. Prepare an Electricity Bill to perform insert, update, delete and display Electricity bill of a particular user

RMI
11. Display a string message
12. Perform arithmetic operations
13. Find factorial
14. Generate Fibonacci series

SERVLET
15. Create a Servlet to display Simple Message
16. Create a Servlet that uses cookies to store the number of times a user has visited the servlet
17. Create a Servlet to generate Random Numbers
18. Create a Servlet that prints Today's date
19. Create Servlet for login page, if the username and password is correct then prints message "Hello username" else "login failed"
20. Create Student Information System to view the details of the Students

JSP
21. Create a JSP that prints hello world
22. Create a JSP that prints current date and time
23. Create a JSP that add and subtract two numbers.
24. Design a JSP Program to implement verification of a particular user login and display a welcome page
25. Design and implement a JAVA JSP Program to get student information and display the same information through Servlet

Note: - Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Demonstrate the concepts such as client/ server, socket and RMI to implement Java code

CO2: Apply an event handling using swing components

CO3: Illustrate the concept of Java bean in Java program

CO4: Discover the database access through Java code using JDBC connectivity

CO5: Create dynamic web pages using Servlet and JSP

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	3	3	9	**29**
CO2	9	3	1	1	3	3	9	**29**
CO3	9	3	1	1	3	3	9	**29**
CO4	9	3	3	3	3	3	9	**33**
CO5	9	3	3	3	3	3	9	**33**
Total	**45**	**15**	**9**	**9**	**15**	**15**	**45**	**153**

Low-1 Medium-3 High-9

DSE II - b) Mobile Communications

(For Students Admitted from 2022-23)

Semester: II **Hours/week: 6**

Subject Code: HMITE2B **Credit: 5**

Course Objectives:

1. To define mobile technologies in terms of hardware, software, and communications and describe existing mobile computing frameworks and architectures
2. To evaluate the effectiveness of different mobile computing frameworks and describe how mobile technology functions to enable other computing technologies

Unit I **(18 hours)**

Introduction: Mobile Computing- Middleware and Gateways-Developing Mobile Computing Applications- Security in Mobile Computing – Architecture of Mobile Computing-Three-Tier Architecture-Design Consideration for Mobile Computing-Mobile Computing through Internet- Mobile Computing through Telephone-Developing an IVR Applications.

Unit II **(18 hours)**

Bluetooth and GSM: Bluetooth- Features and working of RFID -Wireless Broadband (WiMAX) - Mobile IP – IPV6- IPV4 Vs IPV6 –Global System for Mobile Communications – GSM Architecture – Call Routing in GSM – GSM Addresses and Identifiers – Network Aspects in GSM – GSM Frequency Allocation – Authentication and Security- Mobile Computing Over SMS – SMS- Value Added Services through SMS**.**

Unit III **(18 hours)**

GPRS, 3G and 4G Networks: GPRS and Packet Data Network – GPRS Network Architecture – GPRS Network Operations – Data Services in GPRS- Applications for GPRS – Limitations of GPRS- Spread Spectrum Technology- CDMA Versus GSM – Features of 3G Networks –Architecture of 3G- Applications of 3G - Features of 4G- Architecture of 4G - Wireless Technologies Used in 4G- Merits and Demerits of 4G.

Unit IV **(18 hours)**

Mobile Ad-hoc Networks: Mobile Ad-Hoc Basic Concepts-Characteristics- Applications – Design Issues – Routing – Essential of Traditional Routing Protocols –Popular Routing Protocols – Vehicular Ad Hoc Networks (VANET) – MANET Vs VANET – Security of VANET and MANET - **Open Source Tools for Mobile Testing:** Appium - Katalon Studio – Monkey Talk – IOS Driver – Robotium – Calabash.

Unit V **(18 hours)**

Overview of Kotlin- Installation of Android Studio – Getting started with Hello World app- Creating a Registration form- Adding Radio Buttons- Adding spinner and Image- Creating a search App-URL request-Display Search Result-Playing video using YouTube API.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the principles of mobile technologies like GPRS, GSM, CDMA and TDMA and the concepts of Bluetooth and GSM, Mobile Ad-hoc networks

CO2: Apply the features of Android programming for developing Android Applications

CO3: Analyze technology of 1G, 2G, 3G and 4G for gaining the working knowledge of four generation Wireless technologies and Analyze the architecture, merits and demerits of Wireless technologies like Infra-Red, blue tooth, Wi-Fi, RFID and Wi-Max

CO4: Compare the characteristics and techniques MANET with VANET

CO5: Derive wireless communication systems with 3G and 4G technologies.

Text Books:

1. Asoke K. Talukder, Hasan Ahmed, Roopa R Yavagal. *Mobile Computing: Technology, Applications, And Service Creation*, Tata McGraw Hill, 2017.
2. Stefano Basagni , Marco Conti , Silvia Giordano , Ivan IvanStojmenovic, *Mobile AdHoc Networking, Cutting Edge Directions,* Wiley Publications, 2015.

Reference Books:

1. Sunilkumar S. Manvi, Mahabaleshwar S. Kakkasageri, *Wireless and Mobile Networks, Concepts and Protocols*, Wiley Publications, 2016.
2. James C.Sheusi, *Android Application Development for Java programmers*, Cengage Learning, 2013.
3. Peter Spath, *Learn Kotlin for Android Development,* APress Publications, 2019.
4. Charles E.Perkins, *Ad Hoc Networking*, Addison-Wesley Publications, 2008.

E-Resources:

1.www.cse.iitk.ac.in/users/rkg/Talks/mobile_main.pdf
2.pl.cs.jhu.edu/oose/resources/android/Android-Tutorial.pdf
3. SWAYAM: https://swayam.gov.in/nd1_noc19_ee48/preview
4.SWAYAM: https://onlinecourses.swayam2.ac.in/aic20_sp02/preview

5.http://172.16.25.76/course/view.php?id=2224

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	9	9	1	9	9	9	55
CO2	9	9	9	1	9	9	9	55
CO3	9	9	9	1	9	9	9	55
CO4	9	9	9	1	9	9	9	55
CO5	9	9	9	1	9	9	9	55
Total	45	45	45	5	45	45	45	275

Low-1 Medium-3 High-9

Extra Credit II - Internship

(For Students Admitted from 2022-23)

Semester: II
Subject Code: HMITX2P **Credit: 2**

Course Objectives:

1. To articulate and apply principles learned in and outside of the classroom to a specific internship site experience
2. To get the practical knowledge to apply programming skills for developing a project

Students have to undergo an internship in an industry and submit document prepared by them about the internship programme. It can be a group work with a group size of maximum two members. The Internship should be completed and submitted before the commencement of III Semester and viva will be conducted in the first week of III Semester.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand self-understanding, self-confidence, and interpersonal skills

CO2: Assess Strengths, Weaknesses, Opportunities and Threats (SWOT) and explore career options and gain general work experience

CO3: Examine any specific learning outcomes identified in supplemental documentation provided as part of the internship application process

CO4: Apply various soft skills such as time management, positive attitude and communication skills during performance of the tasks assigned in internship organization

CO5: Create the document which contains company profile by compiling the brief history, management structure, products / services offered, key achievements and market performance for organization of internship

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	3	3	9	3	3	9	39
CO2	9	3	3	9	1	1	9	35
CO3	3	3	3	9	1	1	9	29

CO4	9	1	3	9	1	1	9	**33**
CO5	9	3	1	9	1	3	9	**35**
Total	**39**	**13**	**13**	**45**	**7**	**9**	**45**	**171**

Low-1 Medium-3 High-9

Core IX - Software Project Management

(For Students Admitted from 2022-23)

Semester: III **Hours/week: 6**
Subject Code: HMITC31 **Credit: 5**

Course Objectives:

1. To identify the different project contexts and suggest an appropriate management strategy and key phases of project management
2. To determine an appropriate project management approach through an evaluation of the business context and scope of the project and role of professional ethics in successful software development

Unit I **(18 hours)**

Introduction to Software Project Management: Introduction – Software projects versus other types of project – Contract Management and Technical Project Management – Plans, Methods and Methodologies – Some ways of categorizing software projects – Stakeholders – Setting Objectives – The Business Case – Project Success and Failure – Management Control – Traditional versus Modern Project Management Practices. Project **Evaluation and Programme Management:** A Business Case - Project portfolio Management – Evaluation of Individual Projects – Programme Management – Managing the allocation of resources within the programmes – Strategic programme Management.

Unit II **(18 hours)**

An overview of Project Planning: Stepwise Project Planning – **Selection of an Appropriate Project Approach:** Build or Buy – Choosing Methodologies and Technologies – Software Processes and Process Models – Choice of Process models – Structure versus speed of Delivery – The Waterfall Model – The Spiral Model – Software Prototyping.

Unit III **(18 hours)**

Activity Planning: Objectives of Activity planning – Plan – Project schedules – Sequencing and Scheduling Activities – Network Planning models – Formulating a Network Model – The Forward Pass – The Backward Pass – Identifying the Critical path – Activity Float – Shortening the Project Duration – Identifying Critical Activities. **Risk Management:** Risk – Categories of Risk – Risk identification – Risk Planning – Evaluating Risks to the Schedule – Applying the PERT technique – Monte Carlo simulation – Critical Chain Concepts.

Unit IV **(18 hours)**

Monitoring and Control: Creating the Framework -Collecting the Data- Review- Project Termination Review - Cost monitoring- Earned Value Analysis – Prioritizing Monitoring- Change control- Software Configuration Management. **Managing Contracts:** Types of Contract -Stages in Contract Placement – Typical Terms of a Contract – Contract management – acceptance.

Unit V **(18 hours)**

Managing People in Software Environments: Selecting the Right person for the Job-Instruction in the Best Methods -Motivation – The Oldham-Hackman job characteristics model – Stress – Health and Safety -Some Ethical and Professional concerns. **Working in Teams:** Becoming a Team-Decision making-Organization and Team structures-Coordination Dependencies-Dispersed and Virtual teams – Communications genres-Communication plans- Leadership.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Summarize Software Process Models

CO2: Illustrate the steps involved in Software Project Management and activity Planning, Risk Management using case studies

CO3: Apply Software effort Estimation Methods

CO4: Evaluate Software Project Management Tools

CO5: Design the modern techniques in Software Project Management like Agile, Scrum, DevOps

Text Book:

1. Bob Hughes, Mike Cotterell, Rajib Mall, *Software Project Management*, Tata McGraw Hill, Fifth Edition, 2012.

Reference Books:

1. Robert K.Wysocki ,*Effective Software Project Management*, Wiley Publication, 2011.
2. Walker Royce, *Software Project Management*, Addison-Wesley, 1998.
3. Gopalaswamy Ramesh, *Managing Global Software Projects*, Tata McGraw Hill, Fourteenth Reprint, 2013.

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105218/
2. https://onlinecourses.nptel.ac.in/noc19_cs70/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	1	9	9	9	**55**
CO2	9	9	9	1	9	9	9	**55**
CO3	9	9	9	1	9	9	9	**55**
CO4	9	9	9	1	9	9	9	**55**
CO5	9	9	9	1	9	9	9	**55**
Total	**45**	**45**	**45**	**5**	**45**	**45**	**45**	**275**

Low-1 Medium-3 High-9

Core X - Software Development Framework

(For Students Admitted from 2022-23)

Semester: III **Hours/week: 6**
Subject Code: HMITC32 **Credit: 5**

Course Objectives:

1. To understand the code solutions and compile C# projects within the .NET Framework
2. To design and develop professional console and window based .NET Application

Unit I **(18 hours)**

The .NET Framework: .Net programming Framework-VB.NET,C#.NET and the .NET Languages-The Common Language Runtime-The .NET Class Library-ASP.NET-Visual Studio .NET.Learning the .NET Languages:The .NET Languages-Data Types-Declaring Variables-Scope and Accessibility-Variable Operations-Object-Based Manipulation-Conditional Structures-Loop Structures-Functions and Subroutines.Types ,Objects and Namespaces: The Basics about classes –Value Types and Reference Types-Advanced Class Programming-Understanding Namespaces and Assemblies.

Unit II **(18 hours)**

ASP.NET APPLICATIONS: ASP.NET Applications-Code-Behind-The Global.asax Application File-Understanding ASP.NET Classes-ASP.NET Configuration. Web Form Fundamentals: A Simple Page Applet-A Deeper Look at HTML Control Classes-The Page Class-Accessing HTML Server Controls.Web Controls: Stepping Up to Web Controls-Web control Classes-AutoPostBack and Web Control Events.

Unit III **(18 hours)**

Using Visual Studio .NET: The promise of Visual Studio.NET-Starting a Visual Studio.Net Project – The Web form Designer-Writing Code-Visual Studio.NET Debugging-Working Without Visual Studio.NEValidation and Rich Controls: Validation-A simple Validation Example-Understanding Regular Expressions-A Validated Customer Form-Other Rich Controls State Management: The Problem of State-Viewstate-Transferring Information-CustomCookies-Session State.

Unit IV **(18 hours)**

Tracing, Logging and Error Handling: Common Errors-The .NET Exception Object-Handling exceptions-Throwing Your Own Exceptions-Logging Exceptions-Error Pages-Page Tracing.Overview of ADO.NET: Introducing ADO.NET and DataManagement-Characteristics of ADO.Net-The ADO.NET Object Model. ADO.NET Data Access: About the ADO.NET Examples-SQL Basics-The SQL Select Statement-Update-Insert-Delete-Accessing Data the Easy Way-Creating a connection-Defining a Select Command-Using a Command with a DataReader-Updating Data-Accessing Disconnected Data-Selecting Multiple Tables.

Unit V **(18 hours)**

Data Binding: Introduction-Single-Value Data Binding-Repeated-Value Data Binding-Data Binding with Databases.The DataList,DataGrid and Repeater: Introducing Templates-Using Templates with the DataList-Data Binding with Multiple Templates-Comparing the Template

Controls-Selecting Items-Editing Items-Paging with the DataGrid-Sorting with the DataGrid Using XML: XML's Hidden Role in .NET-XML Explained- The XMLClasses-XML Validation-XML Display and Transforms-XML in ADO.NET.

Course Outcomes:

After successful completion of this course, student will be able to

CO1:Interpret the basic concepts of .NET, Problem of the state, data, management, validation and Rich controls

CO2:Determine types, objects and namespaces, enumerators and iterators and error handling

CO3:Illustrate table controls, ASP.Net applications and the web server, interfaces and structures

CO4:Evaluate on Exception Handling, Serializing objects, Direct Data Access

CO5:Develop XML classes and XML Validation, web forms and use web controls

Text Book:

1. Matthew MacDonald, *The Complete Reference ASP.NET*, Tata McGraw Hill, 2017.

Reference Books:

1. Dino Esposito, *Programming Microsoft ASP.NET*, Tata McGraw Hill, 2003.
2. Chris Ullman , John Kauffman, Chris Hart, David Sussman, *Beginning ASP.Net 1.1 with VB.NET* , Wiley Publishing , First Edition, 2003.
3. Elliotte Rusty Harold, *XML 1.1 Bible*, Wesley Publications, Third Edition, 2004.

E-Resources:

1. https://nptel.ac.in/courses/106/104/106104220/#
2. https://nptel.ac.in/courses/110/105/110105033/

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	9	3	3	9	**39**
CO2	9	3	3	9	1	1	9	**35**
CO3	3	3	3	9	1	1	9	**29**
CO4	9	1	3	9	1	1	9	**33**
CO5	9	3	1	9	1	3	9	**35**
Total	**39**	**13**	**13**	**45**	**7**	**9**	**45**	**171**

Low-1 Medium-3 High-9

Core XI – Data Mining and Warehousing

(For students admitted from 2022-23)

Semester: III **Hours/week: 6 (T: 4 P: 2)**

Subject Code: HMITC33 **Credit: 5**

Course Objectives:

1. To Understand and implement classical models and algorithms in data warehouses and data mining

2. To understand data mining techniques in various applications like social, scientific and environmental context and develop skill in selecting the appropriate data mining algorithm for solving practical problems

Unit I **(12 hours)**

Data Mining: Data Mining-Kinds of Data-Kind of Patterns can be mined-Technologies used- Kinds of Application Targeted-Major Issues in Data Mining

Data Preprocessing: Data Cleaning-Data Integration -Data Reduction – Data Transformation and Data Discretization.

Unit II **(12 hours)**

Data Warehouse and OLAP Technology for Data Mining: Data Warehouse: Basic Concepts-A Multidimensional Data Modeling:Data Cube and OLAP Data Warehouse Implementation. **Data Cube Technology:** Data Cube Computation: Preliminary Concepts-Data Cube Computation Methods-Mining Frequent Patterns-**Associations and Correlations:**Basic Concepts-Frequent Itemset Mining Methods-Advanced Pattern Mining-Pattern Mining Multilevel, Multidimensional SpaceVarious Kinds of Association Rules-From Association Mining to Correlation Analysis.

Unit III **(12 hours)**

Classification and Prediction: Issues Regarding Classification and Prediction-Classification by Decision Tree Induction-Bayesian Classification-Classification by Backpropagation–Support Vector Machines-Associative Classification: Classification by Association Rule Analysis-Other Classification Methods-Prediction- Accuracy and Error Measures.

Unit IV **(12 hours)**

Cluster Analysis: Basic Concepts, Methods and Advanced Cluster Analysis: Cluster Analysis-Types of data in Cluster Analysis-A Categorization of Major Clustering Methods-Partitioning Methods-Hierarchical Methods-Density based Methods-Grid based Methods-**Evaluation of Clustering-** Methods-Clustering high dimensional data-Clustering Graph and Network Data-Clustering with Constraints.

Unit V **(12 hours)**

Outlier Detection: Outlier and Outlier analysis-Outlier Detection Methods-Statistical Approaches-Proximity Based Approaches-Outlier Detection in high-Dimensional Data-**Data Mining Trends and Research Frontiers:** Mining Complex Data Types-Other Methodologies of Data Mining-Data Mining Applications-Data Mining Applications.

Course Outcomes:

After Successful completion of the course, student will be able to

CO1: Explore the Basic Concepts of Data Mining

CO2: Analyze the Classification algorithm and Error Prediction

CO3: Improve the knowledge about Types of Classification Methods in Data Mining

CO4: Determine the types of Data clustering methods and types of Data Mining

CO5: Evaluate Data Mining Application with Latest Trends

Text Book:

1. Jiawei Han, Micheline Kamber, *Data Mining: Concept and Technique***,** Morgan Kaufmann Publishers, Third Edition, 2013.

Reference Books:

1. Pieter Adriaans, Dolf Zantinge, *Data Mining*, Pearson Education, Ninth Indian Reprint, 2003.
2. Anand Rajaraman and Jeffrey David Ullman, *Mining of Massive Datasets*, Cambridge University Press, 2012.
3. Pete Warden, *Big Data Glossary***,** O'Reilly, 2011.

Journals:

1. ACM SIGKDD International Conference on Knowledge Discovery & Data Mining
2. ACM International Conference on Web Search and Data Mining

E-Resources:

1. https://www.javatpoint.com/data-mining-cluster-vs-data-warehousing
2. https://onlinecourses.nptel.ac.in/noc21_cs06/preview

Data Mining and Warehousing (Lab)

Hours/week: 2

List of Programs:

1. Implementation of measures of proximity
2. Demonstration of pre-processing on dataset student.arff
3. Demonstration of pre-processing on dataset labor.arff
4. Demonstration of Association rule process on dataset contact lenses.arff using apriori algorithm
5. Develop Association rule process on dataset test.arff using apriori algorithm
6. Implement classification rule process on dataset student.arff using j48 Algorithm
7. Implement classification rule process on dataset empl.arff using Decision Trees classifier
8. Implement classification rule process on dataset student.arff using Naïve Bayesian modelling.
9. Demonstration of clustering rule process on dataset iris.arff using simple k-means algorithm
10. Demonstration of clustering rule process on dataset student.arff using simple k means algorithm

Note: - Questions for the internal examination will be based on the concepts learnt

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	3	9	1	1	**27**
CO2	9	3	3	9	3	9	3	**39**
CO3	9	3	9	3	3	1	1	**29**
CO4	9	1	9	9	9	1	3	**41**
CO5	9	3	9	9	1	9	9	**49**

Total	45	11	33	33	25	21	17	185

Low-1 Medium-3 High-9

Core XII - Software Development Framework Lab

(For Students Admitted from 2022-23)

Semester: III **Hours/week: 6**
Subject Code: HMITC34P **Credit: 5**

Course Objectives:

1. To know about .Net IDE Component Framework
2. To know Programming concepts in .Net Framework and create website using ASP.Net Controls

List of Programs

Console Application

1. Calculate the area of a floor given its length and width
2. Calculate the factorial of a number N, assuming the number is more than zero
3. Check the given numbers (prime, perfect, Armstrong etc.)
4. Generate the numbers (prime, perfect, Armstrong etc.)
5. Calculate age for a person using properties
6. Sort a given list of numbers and find out the average of a list of numbers.
7. Display how many days are in a given month(check for leap years also)
8. Demonstrate Events, Delegates, and Interfaces

Windows Application

9. Build a simple calculator
10. Calculate the arithmetic operations using functions
11. Do String manipulation
12. Write a function that will return a approximate count of the number of words in a string
13. Create notepad
14. Create a greeting card generator

Web Application

15. Design an E-mail application form using standard controls and store these details in SQL tables
16. Create a login page and personal webpage. Enter the username and password in the login page. If the username and password are correct, the personal web page should be loaded otherwise the error page should be loaded
17. Create a student details form and validate the details using validation controls
18. Display employee details using data grid control
19. Display an Electricity bill using data list control
20. Display employee details using repeater control

Note: - Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Build console applications

CO2: Perform Windows and web Applications
CO3: Demonstrate validation controls in web form
CO4: Illustrate Data Grid control to database in Web application
CO5: Compose Data Repeater and Datalist Controls

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	9	3	3	9	**39**
CO2	9	3	3	9	1	1	9	**35**
CO3	3	3	3	9	1	1	9	**29**
CO4	9	1	3	9	1	1	9	**33**
CO5	9	3	1	9	1	3	9	**35**
Total	**39**	**13**	**13**	**45**	**7**	**9**	**45**	**171**

Low-1 Medium-3 High-9

DSE III - b) Compiler Design

(For Students Admitted from 2022-23)

Semester: III **Hours/week: 6**
Subject Code: HMITE3B **Credit: 5**

Course Objectives:

1. To understand the basic principles of compiler design.
2. To acquire the knowledge of various constituent parts, algorithms and data structures required to be used in the compiler

Unit I **(18 hours)**

Introduction – The structure of a compiler –Evolution of programming languages-Applications of compiler technology-**A Simple Syntax Directed Translator**: Syntax definition-syntax-directed translation.

Unit II **(18 hours)**

Parsing-Lexical Analysis-Symbol Tables-**Lexical Analysis**: The role of the lexical analyser-Input Buffering- Specification of Tokens-Recognition of tokens-The lexical analyser generator Lex-Finite Automata.

Unit III **(18 hours)**

Design of lexical analyser generator: DFA for lexical analyser - Important states of an NFA - Converting a regular expression directly to a DFA-Minimizing the number of states of a DFA-**Syntax Analysis:** Syntax error handling-error recovery strategies-Context free grammars-**Top down parsing**: FIRST and FOLLOW –LL(1) Grammars-Bottom Up Parsing.

Unit IV **(18 hours)**

LR Parsing, More Powerful LR Parsers-Using Ambiguous Grammars-Parser Generators-Syntax-**Directed Translation**: Evaluation orders for SDD's –application of SDT-Syntax Directed Translation Schemes- **Intermediate Code Generation**: Variants of Syntax Trees-Three address code.

Unit V **(18 hours)**

Run time environment: Heap Management- **Code Generation**: The target language-Address in the Target Code-A Simple code generator-Peephole Optimization-Optimal Code generation for Expression-Dynamic Programming code-Generation-**Machine-Independent Optimization:** Semantics preserving Transformations-Copy Propagation-Dead –Code Elimination-Code Motion.

Course Outcome:

After successful completion of this course, student will be able to

CO1: Define common forms of parsers

CO2: Illustrate compiler construction tools and describes the Functionality of each stage of compilation process

CO3: Construct Grammars for Natural Languages and find the Syntactical errors/Semantic errors during the compilations using parsing techniques

CO4: Analyze different representations of intermediate code

CO5: Design to construct new compiler for new languages

Text Book:

1. Alfred V Aho, Monica S Lam, Ravi Sethi, Jeffrey D Ullman, *Compiler Principles, Techniques & Tools*, Pearson Addison Wesley, Second Edition, 2007.

Reference Books:

1. Alfred V. Aho, Jeffrey D. Ullman, *Principles of Compiler Design*, Pearson Education, 2001.
2. Kenneth C. Louden, *Compiler Construction– Principles and Practice*, PWS Publishing, First Edition, 1997.
3. K.L.P Mishra, N. Chandrashekaran , *Theory of Computer Science- Automata Languages and Computation*, Prentice Hall of India, Second Edition, 2003.
4. Andrew W. Appel, *Modern Compiler Implementation C*, Cambridge University Press, 2004.

E- Resources:

1. https://www.geeksforgeeks.org/compiler-design-tutorials/
2. https://nptel.ac.in/courses/106/108/106108113/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	9	9	9	9	**57**
CO2	9	3	3	3	3	3	3	**27**
CO3	9	9	3	3	3	9	3	**39**
CO4	9	3	3	3	3	9	3	**33**
CO5	3	3	3	3	3	3	3	**21**
Total	**39**	**27**	**15**	**21**	**21**	**33**	**21**	**177**

Low-1 Medium-3 High-9

Core XIII – Cloud and Distributed Computing

(For Students Admitted from 2022-23)

Semester: IV **Hours/Week: 6**
Subject code: HMITC41 **Credit: 5**

Course Objectives:

1. To impart the complete understanding of cloud, virtualization and distributed clouds
2. To enhance the students to understand the significance of cloud storage, identity and access management

Unit I **(18 hours)**

Introduction to Cloud, Virtualization, and Virtual Machine: Introduction to Cloud Computing - Features of Today's Cloud - Introduction to Virtualization - Mitigation Techniques for VM Migration

Network Virtualization and Geo-Distributed Clouds: Introduction - Cloud Computing and Server Virtualization - Networking of Virtual Machines Inside the Hypervisor – Docker - Software-Defined Network - Network Virtualization in Multi-Tenant Data Centers: VL2 - Network Virtualization in Multi-Tenant Data Centers: NVP - Geo-Distributed Cloud Data Centers.

Unit II **(18 hours)**

Leader Election in Cloud, Distributed Systems, and Industry Systems: Introduction - Leader Election in Rings (Classical Distributed Algorithms) - Ring Leader Election and Bully Leader Election Algorithms - Classical Algorithm: Ring Election Algorithm - Classical Algorithm: Bully Election - Industry Systems: Google Chubby and Apache ZooKeeper - Design of ZooKeeper

Cloud-Native Computing: Introduction – Micro services – Docker – Kubernetes - Introduction to Edge Computing - Classification of Edge Computing.

Unit III **(18 hours)**

Cloud Asset Management and Protection: Differences from Traditional IT - Types of Cloud Assets - Compute Assets - Storage Assets - Network Assets - Asset Management Pipeline - Procurement Leaks - Processing Leaks - Tooling Leaks - Findings Leaks - Tagging Cloud Assets

Software-Defined Networking and Network Function Virtualization: Introduction - Software-Defined Networking - Applications and Use Cases - Software-Defined NFV - Network Slicing - Ongoing Research Opportunities.

Unit IV **(18 hours)**

Cloud Storage: Key-Value Stores/NoSQL Stores and HBase: Design of Key-Value Stores - Design of HBase-**Identity and Access Management:** Differences from Traditional IT - Life Cycle for Identity and Access-Request -Approve - Create, Delete, Grant, or Revoke - Authentication - Cloud IAM Identities-Business-to-Consumer and Business -to-Employee-Multi-Factor Authentication - Passwords and API Keys - Shared IDs - Federated Identity - Single Sign-On -Instance Metadata and Identity Documents-Secrets Management-Authorization- Centralized Authorization - Roles - Revalidate - Putting It All Together in the Sample Application.

Unit V **(18 hours)**

Classical Distributed Algorithms and the Industry Systems: Introduction - Time and Clock Synchronization in Cloud Data Center - Key Challenges - Clock Synchronization - Algorithms for Recording Global State and Snapshot - Mutual Exclusion Algorithms for Distributed Systems-**Cloud Applications:** MapReduce, Spark, and Apache Kafka - MapReduce -Spark- Kafka.

Course Outcomes:

After successful completion of the course, the students will be able to

CO1: Identify the features of Cloud Computing and Virtualization

CO2: Demonstrate the leader election and cloud native computing

CO3: Classify types of cloud assets, software-defined networking and network function virtualization

CO4: Justify cloud storage, Identity and Access Management

CO5: Generate the Classical Distributed Algorithms, the Industry Systems and Cloud applications

Text Books:

1. Rajiv Misra, Yashwant Singh Patel, *Cloud and Distributed Computing: Algorithms and Systems*, Wiley Emerging Technology Series, Wiley India Private Limited, 2020.
2. Chris Dotson, *Practical Cloud Security: A Guide for Secure Design and Deployment*, O'Reilly Media, First Edition, 2019.

Reference Books:

1. Rajkumar Buyya, Christian Vecchiola, Thamarai Selvi, *Mastering Cloud Computing,* Tata McGraw Hill, 2017.
2. Rajkumar Buyya, James Broberg, Andrzej Goscinski, *Cloud Computing Principles and Paradigms***,** John Wiley & Sons Limited ,2011.
3. Toby Velte, Anthony Velte, Robert Elsenpeter, *Cloud Computing-A Practical Approach*, Tata McGraw Hill, 2010.

E - Resources:

1. https://nptel.ac.in/courses/106/104/106104182/
2. https://www.amazon.in/Cloud-Distributed-Computing-Algorithms-Systems/dp/8126520272?asin=B086V7Q2KW&revisionId=&format=4&depth=1

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	9	3	1	9	**35**
CO2	9	1	9	9	3	1	33	**35**
CO3	9	3	3	9	3	1	9	**37**
CO4	3	9	9	9	9	3	9	**51**
CO5	3	9	9	9	9	3	9	**51**
Total	**33**	**23**	**33**	**45**	**27**	**9**	**39**	**209**

Low-1 Medium-3 High-9

Core XIV – Machine Learning

(For Students Admitted from 2022-23)

Semester: IV **Hours/week: 6**
Subject Code: HMITC42 **Credit: 5**

Course Objectives:

1. To know the characteristics of machine learning and machine learning algorithms
2. To understand the concept behind neural networks for learning non-linear functions

Unit I **(18 hours)**

Introduction: Well-Posed Learning Problems-Designing a Learning System-Perspectives and Issues in Machine Learning. Concept Learning: Introduction-A Concept Learning Task-Concept Learning as Search.

Decision Tree Learning: Introduction-Decision Tree Representation-Appropriate Problems-Basic Decision Tree Learning Algorithm-Hypothesis Space Search-Inductive Bias-Issues.

Unit II **(18 hours)**

Artificial Neural Networks: Introduction-Neural Network Representations-Appropriate Problems- Perceptrons - Multilayer Networks and the Back Propagation Algorithm-An **Illustrative Example:** Face Recognition-Advanced Topics.

Unit III **(18 hours)**

Bayesian Learning: Introduction-Bayes Theorem-- Bayes Theorem and Concept Learning – Maximum Likelihood and Least-squared Error Hypotheses- Maximum Likelihood Hypothesis for Predicting Probabilities-Minimum Description Length Principle-Bayes Optimal Classifier-Gibbs Algorithm-Naïve Bayes Classifier-An Example: Learning to Classify Text-Bayesian Belief Networks-The EM Algorithm.

Unit IV **(18 hours)**

Instance-Based Learning: Introduction-K-Nearest Neighbor Learning-Locally Weighted Regression-Radial Basis Functions-Case-based Reasoning

Genetic Algorithms: Genetic Algorithms-An Illustrative Example-Hypothesis Space Search-Genetic programming-Models of Evolution and Learning-Parallelizing Genetic Algorithms.

Unit V **(18 hours)**

Learning Sets of Rules: Introduction-Sequential Covering Algorithms-Learning Rule Sets: Summary- Learning First-Order Rules-Learning Sets of First-Order Rules: FOIL - Induction as Inverted Deduction-Inverting Resolution

Reinforcement Learning: Introduction- Learning Task-Q Learning-Nondeterministic Rewards and Actions-Temporal Difference Learning-Generalizing from Examples-Relationship to Dynamic Programming.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand the need for machine learning for various problem solving

CO2: Demonstrate Decision Tree Learning Algorithm, Back propagation algorithm, Gibbs Algorithm, K-Nearest Neighbor Learning and Temporal Difference Learning with examples
CO3: Categorize the various supervised, semi-supervised and unsupervised learning algorithms in machine learning
CO4: Apply different classification techniques in real time examples
CO5: Design appropriate machine learning algorithms for different problems

Text Book:
1. Tom M. Mitchell, Machine Learning, Tata McGraw Hill, 2017.

Reference Books:
1. Jeremy Watt, Reza Borhani, Aggelos K Katsaggelos, *Machine Learning Refined Foundations, Algorithms,& Applications*, Cambridge University Press, 2016.
2. Ethem Alpaydin, *Introduction to Machine Learning*, MIT Press Cambridge, 2010.
3. Andreas C. Muller, Sarah Guido, *Introduction to Machine Learning with Python*, O'Reilly Media, First Edition, 2016.

E-Resources:
1. NPTEL: https://nptel.ac.in/courses/106/106/106106139/
2. NPTEL: https://onlinecourses.nptel.ac.in/noc22_cs58/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	1	9	9	**43**
CO2	9	1	9	3	1	9	9	**41**
CO3	9	1	9	3	1	9	9	**41**
CO4	9	1	9	3	1	9	9	**41**
CO5	9	3	9	3	1	9	9	**43**
Total	**45**	**9**	**45**	**15**	**5**	**45**	**45**	**209**

Low-1 Medium-3 High-9

Core XV - Project

(For Students Admitted from 2022-23)

Semester: IV **Hours/Week: 18**
Subject Code: HMITC43PW **Credits: 5**

Course Objectives:
1. To understand the fundamental principles of Project management and be familiar with the different methods and techniques used for project development
2. To get good knowledge of the issues and challenges faced while doing the project and to do the Project Scheduling, tracking, Risk analysis, Quality management and Project Cost estimation using different techniques

Students have to undergo an individual project work either on campus or in an industry and appear for the viva voce examination with the software developed and document prepared by them

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Identify goals, constraints, deliverables, performance criteria and resource requirements in consultation with stakeholders

CO2: Implement the plan by executing the code

CO3: Integrate the various aspects of software development for the total project

CO4: Construct the entire software project according to the specific problem

CO5: Check the software project by executing with the various data

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	9	9	3	9	**57**
CO2	9	3	9	3	9	9	9	**51**
CO3	9	3	9	9	9	9	9	**57**
CO4	9	3	9	9	9	9	9	**57**
CO5	9	9	9	9	9	9	9	**45**
Total	**45**	**27**	**45**	**39**	**45**	**39**	**45**	**285**

Low-1 Medium-3 High-9

Extra Credit IV – Document Preparation Lab (LATEX)

(For Students Admitted from 2022-23)

Semester: IV

Subject Code: HMITX4P **Credit: 2**

Course Objectives:

1. To get practical knowledge on preparing documents containing mathematical formulas
2. To prepare a technical and scientific documentation

List of Programs

1. Create a document using an input file
2. Create a document using special symbols, dashes, line breaks & footnotes
3. Create a document using the sectioning command
4. Create a document using quotations, typestyle, commands & environments
5. Create a document using the mathematical symbol
6. Create a document using arrays and table
7. Create a document using a bibliography
8. Create a document using clauses and page style
9. Create a document using pictures and colors
10. Create a document using basics of the math index
11. Create a document using fine print and bibliography database

12. Create a document using math mode, tabbing environment, and files

Note: - Questions for the External examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Identify bibliography database
CO2: Relate math mode, and fine print
CO3: Apply mathematical symbol to create the document
CO4: Select clauses, typestyle, commands, and page style
CO5: Create latex documents

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	3	3	3	3	**25**
CO2	9	1	1	3	3	3	3	**23**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	1	9	3	9	9	9	**49**
CO5	9	3	9	3	9	9	9	**51**
Total	**45**	**9**	**25**	**15**	**33**	**33**	**33**	**193**

Low-1 Medium-3 High-9

M Sc Computer Science
(Two Years Regular Programme)
(For Students Admitted from 2022-23)

Program Specific Outcomes (PSO):
On Completion of this programme, the student will be able to gain

PSO1: Enrich the knowledge in the areas like Artificial Intelligence, Cloud Computing, Software Project Management, Machine Learning and core computing subjects
PSO2: Apply programming and technical skills to solve real life complex problems and hence enhance employability
PSO3: Design solutions for complex problems and design processes that meet the specific needs of the society
PSO4: Apply the knowledge of latest trends to carryout research & development in modern computing environment
PSO5: Ability to apply learned skills to build optimized solution to latest technologies
PSO6: Function effectively as a team member or a leader to accomplish a common goal in a multidisciplinary team
PSO7: Engage in life-long learning, to remain up-to-date in their profession and obtain additional qualifications to enhance their career positions in IT industries

PROGRAMME STRUCTURE - PROGRAMME CODE: PCS

Sem	Subject Code	Course	Subject Title	Hours / week	Credit	CIA	ESE	Total Marks
I	IMCSC11	Core I	○Advanced Java	6	5	40	60	100
	IMCSC12	Core II	Internet of Things	6	5	40	60	100
	IMCSC13	Core III	Compiler Design	6	5	40	60	100
	IMCSC14P	Core IV	Advanced Java Lab	6	5	40	60	100
	IMCSE1A/ IMCSE1B	DSE I	a. Open Source Technologies b. Optimization Techniques	6 (T-4 P-2)	5	40 (T-20 P-20)	60	100
	IMCSX1P/ IMCSX1O	Extra Credit I	RDBMS Lab / * Online Course	-	2	-	100	100

			Total	**30**	**25+2**	**200**	**300 + 100**	**500+ 100**
II	IMCSC21	Core V	Big Data Analytics	6	5	40	60	100
	IMCSC22	Core VI	Data Structures and Algorithms using Python	6	5	40	60	100
	IMCSC23	Core VII	Cloud and Distributed Computing	6	5	40	60	100
	IMCSC24P	Core VIII	Data Structures and Algorithms using Python Lab	6	5	40	60	100
	IMCSE2A/ IMCSE2B	DSE II	a. Artificial Intelligence b. Mobile Computing	6	5	40	60	100
	IMCSX2P/ IMCSX2O	Extra Credit II	#Internship / *Online Course	-	2	-	100	100
			Total	**30**	**25+2**	**200**	**300 + 100**	**500+ 100**
III	IMCSC31	Core IX	Software Project Management	6	5	40	60	100
	IMCSC32	Core X	Digital Image Processing	6	5	40	60	100
	IMCSC33	Core XI	Web Technology	6 (T-4 P-2)	5	40 (T-20 P-20)	60	100
	IMCSC34P	Core XII	Image Processing Lab	6	5	40	60	100
	IMCSE3A/ IMCSE3B	DSE III	a. Theory of Computation b. Data Mining and Warehousing	6	5	40	60	100

	IMCSX3/ IMCSX3O	Extra Credit III	Employability Skills / * Online Course	-	2	100	-	100
			Total	**30**	**25+2**	**200 +100**	**300**	**500+ 100**
IV	IMCSC41	Core XIII	Cryptography and Network Security	6	5	40	60	100
	IMCSC42	Core XIV	○ Machine Learning	6	5	40	60	100
	IMCSC43PW	Core XV	Project	18	5	100	100	200
	IMCSX4P/ IMCSX4O	Extra Credit IV	Document Preparation Lab (LATEX) / *Online Course	-	2	-	100	100
			Total	**30**	**15+2**	**180**	**220 + 100**	**400+ 100**
			Grand Total	**120**	**90+8**	**780+ 100**	**1120+ 300**	**1900+ 400**

*****For Online Course credit alone will be assigned on submission of certificate obtained by appearing for online examination from EdX, Spoken Tutorial, NPTEL or Coursera etc.
#For internship course, refer www.internshala.com

- For online course integration, syllabus will be taken from spoken tutorial.

DSE - Discipline Specific Elective

Core I - Advanced Java

(For Students Admitted from 2022-23)

Semester: I **Hours/ Week: 6**
Subject code: IMCSC11 **Credit: 5**

Course Objectives:

1. To learn networking and remote method invocation using Java API and Java Bean to increase the ability of students in web application development
2. To develop programming knowledge to create dynamic web applications using server side technology with Java database connectivity

Unit I **(18 hours)**

JSP- JEEE- JSF- J2ME- Struts. **Networking with Java:** Basics of Networking - Sockets in Java - Client-Server in Networking - Proxy Servers - Internet Addressing - Domain Naming Service(DNS) - Inet4 Addresses and Inet6 Addresses - The URL Class - The URI Class - TCP/IP and Datagram - Java Net APIs – InetAddresses - InetAddress Caching - Creating and Using Sockets - Creating TCP Clients and Servers - A Whois Example - Submitting an HTML Form from Java - Handling URL- Using URLConnection Objects - Working With Datagrams - Datagram Server and Client

Swing: The Java Foundation Classes - Swing- Heavyweight versus Lightweight Components- Swing Features- Graphics Programming Using Panes- Model View Controller Architecture- Working With Swing- Preparing to Create a Swing Applet- Understanding Root Panes, Layered Pane and Content Panes- Creating a Swing Applet and Application – Closing JFrame Windows.

Unit II **(18 hours)**

Understanding RMI: Remote Method Invocation (RMI) - Client/Server Architecture- Implementing RMI - Limitation of RMI, A Model RMI Transaction -Writing an RMI Server- Designing a Remote Interface- Implementing a Remote Interface- Passing Object in RMI- Implementing the Server's Main Method- Creating a Client Program- Compiling and Running the Example – Exporting with Unicast Remote Object

Working with Java Beans: What is Java Bean - Understanding Java Beans - Designing programs Using Java Beans - Creating Applets that Use Java Beans - Creating a Java Bean - Creating a Bean Manifest File and JAR File - Using a New Bean - Adding Controls to Beans - Giving a Bean Properties- Design Patterns for Properties- Simple Properties - Design Patterns for Events - Methods and Design Patterns - Giving a Bean Methods - Giving a Bean an Icon - The JavaBeans API.

Unit III **(18 hours)**

Talking to Database: JDBC- JDBC versus ODBC and Other APIs - Two- Tier and Three - Tier Models - Introducing SQL - The JDBC Package - Types of JDBC Drivers - Javasoft Framework-Driver Interface and Driver Manager Class - The Essential JDBC Program- Using a Prepared Statement Object- The Interactive SQL Tool- Using Tables- Defining a Table Model

JDBC in Action: Data Types and JDBC – Scrollable Result Sets - Batch Updates - Mapping Relational Data into Java Objects - Basic JDBC Types - Advanced JDBC data types.

Unit IV **(18 hours)**

Servlets: Architecture – Life cycle – First program – Client HTTP request – Server HTTP response – HTTP status code – Writing filters – Exception handling – Cookies handling – Session tracking – Database access – File uploading – Handling date – Servlets-page redirection – Sample program – Servlets-packaging.

Unit V **(18 hours)**

Java Server Pages: An Overview – Advantages of JSP – Architecture – JSP life cycle – JSP comments – JSP syntax – Implicit objects – Control-flow statements – Client-Server JSP – Database access – Custom tags – Exception handling – JSP standard tag library.

Course Outcomes:

After successful completion of the course, the students will be able to

CO1: Explain the concepts of JSP, JEEE, JSF, J2ME, Struts, Swing, RMI, Java Bean and Servlet
CO2: Utilize the technique of swing and RMI to create various fields and invoke client/ server communication
CO3: Examine an implementation of networking with Java, RMI and Java Bean
CO4: Evaluate different types of JDBC drivers and connectivity
CO5: Design the web application using swing, servlet, JSP and database

Text Books:
1. DT Editorial Services, *Java 8 Programming Black Book*, Dreamtech Press, 2015.
2. B Prasanalakshmi *Advanced Java Programming*, CBS Publishers & Distributors d, 2015.

Reference Books:
1. Steven Holzner et al, *Java 2(JDK 5 Edition) Programming Black Book*, Dreamtech press, 2006.
2. Herbert Schildt, *Java: The Complete Reference*, Eleventh Edition, McGraw Hill, 2020.
3. James Gosling, David Holmes, Ken Arnold, *The Java Programming Language*, Addison-Wesley Professional, Fourth Edition, 2005.

E - Resources:
1. Advanced Java, https://www.youtube.com/watch?v=Ae-r8hsbPUo
2. Java Programming, https://www.learnvern.com/course/advanced-java-tutorial

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	3	3	9	**29**
CO2	9	3	1	1	3	3	9	**29**
CO3	9	3	1	1	3	3	9	**29**
CO4	9	3	3	3	3	3	9	**33**
CO5	9	3	3	3	3	3	9	**33**
Total	**45**	**15**	**9**	**9**	**15**	**15**	**45**	**153**

Low-1 Medium-3 High-9

Core II – Internet of Things

(For Students Admitted from 2022-23)

Semester: I **Hours/week: 6**
Subject Code: IMCSC12 **Credit: 5**

Course Objectives:
1. To understand the application areas of IoT, building blocks of Internet of Things and characteristics
2. To realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks

Unit I **(18 hours)**

Introduction to IoT: Introduction to IoT- Enabling technologies of IoT - AI and Machine Learning - Physical and logical design of IoT - IoT Reference Architecture - IoT Functional Architecture - IoT levels and deployment templates – Application domains of IoT: Home

automation – Cities – Environment – Energy – Industry – Agriculture – Transportation - Health care & Lifestyle.

Unit II **(18 hours)**

IoT and M2M: Introduction to M2M – Difference between IoT and M2M- SDN and NFV for IoT- IoT System Management with NETCONF-YANG- Need for IoT Systems Management-SNMP- Network Operator Requirements-NETCONF- YANG- IoT Systems Management with NETCONF- YANG.

Unit III **(18 hours)**

IOT Platforms Design Methodology: Step 1 to Step 10- Case Study on IoT System for Weather Monitoring- Motivation for Using Python- IoT Systems Logical Design using Python- Introduction-Installing Python- Python Data Types and Data Structures-Control Flow-Functions-Modules- Packages-File Handling-Date/Time Operations- Classes- Python Packages of Internet for IoT.

Unit IV **(18 hours)**

IoT Physical Devices and Endpoints: What is an IoT Device- Exemplary Device: Raspberry Pi- About the board-Linux and Raspberry Pi- Raspberry Pi Interfaces- Programming Raspberry Pi with Python- Other IoT Devices.

Unit V **(18 hours)**

IoT Physical Servers and Cloud Offerings: Introduction to Cloud Storage Models and Communication API – WAMP-AutoBahn for IoT-Xively Cloud for IoT-Python Web Application Framework-Django-Designing a RESTful Web API-Amazon Web Services for IoT-Case Studies Illustrating IoT Design- Home Automation-Cities-Environment-Agriculture-Productivity Applications.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Recall the importance of smart objects and smart environment

CO2: Define IoT and M2M

CO3: Create IoT platforms using design methodology

CO4: Perform WiFi data communications, remote data storage in cloud and handle the data using web applications

CO5: Develop potential problems and solutions using IoT

Text Book:

1. Arshdeep Bahga, Vijay Madisetti, *Internet of Things: A Hands-On Approach*, Universities Press, 2015.

Reference Books:

1. Charles Platt, *Make Electronics – Learning by Discovery*, O'Reilly Media, 2015.
2. Michael Miller, *The Internet of Things*, Pearson Education, 2015.

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105166/
2. https://www.classcentral.com/course/swayam-introduction-to-internet-of-things-10093

Course Outcomes	Program Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	1	3	9	9	**35**
CO2	9	3	3	1	3	9	9	**37**
CO3	9	3	3	1	3	9	9	**37**
CO4	9	3	3	1	3	9	9	**37**
CO5	9	9	9	1	9	9	9	**55**
Total	**45**	**19**	**21**	**5**	**21**	**45**	**45**	**201**

Low-1 Medium-3 High-9

Core III- Compiler Design

(For Students Admitted from 2022-23)

Semester: I **Hours/ Week: 6**
Subject code: IMCSC13 **Credit: 5**

Course Objectives:

1. To provide an understanding of the fundamental principles in compiler design
2. To learn the process of translating a modern high-level language to executable code required for compiler construction

Unit I **(18 hours)**

Introduction: The structure of a compiler –Evolution of programming languages-Applications of compiler technology-A Simple Syntax Directed Translator: Syntax definition-syntax-directed translation.

Unit II **(18 hours)**

Parsing: Lexical Analysis-Symbol Tables-Lexical Analysis: The role of the lexical analyser-Input Buffering- Specification of Tokens-Recognition of tokens-The lexical analyser generator Lex-Finite Automata.

Unit III **(18 hours)**

Design of lexical analyser generator: DFA for lexical analyser - Important states of an NFA, Converting a regular expression directly to a DFA-Minimizing the number of states of a DFA-**Syntax Analysis:** Syntax error handling-error recovery strategies-Context free grammars-Top down parsing: FIRST and FOLLOW –LL(1) Grammars-Bottom Up Parsing.

Unit IV **(18 hours)**

LR Parsing: More Powerful LR Parsers-Using Ambiguous Grammars-Parser Generators-Syntax-Directed Translation: Evaluation orders for SDD's – application of SDT-Syntax Directed Translation Schemes- Intermediate Code Generation: Variants of Syntax Trees-Three address code.

Unit V **(18 hours)**

Run time environment: Heap Management- Code Generation: The target language-Address in the Target Code-A Simple code generator-Peephole Optimization-Optimal Code generation for Expression-Dynamic Programming code-Generation-Machine-Independent Optimization: Semantics preserving Transformations-Copy Propagation-Dead –Code Elimination-Code Motion.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Define common forms of parsers

CO2: Illustrate compiler construction tools and describes the Functionality of each stage of compilation process

CO3: Construct Grammars for Natural Languages and find the Syntactical errors/Semantic errors during the compilations using parsing techniques

CO4: Analyze different representations of intermediate code

CO5: Design to construct new compiler for new languages

Text Book:

1. Alfred V Aho, Monica S Lam, Ravi Sethi, Jeffrey D Ullman, *Compiler Principles, Techniques & Tools*, Pearson Addison Wesley, Second Edition, 2007.

Reference Books:

1. Alfred V. Aho, Jeffrey D. Ullman, *Principles of compiler design*, Pearson Education, Indian student Edition, 2001.
2. Kenneth C. Louden, *Compiler Construction– Principles and Practice*, PWS Publishing, First edition, 1997.
3. K. L. P Mishra, N. Chandrashekaran, *Theory of computer science- Automata Languages and Computation*, Prentice Hall of India, Second edition, 2003.
4. Andrew W. Appel, *Modern Compiler Implementation C*, Cambridge University Press, 2004.

E- Resources:

1. https://www.geeksforgeeks.org/compiler-design-tutorials/
2. https://nptel.ac.in/courses/106/108/106108113/

Course Outcomes	Program Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	1	9	9	9	**55**
CO2	9	9	9	1	9	9	9	**55**
CO3	9	9	9	1	9	9	9	**55**
CO4	9	9	9	1	9	9	9	**55**
CO5	9	9	9	1	9	9	9	**55**
Total	**45**	**45**	**45**	**5**	**45**	**45**	**45**	**275**

Low-1 Medium-3 High-9

Core IV -Advanced Java Lab

(For Students Admitted from 2022-23)

Semester: I **Hours/week: 6**
Subject Code: IMCSC14P **Credit: 5**

Course Objectives:

1. To apply the concept of RMI to invoke Client/Server Communication and AWT, Swing to design and develop GUI applications
2. To build dynamic web applications using JSP, Servlet and Java Data Base Connectivity (JDBC)

LIST OF PROGRAMS

NETWORKING

1.Do one and two way communication(s)
2.Implement TCP Socket

SWING

3. Display current date & time in different format
4. Set a foreground and background color for label
5. Create simple calculator

BEAN

6. Create button
7. Create text box which accepts only characters
8. Create text box which accepts only integer value

JDBC

9. Prepare a student's details with Roll-No, Name, Mark1, Mark2, Mark3, Total, Average and Grade to perform insert, update, delete and display of student information
10. Prepare an Electricity Bill to perform insert, update, delete and display Electricity bill of a particular user

RMI

11. Display a string message
12. Perform arithmetic operations
13. Find factorial
14. Generate Fibonacci series

SERVLET

15. Create a Servlet to display Simple Message
16. Create a Servlet that uses cookies to store the number of times a user has visited the servlet
17. Create a Servlet to generate Random Numbers
18. Create a Servlet that prints Today's date
19. Create Servlet for login page, if the username and password is correct then prints message "Hello username" else "login failed"
20. Create Student Information System to view the details of the Students

JSP

21. Create a JSP that prints hello world
22. Create a JSP that prints current date and time
23. Create a JSP that add and subtract two numbers.
24. Design a JSP Program to implement verification of a particular user login and display a welcome page
25. Design and implement a JAVA JSP Program to get student information and display the same information through Servlet

Note: - Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Demonstrate the concepts such as client/ server, socket and RMI to implement Java code
CO2: Apply an event handling using swing components
CO3: Illustrate the concept of Java bean in Java program
CO4: Discover the database access through Java code using JDBC connectivity
CO5: Create dynamic web pages using Servlet and JSP

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	3	3	9	**29**
CO2	9	3	1	1	3	3	9	**29**
CO3	9	3	1	1	3	3	9	**29**
CO4	9	3	3	3	3	3	9	**33**
CO5	9	3	3	3	3	3	9	**33**
Total	**45**	**15**	**9**	**9**	**15**	**15**	**45**	**153**

Low-1 Medium-3 High-9

DSE I – a) Open Source Technologies

(For Students Admitted from 2022-23)

Semester: I **Hours/week: 6 (T:4 P:2)**
Subject Code: IMCSE1A **Credit: 5**

Course Objectives:

1. To expose students to free open source software environment and introduce them to use open source packages
2. To implement various applications using build systems and understand the installation of various packages in open source operating systems

Unit I **(12 hours)**

PHP- Introduction-What is PHP-Why use PHP and MYSQL-PHP strengths-Key features of PHP-**Using PHP**-Accessing PHP-Creating sample application- Embedding PHP in HML – Accessing form variables-Understanding identifiers- Examining Variable types- Using Operators-Making Decisions with conditionals-Repeating actions through iteration.

Unit II **(12 hours)**

Storing and Retrieving Data-Processing files-Opening a file-Writing to a file-Closing a file-Reading from a file-Using other file functions-**Using arrays**-What is an array-Numerically indexed arrays-Arrays with different indices-array operators-multidimensional array-sorting array-String manipulation and regular expressions.

Unit III **(12 hours)**

MYSQL- SQL-Inserting Data into the Database-Retrieving Data from the Database-Updating Records in the Database-Altering Tables after creation-Deleting Records from the Database-Dropping Tables-Dropping a Whole Database-Accessing your MYSQL database from the web with PHP-Querying a database from the web-putting new information in the database-Using other PHP database interfaces.

Unit IV **(12 hours)**

PYTHON-Introduction-Algebra with Variables-variables, complex quantities, common functions with numbers, logical operators, strings and printing. Simple programs-basic program structure, flowchart, conditional operations, iterative routines. Functions and Modules-Functions-Recursion, Nested functions, Nested scope, Modules-Built-in modules, maths module.

Unit V **(12 hours)**

Sequences and Operations with Sequences-String, tuple, list, dictionary, set, operators with sequences, iterator, iterator functions, input. Classes and Objects- classes, functions with attributes, overloading, inheritance, execution from command line.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Demonstrate install and run Linux operating system
CO2: Apply the MYSQL database concepts
CO3: Develop website and control using PHP and MYSQL
CO4: Explain Install open source web technologies MySQL and PHP
CO5: Illustrate the Python software making process

Text Books:

1. Luke Welling, Laura Thomson, *PHP and MYSQL Web Development*, Pearson Education, Fifth Edition, 2017.
2. T.R. Padmanabhan, Programming *with Python*, Springer Nature, 2016.

Reference Books:

1. James Lee and Brent Ware, *Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP*, Dorling Kindersley Private Limited, 2008.
2. Eric S. Raymond, Michael Tiemann, *Open Sources: Voices from the Open Source Revolution*, O'Reilly,1999.
3. Steve Holzner, *PHP: The Complete Reference*, Tata McGraw Hill, Second Edition, 2009.

E - Resources:

1. http://www.openresources.com/documents/open-resources/

2. http://www.alexsoft.com/

Open Source Technologies (Lab)

Hours/week: 2

Python:

Display Text

1. To display any given text message
2. To display Fibonacci series

Array

3. To count the number of vowel in the string

Function

4. To convert a date read from the user, given in DD/MM/YYYY format into written format. For example, Enter a date in DD/MM/YYYY Format: 16/7/2003 Output: 16 July, 2003
5. To print the contents of a file in uppercase using function

MySQL:

6. Create student database and display the data using Python
7. Create Employee database and display the employee salary data using Python

PHP:

8. To find Sum of digits of given number
9. To find factorial of a number
10. To display count, from 10 to 20 using loop
11. To check given number is prime number or not

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	1	3	9	3	9	**43**
CO2	9	9	3	9	3	9	9	**51**
CO3	9	9	9	3	9	3	3	**45**
CO4	9	1	3	9	3	9	1	**35**
CO5	3	9	3	9	9	3	3	**39**
Total	**39**	**37**	**19**	**33**	**33**	**27**	**25**	**213**

Low-1 Medium-3 High-9

DSE I - b) Optimization Techniques

(For Students Admitted from 2022-23)

Semester: I **Hours/week 6**

Subject Code: IMCSE1B **Credit: 5**

Course Objectives:

1. To impart knowledge in concepts and tools of Operations Research (OR)
2. To apply OR techniques constructively to make effective business decisions

Unit I **(18 hours)**

Basics of Operations Research: Development of OR – Definition-Characteristics-Scientific Method-Necessity of OR-Scope-OR and Decision-Making-Scope of OR in Management, Financial management-Applications of various OR Techniques-Objectives –Phases-Models-Classification Schemes of Models-Role of Computers in OR – Difficulties in OR - Limitations of OR

Linear Programing: Introduction-Requirements for a Linear Programming Problem - Assumptions in Linear Programming Models – Applications of LP method- Formulation of LPP-Advantages – Limitations – Graphical Method of Solutions – Some Exceptional Cases.

Unit II **(18 hours)**

General LPP-Canonical and standard Forms of LPP-Theory of Simplex Method – Some Important Definitions –Analytical Method or Trial and Error Method – Simplex Method – Artificial Variables Techniques – Special cases in Simplex Method Applications – Solution of Simultaneous Equations by Simplex Method – Some Additional Points – Computational Efficiency of the Simplex Technique.

Unit III **(18 hours)**

Transportation Model: Introduction to the Model – Assumptions in Transportation Model – Definition – Matrix Terminology – Formulation and Solution – Variants in Transportation Problems – Additional Problems –Least-Time Transportation Problems – Post Optimality Analysis in Transportations – Trans-Shipment Problem – Dual of the Transportation Problem.

Unit IV **(18 hours)**

Assignment Model: Definition of Assignment Model – Mathematical Representation – Comparison with the Transportation Model – Solution of Assignment Models – Hungarian Method for Solution of Assignment Problems – Formulation and Solution of Assignment Models – Variations – Additional Problems- Sensitivity Analysis in Assignment Problem – Travelling Salesman Problem.

Unit V **(18 hours)**

Advanced Topics in LP: Duality in LP – Dual Simplex Method – Revised Simplex Method – Bounded Variable Problem.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain characteristics of Operational Research, Computational Efficiency of the Simplex Technique, Transportation Problems, Assignment problem and Duality

CO2: Apply Graphical, Simplex methods, Assignment Problem, Transportation Problem and Dual Simplex Method methods to get optimal solution for Linear Programming

CO3: Analyse the optimal solutions of different Linear Programming methods such as Graphical, Simplex method, Assignment Problem and Transportation Problem and Dual Simplex methods for making effective business decisions

CO4: Compare Solutions of as Graphical, Simplex and Dual Simplex method
CO5: Generate dual of LPP and dual of Transportation Problem

Text Book:

1. Er. Prem Kumar Gupta, Dr D S Hira, *Operations Research*, S Chand Publisher, Revised Edition, 2017.

Reference Books:

1. V.K.Kapoor, *Operations Research*, Sultan Chand & Sons Publishers, Fourth Edition, 2001
2. Hamdy A.Taha, *Operations Research*, Prentice Hall of India, Seventh Edition, 2005.
3. J K Sharma, *Operations Research Theory and Applications*, Macmillan Publishers India Limited, Fifth Edition, 2013.
4. Kanti Swarup , P.K. Gupta and Man Mohan, *Operations Research*, Sultan Chand & Sons Publishers,Thirteenth Edition, 2004.

E-Resources:

1. https://nptel.ac.in/courses/110/106/110106062/
2. https://onlinecourses.swayam2.ac.in/cec20_ma10/preview
3. https://www.bbau.ac.in/dept/UIET/EMER-601%20Operation%20Research%20Queuing%20theory.pdf

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	1	9	9	**37**
CO2	9	3	3	3	1	9	9	**37**
CO3	9	3	3	3	1	9	9	**37**
CO4	9	3	3	3	1	9	9	**37**
CO5	9	3	3	9	1	9	9	**43**
Total	**45**	**15**	**15**	**21**	**5**	**45**	**45**	**191**

Low-1 Medium-3 High-9

Core V – Big Data Analytics

(For Students Admitted from 2022-23)

Semester: II **Hours/week: 6**
Subject Code: IMCSC21 **Credit: 5**

Course Objectives:

1. To understand about Big Data Technology,Hadoop Ecosystem and various tools related to it.
2. To learn about the HDFS File System, Map Reduce Framework, analysing data using Hbase and Hive along with the Integration of R with Hadoop.

Unit I **(18 hours)**

Introduction to Big Data

What Is Big Data? History of Data Management, Evolution of Big Data, Structuring of Big Data, Elements of Big Data, Application of Big Data in the Business Context, Careers in Big Data. Business Applications of Big Data: The Significance of Social Network Data,

Financial Fraud and Big Data, Fraud Detection in Insurance, Use of Big Data in the Retail Industry.

Unit II **(18 hours)**

Technologies for Handling Big Data

Distributed and Parallel Computing for Big Data, Understanding Hadoop, Cloud Computing, Grid Computing, and In-Memory Technology for Big Data. VMWare Installation of Hadoop, Linux and its Shell Commands, Different Hadoop Distributions and their advantages, Hortonworks, Cloudera, MapR.

Unit III **(18 hours)**

Understanding the Hadoop Ecosystem

The Hadoop Ecosystem, Storing Data with HDFS, Design of HDFS, HDFS Concepts, Command Line Interface to HDFS, Hadoop File Systems, Java Interface to Hadoop, Anatomyof a file read, Anatomy of a file write, Replica placement and Coherency Model. Parallel Copying with distcp, keeping an HDFS Cluster Balanced.

Unit IV **(18 hours)**

Map Reduce Fundamentals

Origins of Map Reduce, How Map Reduce Works, Optimization Techniques for Map Reduce Jobs, Applications of Map Reduce, Java Map Reduce classes (new API), Data flow, combiner functions, running a distributed Map Reduce Job. Configuration API, setting up the development environment, Managing Configuration.

Unit V **(18 hours)**

Integrating R with Hadoop, Understanding Hive & Hbase

Understanding R-Hadoop, Integration Procedure, Packages needed for R under Hadoop Ecosystem, Text Mining for Deriving Useful Information using R within Hadoop, Introductionto Hive & Hbase, Hive and Hbase Architecture, Understanding Queries, Mining Big Data withHive & Hbase.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the fundamentals of Big Data and its Applications in various Domains.
CO2: Apply HDFS File Structure, Map Reduce Framework to solve complex problems
CO3: Analyse the technologies behind Big Data
CO4: Implement Hive/Hbase shell pertaining to relational data handling under Hadoop.
CO5: Build applications integrating R with Hadoop

Text Book:

1. Arshdeep Bahga, 2016, *Big Data Science & Analytics: A Hands-On Approach*, VPT.

Reference Books:

1. Tom White, 2012, *Hadoop: The Definitive Guide*, O'Reilly.
2. Adam Shook and Donald Miner, 2012, *Map Reduce Design Patterns: Building Effective Algorithms and Analytics for Hadoop and Other Systems*, O'Reilly.
3. Dean Wampler, Edward Capriolo & Jason Rutherglen, 2012, *Programming Hive*, O'Reilly.

4. Lars George, 2011, *HBase - The Definitive Guide: Random Access to Your Planet-Size Data*, O'Reilly.

E-Resources:

1. https://nptel.ac.in/courses/106104189
2. https://www.naukri.com/learning/big-data-computing-by-nptel-course-nptel33?enModal=Y&logFlow=N

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	3	3	**31**
CO2	9	3	9	1	9	9	3	**43**
CO3	9	3	3	1	9	9	9	**43**
CO4	9	3	9	1	9	9	9	**49**
CO5	9	3	3	1	9	9	9	**43**
Total	**45**	**15**	**27**	**5**	**45**	**39**	**33**	**209**

Low-1 Medium-3 High-9

Core VI - Data Structures and Algorithms using Python

(For Students Admitted from 2022-23)

Semester: II **Hours/week: 6**
Subject Code: IMCSC22 **Credit: 5**

Course Objectives:

1. To understand data structures and algorithms in computer science perspectives, algorithms analysis procedure, space and time complexity of various algorithms
2. To use existing data structures and algorithms found in python's libraries and to apply data structures and algorithms to solve real world problems

Unit I **(18 hours)**

Computational Complexity: Computer Architecture - Accessing Elements in a Python List - Big-Oh Notation- Other Asymptotic Notations for Complexity of Algorithms - More Asymptotic Notation. **Recursion:** The Run-Time Stack and the Heap – Recursion on Lists and Strings.

Unit II **(18 hours)**

Sequences: Lists- Cloning Objects - Item Ordering - Selection Sort - Merge Sort – Quicksort. **Two-Dimensional Sequences Trees:** Traversal algorithms using Stacks- The Minimax Algorithm - Linked Lists. Stacks and Queues- Radix Sort.

Unit III **(18 hours)**

Trees: Abstract Syntax Trees and Expressions - Search Spaces. **Graphs:** Graph Notation-Searching a Graph-Kruskal's Algorithm-Dijkstra's Algorithm-Graph Representations. **Heaps:** Building a Heap- The Heapsort Algorithm Version 1-Analysis of Heapsort Version 2.

Unit IV **(18 hours)**

Balanced Binary Search Trees: Binary Search Trees - AVL Trees - Splay Trees. **B-Trees:** B-Tree Organization- B-Tree Implementation- B-Tree Insert-B-Tree Delete.

Unit V **(18 hours)**

Algorithm Design Techniques: Greedy Algorithms – Divide and Conquer – Dynamic Programming– Backtracking- Complexity Theory.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the concepts of linear and Non- linear data structures
CO2: Apply linear and non-linear data structures and its algorithms in real time applications
CO3: Analyze the efficiency of algorithms with Python
CO4: Compare different sorting algorithms
CO5: Develop different algorithm design techniques

Text Books:

1. Kent D. Lee, Steve Hubbard, *Data Structures and Algorithms with Python*, Springer International Publishing Switzerland, 2015.
2. Hemant Jain, *Problem Solving in Data Structures & Algorithms*, Taran Technologies Private Limited, First Edition, 2016.

Reference Books:

1. Ellis Horowitz, Sartaj Sahni, *Fundamentals of Data Structures*, Galgotia Book Source, Second Edition, 2004.
2. Alfred V.Aho Johne, Hopcroft, *Data Structures and Algorithm*, Addison-Wesley, Third Edition, 2012.
3. Mark Allen Weiss, *Data Structures and Algorithm Analysis in C++*, Pearson Education, Fourth Edition, 2014.

E-Resources:

1. http://www.dave-reed.com/csc427.F04/
2. http://www.math.tau.ac.il/~matias/ds03.html
3. https://onlinecourses.nptel.ac.in/noc20_cs70/preview
4. https://www.tutorialspoint.com/python_data_structure/python_data_structure_tutorial.pdf
5. https://nptel.ac.in/courses/106/106/106106145/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	9	9	**43**
CO2	9	3	3	1	9	9	9	**43**
CO3	9	3	3	1	9	9	9	**43**
CO4	9	3	3	1	9	9	9	**43**
CO5	9	3	3	1	9	9	9	**43**
Total	**45**	**15**	**15**	**5**	**45**	**45**	**45**	**215**

Low-1 Medium-3 High-9

Core VII – Cloud and Distributed Computing

(For Students Admitted from 2022-23)

Semester: II **Hours/Week: 6**
Subject code: IMCSC23 **Credit: 5**

Course Objectives:

1. To impart the complete understanding of cloud, virtualization and distributed clouds
2. To enhance the students to understand the significance of cloud storage, identity and access management

Unit I **(18 hours)**

Introduction to Cloud, Virtualization, and Virtual Machine: Introduction to Cloud Computing - Features of Today's Cloud - Introduction to Virtualization - Mitigation Techniques for VM Migration

Network Virtualization and Geo-Distributed Clouds: Introduction - Cloud Computing and Server Virtualization - Networking of Virtual Machines Inside the Hypervisor – Docker - Software-Defined Network - Network Virtualization in Multi-Tenant Data Centers: VL2 - Network Virtualization in Multi-Tenant Data Centers: NVP - Geo-Distributed Cloud Data Centers.

Unit II **(18 hours)**

Leader Election in Cloud, Distributed Systems, and Industry Systems: Introduction - Leader Election in Rings (Classical Distributed Algorithms) - Ring Leader Election and Bully Leader Election Algorithms - Classical Algorithm: Ring Election Algorithm - Classical Algorithm: Bully Election - Industry Systems: Google Chubby and Apache ZooKeeper - Design of ZooKeeper

Cloud-Native Computing: Introduction – Micro services – Docker – Kubernetes - Introduction to Edge Computing - Classification of Edge Computing.

Unit III **(18 hours)**

Cloud Asset Management and Protection: Differences from Traditional IT - Types of Cloud Assets - Compute Assets - Storage Assets - Network Assets - Asset Management Pipeline - Procurement Leaks - Processing Leaks - Tooling Leaks - Findings Leaks - Tagging Cloud Assets

Software-Defined Networking and Network Function Virtualization: Introduction - Software-Defined Networking - Applications and Use Cases - Software-Defined NFV - Network Slicing - Ongoing Research Opportunities.

Unit IV **(18 hours)**

Cloud Storage: Key-Value Stores/NoSQL Stores and HBase: Design of Key-Value Stores - Design of HBase-**Identity and Access Management:** Differences from Traditional IT - Life Cycle for Identity and Access-Request -Approve - Create, Delete, Grant, or Revoke - Authentication - Cloud IAM Identities-Business-to-Consumer and Business -to-Employee-Multi-Factor Authentication - Passwords and API Keys - Shared IDs - Federated Identity - Single Sign-On -Instance Metadata and Identity Documents-Secrets Management-Authorization- Centralized Authorization - Roles - Revalidate - Putting It All Together in the Sample Application.

Unit V **(18 hours)**

Classical Distributed Algorithms and the Industry Systems: Introduction - Time and Clock Synchronization in Cloud Data Center - Key Challenges - Clock Synchronization - Algorithms for Recording Global State and Snapshot - Mutual Exclusion Algorithms for Distributed Systems-**Cloud Applications:** MapReduce, Spark, and Apache Kafka - MapReduce -Spark- Kafka.

Course Outcomes:

After successful completion of the course, the students will be able to

CO1: Identify the features of Cloud Computing and Virtualization

CO2: Demonstrate the leader election and cloud native computing

CO3: Classify types of cloud assets, software-defined networking and network function virtualization

CO4: Justify cloud storage, Identity and Access Management

CO5: Generate the Classical Distributed Algorithms, the Industry Systems and Cloud applications

Text Books:

1. Rajiv Misra, Yashwant Singh Patel, *Cloud and Distributed Computing: Algorithms and Systems*, Wiley Emerging Technology Series, Wiley India Private Limited, 2020.
2. Chris Dotson, *Practical Cloud Security: A Guide for Secure Design and Deployment*, O'Reilly Media, First Edition, 2019.

Reference Books:

1. Rajkumar Buyya, Christian Vecchiola, Thamarai Selvi, *Mastering Cloud Computing*, Tata McGraw Hill, 2017.
2. Rajkumar Buyya, James Broberg, Andrzej Goscinski, *Cloud Computing Principles and Paradigms***,** John Wiley & Sons Limited ,2011.
3. Toby Velte, Anthony Velte, Robert Elsenpeter, *Cloud Computing-A Practical Approach*, Tata McGraw Hill, 2010.

E - Resources:

1. https://nptel.ac.in/courses/106/104/106104182/
2. https://www.amazon.in/Cloud-Distributed-Computing-Algorithms-Systems/dp/8126520272?asin=B086V7Q2KW&revisionId=&format=4&depth=1

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	9	3	1	9	**35**
CO2	9	1	9	9	3	1	33	**35**
CO3	9	3	3	9	3	1	9	**37**
CO4	3	9	9	9	9	3	9	**51**
CO5	3	9	9	9	9	3	9	**51**

Total	33	23	33	45	27	9	39	209

Low-1 Medium-3 High-9

Core VIII - Data Structures and Algorithms using Python Lab

(For Students Admitted from 2022-23)

Semester: II **Hours/week: 6**
Subject Code: IMCSC24P **Credit: 5**

Course Objectives:

1. To identify and apply the suitable data structure for the given real world problem
2. To gain knowledge in practical applications of data structures using python

List of Programs

Display Text

1. To develop a simple calculator
2. To check given year is leap year or not

Formula Substitution

3. To find the factorial of the given number
4. To compute the GCD of two numbers.
5. To find the Distance between Two Points
6. To evaluate the Fibonacci series for n terms
7. To find given number is odd or even.
8. To find ind the square root of a number (Newton's method)
9. To find Exponentiation (power of a number)
10. To find the maximum of a list of numbers.
11. To find First n prime numbers
12. To Find Given Number is Armstrong Number or not

Algorithm Substitution

13. To perform Linear search and Binary search
14. To perform Selection sort
15. Write a Python program to perform Insertion sort
16. To perform Merge sort
17. To perform Bubble Sort Algorithm

Array

18. To multiply matrices
19. To use command line arguments for counting words (word count)

File

20. To find the most frequent words in a text read from a file

Note: - Questions for Internal and External examination will be based on concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe the Python language syntax including control statements, loops and functions to write programs for a wide variety problem in mathematics.

CO2: Examine the core data structures in python to store, process and sort the data.

CO3: Basic knowledge of condition checking

CO4: Implement the structure of algorithm

CO5: Examine the file and array concept

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	9	9	**43**
CO2	9	3	3	1	9	9	9	**43**
CO3	9	3	3	1	9	9	9	**43**
CO4	9	3	3	1	9	9	9	**43**
CO5	9	3	3	1	9	9	9	**43**
Total	**45**	**15**	**15**	**5**	**45**	**45**	**45**	**215**

Low-1 Medium-3 High-9

DSE II - a) Artificial Intelligence

(For Students Admitted from 2022-23)

Semester: II **Hours/week: 6**

Subject Code: IMCSE2A **Credit: 5**

Course Objectives:

1. To describe the modern view of AI as the study of agents that receive percepts from the Environment and perform actions and AI techniques for knowledge representation, planning and uncertainty Management
2. To develop knowledge of decision making and learning methods and explain the concept of Knowledge Representation

Unit I **(18 hours)**

Introduction to Artificial Intelligence-Intelligent Agents, Approaches in Artificial Intelligence, Definitions of Artificial Intelligence, AI problems, Features of AI Programs, Importance of AI, Advantages and Disadvantages of AI.

Unit II **(18 hours)**

Applications of Artificial Intelligence- Finance, Hospitals and Medicine, Robotics, Expert systems, Diagnosis, Pattern Recognition, Natural Language Processing, Game Playing, Image Processing, Data mining, Big Data Mining. Introduction to the state space search- State space search, search techniques, Types of searching techniques.

Unit III **(18 hours)**

Heuristic Search Strategies-Types of Heuristic Search techniques, Hill Climbing Search, Simulated Annealing search, A* Algorithm, AND-OR Graphs, Properties of the Heuristic Search Algorithm, Adversary Search, The MINIMAX Algorithm.

Unit IV **(18 hours)**

Expert Systems-Definitions of Expert Systems, Features of Good Expert systems, Architecture and Components of Expert systems, Roles of the Individuals who interact with the system, Advantages of Expert systems, Disadvantages of Expert Systems.

Unit V **(18 hours)**

Knowledge Representation-Definitions of Knowledge Representation, Characteristics of Good Knowledge Representation, Basics of Knowledge representation, Properties of the Symbolic representation of knowledge, Properties of the Good knowledge representation systems, Categories of knowledge representation schemes, types of knowledge representation schemes.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Illustrate knowledge on Artificial Knowledge concepts
CO2: Apply all searching algorithms and Hill-climbing procedures
CO3: Analyze their gaming skills and learn about Expert system
CO4: Evaluate the learners for aspiring careers in the field of Artificial Intelligence
CO5: Develop the game playing and planning of expert systems

Text Book:

1. I.Gupta, G.Nagpal, *Artificial Intelligence and Expert Systems*, Laxmi Publications, 2018.

Reference Books:

1. V.S. Jankiraman, *Foundations of Artificial Intelligence and Expert Systems*, Laxmi Publications, 2017.
2. Joseph C.Giarratano, Gary D.Riley, *Expert Systems: Principles and Programming*, Brooks/Cole Publications, Fourth Edition, 2018.
3. Lavika Goel, *Artificial Intelligence: Concepts and Applications*, Wiley India Private Limited, 2015.

E-Resources:

1. https://nptel.ac.in/courses/106/102/106102220/
2. https://nptel.ac.in/courses/112/103/112103280/

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	3	9	9	9	**57**
CO2	9	3	9	9	3	9	3	**45**
CO3	3	9	3	3	9	9	9	**45**
CO4	9	9	9	9	3	1	9	**49**
CO5	9	9	9	3	9	9	3	**51**
Total	**39**	**39**	**39**	**27**	**33**	**37**	**33**	**247**

Low-1 Medium-3 High-9

DSE II - b) Mobile Computing

(For Students Admitted from 2022-23)

Semester: II **Hours/week: 6**
Subject Code: IMCSE2B **Credit: 5**

Course Objectives:

1. To define mobile technologies in terms of hardware, software, and communications and describe existing mobile computing frameworks and architectures
2. To evaluate the effectiveness of different mobile computing frameworks and describe how mobile technology functions to enable other computing technologies

Unit I **(18 hours)**

Introduction: Mobile Computing- Middleware and Gateways-Developing Mobile Computing Applications- Security in Mobile Computing – Architecture of Mobile Computing-Three-Tier Architecture-Design Consideration for Mobile Computing-Mobile Computing through Internet- Mobile Computing through Telephone-Developing an IVR Applications.

Unit II **(18 hours)**

Bluetooth and GSM: Bluetooth- Features and working of RFID -Wireless Broadband (WiMAX) - Mobile IP – IPV6- IPV4 Vs IPV6 –Global System for Mobile Communications – GSM Architecture – Call Routing in GSM – GSM Addresses and Identifiers – Network Aspects in GSM – GSM Frequency Allocation – Authentication and Security- Mobile Computing Over SMS – SMS- Value Added Services through SMS**.**

Unit III **(18 hours)**

GPRS, 3G and 4G Networks: GPRS and Packet Data Network – GPRS Network Architecture – GPRS Network Operations – Data Services in GPRS- Applications for GPRS – Limitations of GPRS- Spread Spectrum Technology- CDMA Versus GSM – Features of 3G Networks –Architecture of 3G- Applications of 3G - Features of 4G- Architecture of 4G - Wireless Technologies Used in 4G- Merits and Demerits of 4G.

Unit IV **(18 hours)**

Mobile Ad-hoc Networks: MOBILE Ad-Hoc Basic Concepts-Characteristics- Applications – Design Issues – Routing – Essential of Traditional Routing Protocols –Popular Routing Protocols – Vehicular Ad Hoc Networks (VANET) – MANET Vs VANET – Security of VANET and MANET

Open Source Tools for Mobile Testing: Appium **-** Katalon Studio – Monkey Talk – IOS Driver – Robotium – Calabash.

Unit V **(18 hours)**

Overview of Kotlin- Installation of Android Studio – Getting started with Hello World app- Creating a Registration form- Adding Radio Buttons- Adding spinner and Image- Creating a search App-URL request-Display Search Result-Playing video using YouTube API.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the principles of mobile technologies like GPRS, GSM, CDMA and TDMA and the concepts of Bluetooth and GSM, Mobile Ad-hoc networks

CO2: Apply the features of Android programming for developing Android Applications

CO3: Analyze technology of 1G, 2G, 3G and 4G for gaining the working knowledge of four generation Wireless technologies and Analyze the architecture, merits and demerits of Wireless technologies like Infra-Red, blue tooth, Wi-Fi, RFID and Wi-Max

CO4: Compare the characteristics and techniques MANET with VANET

CO5: Derive wireless communication systems with 3G and 4G technologies.

Text Books:

1. Asoke K. Talukder, Hasan Ahmed, Roopa R Yavagal. *Mobile Computing: Technology, Applications, And Service Creation*, Tata McGraw Hill, 2017.
2. Stefano Basagni , Marco Conti , Silvia Giordano , Ivan IvanStojmenovic, *Mobile AdHoc Networking, Cutting Edge Directions*, Wiley Publications, 2015.

Reference Books:

1. Sunilkumar S. Manvi, Mahabaleshwar S. Kakkasageri, *Wireless and Mobile Networks, Concepts and Protocols*, Wiley Publications, 2016.
2. James C.Sheusi, *Android Application Development for Java programmers*, Cengage Learning, 2013.
3. Peter Spath, *Learn Kotlin for Android Development*, APress Publications, 2019.
4. Charles E.Perkins, *Ad Hoc Networking*, Addison-Wesley Publications, 2008.

E-Resources:

1.www.cse.iitk.ac.in/users/rkg/Talks/mobile_main.pdf
2.pl.cs.jhu.edu/oose/resources/android/Android-Tutorial.pdf
3. SWAYAM: https://swayam.gov.in/nd1_noc19_ee48/preview
4.SWAYAM: https://onlinecourses.swayam2.ac.in/aic20_sp02/preview
5.http://172.16.25.76/course/view.php?id=2224

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	1	9	9	9	**55**
CO2	9	9	9	1	9	9	9	**55**
CO3	9	9	9	1	9	9	9	**55**
CO4	9	9	9	1	9	9	9	**55**
CO5	9	9	9	1	9	9	9	**55**
Total	**45**	**45**	**45**	**5**	**45**	**45**	**45**	**275**

Low-1 Medium-3 High-9

Core IX - Software Project Management

(For Students Admitted from 2022-23)

Semester: III **Hours/week: 6**
Subject Code: IMCSC31 **Credit: 5**

Course Objectives:

1. To identify the different project contexts and suggest an appropriate management strategy and key phases of project management
2. To determine an appropriate project management approach through an evaluation of the business context and scope of the project and role of professional ethics in successful software development

Unit I **(18 hours)**

Introduction to Software Project Management: Introduction – Software projects versus other types of project – Contract Management and Technical Project Management – Plans, Methods and Methodologies – Some ways of categorizing software projects – Stakeholders – Setting Objectives – The Business Case – Project Success and Failure – Management Control – Traditional versus Modern Project Management Practices. Project **Evaluation and Programme Management:** A Business Case - Project portfolio Management – Evaluation of Individual Projects – Programme Management – Managing the allocation of resources within the programmes – Strategic programme Management.

Unit II **(18 hours)**

An overview of Project Planning: Stepwise Project Planning – **Selection of an Appropriate Project Approach:** Build or Buy – Choosing Methodologies and Technologies – Software Processes and Process Models – Choice of Process models – Structure versus speed of Delivery – The Waterfall Model – The Spiral Model – Software Prototyping.

Unit III **(18 hours)**

Activity Planning: Objectives of Activity planning – Plan – Project schedules – Sequencing and Scheduling Activities – Network Planning models – Formulating a Network Model – The Forward Pass – The Backward Pass – Identifying the Critical path – Activity Float – Shortening the Project Duration – Identifying Critical Activities. **Risk Management:** Risk – Categories of Risk – Risk identification – Risk Planning – Evaluating Risks to the Schedule – Applying the PERT technique – Monte Carlo simulation – Critical Chain Concepts.

Unit IV **(18 hours)**

Monitoring and Control: Creating the Framework -Collecting the Data- Review- Project Termination Review - Cost monitoring- Earned Value Analysis – Prioritizing Monitoring- Change control- Software Configuration Management. **Managing Contracts:** Types of Contract -Stages in Contract Placement – Typical Terms of a Contract – Contract management – acceptance.

Unit V **(18 hours)**

Managing People in Software Environments: Selecting the Right person for the Job- Instruction in the Best Methods -Motivation – The Oldham-Hackman job characteristics model – Stress – Health and Safety -Some Ethical and Professional concerns. **Working in Teams:** Becoming a Team-Decision making-Organization and Team structures- Coordination Dependencies-Dispersed and Virtual teams – Communications genres- Communication plans- Leadership.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Summarize Software Process Models

CO2: Illustrate the steps involved in Software Project Management and activity Planning, Risk Management using case studies
CO3: Apply Software effort Estimation Methods
CO4: Evaluate Software Project Management Tools
CO5: Design the modern techniques in Software Project Management like Agile, Scrum, DevOps

Text Book:

1. Bob Hughes, Mike Cotterell, Rajib Mall, *Software Project Management*, Tata McGraw Hill, Fifth Edition, 2012.

Reference Books:

1. Robert K.Wysocki ,*Effective Software Project Management*, Wiley Publication, 2011.
2. Walker Royce, *Software Project Management*, Addison-Wesley, 1998.
3. Gopalaswamy Ramesh, *Managing Global Software Projects*, Tata McGraw Hill, Fourteenth Reprint, 2013.

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105218/
2. https://onlinecourses.nptel.ac.in/noc19_cs70/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	1	9	9	9	**55**
CO2	9	9	9	1	9	9	9	**55**
CO3	9	9	9	1	9	9	9	**55**
CO4	9	9	9	1	9	9	9	**55**
CO5	9	9	9	1	9	9	9	**55**
Total	**45**	**45**	**45**	**5**	**45**	**45**	**45**	**275**

Low-1 Medium-3 High-9

Core X -Digital Image Processing

(For Students Admitted from 2022-23)

Semester: III **Hours / Week:6**
Subject Code: IMCSC32 **Credit: 5**

Course Objectives:

1. To explain the fundamentals of digital image and its processing
2. To perform image enhancement techniques in spatial and frequency domain, apply the concept of image segmentation and describe object detection and recognition techniques

Unit I **(18 hours)**

Introduction: Digital Image Processing-The Origins of Digital Image Processing- Examples of Fields that Use Digital Image Processing- Fundamental Steps in Digital Image Processing -Components of an Image Processing System**. Digital Image Fundamentals:** Elements of Visual Perception- Light and the Electromagnetic Spectrum- Image Sensing and Acquisition

- Image Sampling and Quantization -Some Basic Relationships between Pixels -Introduction to the Basic Mathematical Tools Used in Digital Image Processing.

Unit II **(18 hours)**

Intensity Transformations and Spatial Filtering: Background - Some Basic Intensity Transformation Functions -Histogram Processing- Fundamentals of Spatial Filtering - Smoothing (Lowpass) Spatial Filters-Sharpening (Highpass) Spatial Filters-High Pass, Bandreject, and Bandpass Filters from Lowpass Filters -Combining Spatial Enhancement Methods-Using Fuzzy Techniques for Intensity Transformations and Spatial Filtering.

Unit III **(18 hours)**

Filtering in the Frequency Domain: Background -Preliminary Concepts -Sampling and the Fourier Transform of Sampled Functions -The Discrete Fourier Transform of One Variable - Extensions to Functions of Two Variables -Some Properties of the 2-D DFT and IDFT -The Basics of Filtering in the Frequency Domain -Image Smoothing Using Low Pass Frequency Domain Filters -Image Sharpening Using High Pass Filters- Selective Filtering- The Fast Fourier Transform.

Unit IV **(18 hours)**

Image Restoration and Reconstruction: Noise Models- Restoration in the Presence of Noise Only. Wavelet and Other Image Transforms: Matrix-based Transforms- Fourier-Related Transforms- Walsh-Hadamard Transforms -Slant Transform - Haar Transform - Wavelet Transforms . **Color Image Processing**: Color Models- Basics of Full-Color Image Processing-Color Transformations-Color Image Smoothing and Sharpening-Using Color in Image Segmentation-Noise in Color Images-Color Image Compression.

Unit V **(18 hours)**

Morphological Image Processing: Erosion and Dilation-Opening and Closing-The Hit-or-Miss Transform-Some Basic Morphological Algorithms. **Image Segmentation I:** Edge Detection, Thresholding, and Region Detection: Thresholding -Segmentation by Region Growing and by Region Splitting and Merging-Region Segmentation Using Clustering and Superpixels-Region Segmentation Using Graph Cut-Segmentation Using Morphological Watersheds -The Use of Motion in Segmentation. Image Pattern Classification: Optimum (Bayes) Statistical Classifiers-Neural Networks and Deep Learning.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the origins, components, elements of visual perception, basic intensity, transformation, discrete Fourier transform, color models, noise models and morphological algorithms of image processing

CO2: Apply fundamental steps, smoothing, sharpening, segmentation and classification to the image

CO3: Analyze relationship between pixels, mathematical tools, fuzzy techniques, filters, wavelet transforms, region grouping, splitting and merging

CO4: Determine histogram, the color image compression

CO5: Solve noise for color image

Text Book:

1. Rafael C. Gonzalez, Richard E. Woods, *Digital Image Processing*, Pearson Education, Fourth Edition, 2018.

Reference Books:

1. B.Chanda, D.Dutta Majumder, *Digital Image Processing and Analysis*, Prentice Hall of India, 2003.
2. Nick Efford, *Digital Image Processing a practical Introducing using Java*, Pearson Education, 2004.

E-Resources:

1. https://www.tutorialspoint.com/dip/index.htm
2. https://onlinecourses.nptel.ac.in/noc19_ee55/preview
3. https://www.edx.org/learn/image-processing

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	1	9	9	9	**80**
CO2	9	9	3	1	9	9	9	**74**
CO3	9	3	9	1	9	9	9	**74**
CO4	9	9	9	1	9	9	9	**80**
CO5	9	9	9	1	9	9	9	**80**
Total	**45**	**39**	**39**	**5**	**45**	**45**	**45**	**388**

Low-1 Medium-3 High-9

Core XI - Web Technology

(For Students Admitted from 2022-23)

Semester: III **Hours/Week: 6 (T: 4 P: 2)**
Subject Code: IMCSC32 **Credit: 4**

Course Objectives:

1. To analyze a web page and identify its elements and attributes and create web pages using XHTML and Cascading Style Sheets
2. To build dynamic web pages using JavaScript (Client side programming), create XML documents and Schemas, build interactive web applications using AJAX

Unit I **(12 hours)**

Internet Protocols: Introduction- Internet Protocols-Host Names- Internet Applications and Application Protocols. **Introduction to HTML:** Introduction-SGML-Outline of an HTML Document-Head Section-Body Section- HTML Forms. **JAVA Network Programming:** Introduction- UDP/IP and TCP/IP Communications-I/O Streams- Sockets-Remote Method Invocation-Protocol Handler.

Unit II **(12 hours)**

JAVASCRIPT: Introduction-Language Elements - Objects of JavaScript - Other Objects. **Syntax:** An overview of JavaScript's syntax- Identifiers**. Consoles:** interactive JavaScript

command lines. **VBSCRIPT:** Embedding VBScript code in an HTML Document-Variables-Procedures-Conditional statements-Looping Constructs-Objects and VBScript.

Unit III **(12 hours)**

Dynamic HTML(DHTML): Introduction-Cascading Style Sheets(CSS)-DHTML Document Object Model and Collections-Event Handling-Data Binding. **EXTENSIBLE MARK-UP LANGUAGE (XML):** Introduction-HTML vs XML- XML Attributes- XML Validation-XML DTD -The Building Blocks of XML Documents.

Unit IV **(12 hours)**

JAVA SERVER PAGES (JSP): Introduction -Advantages of JSP-Components of JSP - Cookies. **Active Server Pages (ASP):** Introduction- Advantages of Using ASP-First ASP Script-Processing of ASP Scripts with Forms-Variables and Constructs-Subroutines-ASP Cookies-ASP Objects-Connecting to Data with ASP.

Unit V **(12 hours)**

Introduction to PHP: Introduction-Installing PHP-PHP Tags-Comments-Print and Echo Statements-Data Types-Constants-Operators-Control Statements-Looping Constructs-String Fuctions-Numeric Fuctions-Arrays-User Defined Functions-Working with Forms-**MYSQL:** Introduction Database Systems-Accessing the Database with PHP.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the fundamentals of web development technologies
CO2: Apply the different tags to develop a dynamic webpage using JavaScript, JSP and ASP
CO3: Able to write a well formed /valid XML document
CO4: Justify best technologies for solving web client/server problems
CO5: Build web pages using various web design languages

Text Books:

1. N.P.Gopalan, J.Akilandeswari, *Web Technology, A Developer's Perspective*, PHI Learning Private Limited, Second Edition, 2016.
2. Dr. Axel Rauschmayer, *JavaScript for Impatient Programmers*, ECMA Script, 2022.

Reference Books:

1. Jeffrey C. Jackson, *WEB TECHNOLOGIES A Computer Science Perspective*, Pearson Education, 2007.
2. Thomas A. Powell, *HTML & CSS: The Complete Reference*, McGraw-Hill, Fifth Edition, 2010.

E - Resources:

1. https://www.ecyrd.com/JSPWiki/attach/JSPWikiFileAttachments/Intro%20to%20ASP.pdf
2. https://link.springer.com/content/pdf/bbm%3A978-1-4302-1097-9%2F1.pdf
3. https://www.coursera.org/learn/html-css-javascript-for-web-developers
4. coursera.org/lecture/service-oriented-architecture/4-1-5-html-xml-json-rK9X5

Web Designing Lab

Hours/Week: 2

LIST OF PROGRAMS

HTML

1. To illustrate all basic tags
2. To display study time table for end semester examination
3. To display a menu list for bakery
4. To use all style sheets
5. To demonstrate frame
6. To use hyperlink for both text and image
7. To demonstrate forms

Java Script

8. Leap year checking
9. To convert temperature from Fahrenheit to Celsius
10. To create login form

Note: - Questions for the Internal examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the basics of all HTML tags to create the static web page
CO2: Apply the concepts of table and list in HTML
CO3: Examine the use of style sheets, frames and hyperlinks
CO4: Evaluate the concept of validation using JavaScript
CO5: Create a dynamic website

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	3	9	3	3	**31**
CO2	9	3	1	3	9	3	3	**31**
CO3	9	3	3	3	9	3	3	**33**
CO4	9	3	3	9	9	3	3	**39**
CO5	9	3	9	3	9	9	3	**45**
Total	**45**	**15**	**17**	**21**	**45**	**21**	**15**	**179**

Low-1 Medium-3 High-9

Core XII - Image Processing Lab

(For Students Admitted from 2022-23)

Semester: III **Hours/week: 6**

Subject Code: IMCSC34P **Credit: 5**

Course Objectives:

1. To study the various techniques of image enhancement, reconstruction, Compression, and segmentation
2. To gain knowledge in morphological operations

List of Programs

1. Simulation and Display of an Image, Negative of an Image(Binary & Gray Scale)
2. Implementation of Image Intensity slicing technique for image enhancement
3. To implement power Law correction
4. Implementation of Relationships between Pixels
5. Implementation of Transformations of an Image
6. Contrast stretching of a low contrast image
7. To obtain histogram and histogram equalization image
8. Display of bit planes of an Image
9. Display of colour images
10. Conversion of 24 bit color image to 8 bit, 4 bit, 1 bit image
11. Display of FFT(1-D & 2-D) of an image
12. Computation of Mean, Standard Deviation, Correlation coefficient of the given Image
13. Implementation of Image Smoothening Filters (Mean and Median filtering of an Image)
14. To Implement smoothing or averaging filter in spatial domain
15. To perform Filtering in frequency domain
16. Implementation of image sharpening filters and Edge Detection using Gradient Filters
17. Program for Canny and Sobel edge detection algorithm
18. Program for Edge Detection using Prewitt and Roberts Operators
19. Image Compression by DCT,DPCM, HUFFMAN coding 11. 12. 13.
20. To fill the region of interest for the image
21. Program for Segmentation using watershed transform
22. Program for morphological operations on binary images
23. Implementation of image restoring techniques
24. Program for DCT/IDCT computation

Note: - Questions for Internal and External examination will be based on concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Display the images, image attributes, and functions to write programs for a wide variety of problems in image processing.

CO2: Enhancement of an image is understood with the concept of filtering, and power law.

CO3: Basic knowledge of smoothening and sharpening in spatial and frequency domain.

CO4: Implement the structure of algorithm for edge detection and compression.

CO5: Examine the segmentation and morphological operations.

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	3	9	1	9	**49**
CO2	9	9	9	3	9	1	9	**49**
CO3	9	9	9	3	9	1	9	**49**
CO4	9	9	9	3	9	1	9	**49**
CO5	9	9	9	3	9	1	9	**49**
Total	**45**	**45**	**45**	**15**	**45**	**5**	**45**	**245**

Low-1 Medium-3 High-9

DSE III - a) Theory of Computation

(For Students Admitted from 2022-23)

Semester: III **Hours/week: 6**
Subject Code: IMCSE3A **Credit: 5**

Course Objectives:

1. To give an overview of the theoretical foundations of computer science from the perspective of formallanguages and regular grammars, context frees grammar
2. To illustrate finite state machines to solve problems in computing and explain the hierarchy ofproblems arising in the computer sciences

Unit I **(18 hours)**

Automata Fundamentals: Introduction to formal proof – Additional forms of Proof – Inductive Proofs – Finite Automata – Deterministic Finite Automata – Non-deterministic Finite Automata – Finite Automata withEpsilon Transitions.

Unit II **(18 hours)**

Regular expressions and languages: Regular Expressions – FA and Regular Expressions – ProvingLanguages notto be regular – Closure Properties of Regular Languages – Equivalence and Minimization of Automata.

Unit III **(18 hours)**

Context Free Grammar and Languages: CFG – Parse Trees – Ambiguity in Grammars and Languages – Definition of the Pushdown Automata – Languages of a Pushdown Automata – Equivalence of Pushdown Automata and CFG, Deterministic Pushdown Automata.

Unit IV **(18 hours)**

Properties of Context Free Languages : Normal Forms for CFG – Pumping Lemma for CFL – ClosureProperties of CFL – Turing Machines – Programming Techniques for TM.

Unit V **(18 hours)**

Undecidability: Non Recursive Enumerable (RE) Language – Undecidable Problem with RE – Undecidable Problems about TM – Post's Correspondence Problem, The Class P and NP.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the language hierarchy, Turing machines and their capability and undecidable problemsand NP class problems

CO2: Apply the theoretical foundations of computer science from the perspective of formal languages

CO3: Illustrate finite state machines to solve problems in computing and various problems of applyingnormal form techniques push down automata and Turing Machines

CO4: Evaluate automata for any given pattern and find its equivalent regular expressions and constructcontext free grammar for various languages

CO5: Design a context free grammar for any given language and design Finite Automata's for different regular expressions and languages

Text Book:

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, *Introduction to Automata Theory Languages and Computation*, Pearson Education, Third Edition, 2007.

Reference Books:

1. K. L. P Mishra, N. Chandrashekaran, *Theory of Computer Science-Automata Languages and Computation*, Second edition, 2003.
2. H.R.Lewis and C.H.Papadimitriou, *Elements of the theory of Computation*, Prentice Hall of India, Second Edition, 2003.
3. J.Martin, *Introduction to Languages and the Theory of Computation*, Tata McGraw Hill, Third Edition, 2003.
4. Micheal Sipser, *Introduction of the Theory and Computation*, Thomson Brokecole, 1997.

E-Resources:

1. https://nptel.ac.in/courses/106/104/106104148/
2. https://nptel.ac.in/courses/106/104/106104028/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	1	9	9	9	**49**
CO2	9	9	3	1	9	9	9	**49**
CO3	9	9	3	1	9	9	9	**49**
CO4	9	3	3	1	9	9	9	**43**
CO5	9	9	3	1	9	9	9	**49**
Total	**45**	**39**	**15**	**5**	**45**	**45**	**45**	**239**

Low-1 Medium-3 High-9

DSE III - b) Data Mining and Warehousing

(For Students Admitted from 2022-23)

Semester: III **Hours/week: 6**

Subject Code: IMCSE3B **Credit: 5**

Course Objectives:

1. To understand and implement classical models and algorithms in data warehouses and data mining
2. To understand data mining techniques in various applications like social, scientific and environmental context and Develop skill in selecting the appropriate data mining algorithm for solving practical problems

Unit I **(18 hours)**

Data Mining: Data Mining-Kinds of Data-Kind of Patterns can be mined-Technologies used- Kinds of Application Targeted-Major Issues in Data Mining - **Data Preprocessing:** Data Cleaning-Data Integration -Data Reduction – Data Transformation and Data Discretization.

Unit II **(18 hours)**

Data Warehouse and OLAP Technology for Data Mining: Data Warehouse: Basic Concepts-A Multidimensional Data Modeling: Data Cube and OLAP Data Warehouse Implementation. **Data Cube Technology:** Data Cube Computation: Preliminary Concepts-Data Cube Computation Methods-Mining Frequent Patterns- **Associations and Correlations:** Basic Concepts-Frequent Itemset Mining Methods-Advanced Pattern Mining-Pattern Mining Multilevel, Multidimensional Space Various Kinds of Association Rules-From Association Mining to Correlation Analysis.

Unit III **(18 hours)**

Classification and Prediction: Issues Regarding Classification and Prediction-Classification by Decision Tree Induction-Bayesian Classification-Classification by Backpropagation–Support Vector Machines-Associative Classification: Classification by Association Rule Analysis-Other Classification Methods-Prediction- Accuracy and Error Measures.

Unit IV **(18 hours)**

Cluster Analysis: Basic Concepts, Methods and Advanced Cluster Analysis : What is Cluster Analysis-Types of data in Cluster Analysis-A Categorization of Major Clustering Methods-Partitioning Methods-Hierarchical Methods-Density based Methods-Grid based Methods-**Evaluation of Clustering**- Methods-Clustering high dimensional data-Clustering Graph and Network Data-Clustering with Constraints.

Unit V **(18 hours)**

Outlier Detection: Outlier and Outlier analysis-Outlier Detection Methods-Statistical Approaches-Proximity Based Approaches-Outlier Detection in high-Dimensional Data - **Data Mining Trends and Research Frontiers:** Mining Complex Data Types-Other Methodologies of Data Mining-Data Mining Applications-Data Mining Applications.

Course Outcomes:

After Successful completion of the course, student will be able to

CO1: Explore the Basic Concepts of Data Mining
CO2: Analyze the Classification algorithm and Error Prediction
CO3: Improve the knowledge about Types of Classification Methods in Data Mining
CO4: Determine the types of Data clustering methods and Types of Data Mining

CO5: Evaluate Data Mining Application with Latest Trends

Text Book:

1. Jiawei Han, Micheline Kamber, *Data Mining: Concept and Technique*, Morgan Kaufmann Publishers, Third Edition, 2013.

Reference Books:

1. Pieter Adriaans, Dolf Zantinge, *Data Mining*, Pearson Education, Ninth Indian Reprint, 2003.
2. Anand Rajaraman, Jeffrey David Ullman, *Mining of Massive Datasets*, Cambridge University Press, 2012.
3. Pete Warden, *Big Data Glossary*, O'Reilly, 2011.

Journals:

1. ACM SIGKDD International Conference on Knowledge Discovery & Data Mining
2. ACM International Conference on Web Search and Data Mining

E-Resources:

1. https://www.javatpoint.com/data-mining-cluster-vs-data-warehousing
2. https://onlinecourses.nptel.ac.in/noc21_cs06/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	1	1	1	1	1	**15**
CO2	9	1	1	1	3	3	1	**19**
CO3	9	9	3	1	3	3	1	**29**
CO4	9	9	3	3	3	1	1	**29**
CO5	9	3	3	3	3	3	1	**25**
Total	**45**	**23**	**11**	**9**	**13**	**11**	**5**	**117**

Low-1 Medium-3 High-9

Core XIII -Cryptography and Network Security

(For Students Admitted from 2022-23)

Semester: IV **Hours / Week: 6**
Subject code: IMCSC41 **Credit: 5**

Course Objectives:

1. To understand the basics of Cryptography and Network Security and secure a message over insecure channel by various means
2. To learn about how to maintain the Confidentiality, Integrity and Availability of data and various protocols for network security to protect against the threats in the networks

Unit I **(18 hours)**

Computer and Network Security concept: Computer security concepts-The OSI security Architecture-Security Attacks- Security Services-Security Mechanisms. **Number Theory:**

The Euclidean Algorithm-Modular Arithmetic-Prime Numbers- Fermat's Euler's Theorem-Discrete Logarithms.

Unit II **(18 hours)**

Symmetric Ciphers: Classical Encryption Techniques: Symmetric Chippers Model-Substitution Techniques-Transposition Techniques-Traditional Block Cipher Structure-Block Cipher Design Principles. **Finite Fields:** Groups-Rings-Fields-Finite Fields of the FormGF(p).

Unit III **(18 hours)**

Advanced Encryption Standard: Finite Field Arithmetic-AES Structure-AES Transformation Functions-AES Key Expansion. **Asymmetric Ciphers:** Principles of public – key cryptosystems-The RSA Algorithm.

Unit IV **(18 hours)**

Other Public-Key Cryptosystem: Diffie-Hellman Key Exchange-Elgamal cryptographic system-Elliptic curve arithmetic- Elliptic curve Cryptography. **Digital Signature:** Digital signature - Elgamal Digital Signature Scheme-Schnorr Digital Scheme-NIST Digital signature algorithm.

Unit V **(18 hours)**

Wireless Network Security: Wireless Security-Mobile Device Security-IEEE802.11 Wireless LAN Overview- IEEE802.11 Wireless LAN Security. **Electronic Mail Security:** Internet Mail Architecture-Email Formats-Email Threats and compressive Email Security-S/MIME –DNSSEC-Sender policy Framework-Domain Keys Identify Mail.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Define various Cryptographic Techniques
CO2: Demonstrate various data encryption techniques
CO3: Explain the encryption standard and asymmetric ciphers
CO4: Analyze Hashing and Digital Signature techniques
CO5: Discuss various Security Applications

Text Book:

1. William Stallings, *Cryptography and Network Security Principles and Practice*, Pearson Education, Seventh Edition, 2017.

Reference Books:

1. Wade Trappe, Lawrence C Washington, *Introduction to Cryptography with Coding Theory*, Pearson Education, Second Edition, 2007.
2. William Stallings, *Cryptography and Network security Principles and Practices*, Pearson Education, Fourth Edition, 2006.
3. W.Mao, *Modern Cryptography – Theory and Practice*, Pearson Education, Second Edition, 2007.

E- Resource:

1. https://nptel.ac.in/courses/106/105/106105162/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	9	9	9	**41**
CO2	9	3	1	1	9	9	9	**41**
CO3	9	3	1	1	9	9	9	**41**
CO4	9	3	1	1	9	9	9	**41**
CO5	9	3	1	1	9	9	9	**41**
Total	**45**	**15**	**5**	**5**	**45**	**45**	**45**	**205**

Low-1 Medium-3 High-9

Core XIV – Machine Learning

(For Students Admitted from 2022-23)

Semester: IV **Hours/week: 6**
Subject Code: IMCSC42 **Credit: 5**

Course Objectives:

1. To recognize the characteristics of machine learning that makes it useful to real-world problems
2. To understand the concept behind neural networks for learning non-linear functions

Unit I **(18 hours)**

Introduction: Well-Posed Learning Problems-Designing a Learning System-Perspectives and Issues in Machine Learning. Concept Learning: Introduction - A Concept Learning Task-Concept Learning as Search - Decision Tree Learning: Introduction-Decision Tree Representation-Appropriate Problems-Basic Decision Tree Learning Algorithm-Hypothesis Space Search-Inductive Bias-Issues.

Unit II **(18 hours)**

Artificial Neural Networks: Introduction-Neural Network Representations - Appropriate Problems - Perceptrons - Multilayer Networks and the Back Propagation Algorithm-An Illustrative Example: Face Recognition-Advanced Topics.

Unit III **(18 hours)**

Bayesian Learning: Introduction-Bayes Theorem-- Bayes Theorem and Concept Learning – Maximum Likelihood and Least-squared Error Hypotheses- Maximum Likelihood Hypothesis for Predicting Probabilities-Minimum Description Length Principle-Bayes Optimal Classifier-Gibbs Algorithm-Naïve Bayes Classifier-An Example: Learning to Classify Text-Bayesian Belief Networks-The EM Algorithm.

Unit IV **(18 hours)**

Instance-Based Learning: Introduction-K-Nearest Neighbor Learning-Locally Weighted Regression-Radial Basis Functions-Case-based Reasoning - Genetic Algorithms: Genetic Algorithms-An Illustrative Example-Hypothesis Space Search-Genetic programming-Models of Evolution and Learning-Parallelizing Genetic Algorithms.

Unit V **(18 hours)**

Learning Sets of Rules: Introduction-Sequential Covering Algorithms-Learning Rule Sets: Summary- Learning First-Order Rules-Learning Sets of First-Order Rules: FOIL - Induction as Inverted Deduction-Inverting Resolution - Reinforcement Learning: Introduction-Learning Task-Q Learning-Nondeterministic Rewards and Actions-Temporal Difference Learning-Generalizing from Examples-Relationship to Dynamic Programming.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand the need for machine learning for various problem solving

CO2: Demonstrate Decision Tree Learning Algorithm, Back propagation algorithm, Gibbs Algorithm, K-Nearest Neighbor Learning and Temporal Difference Learning with examples

CO3: Categorize the various supervised, semi-supervised and unsupervised learning algorithms in machine learning

CO4: Apply different classification techniques in real time examples

CO5: Design appropriate machine learning algorithms for different problems

Text Book:

1. Tom M. Mitchell, *Machine Learning*, Tata McGraw Hill, 2017.

Reference Books:

1. Jeremy Watt, Reza Borhani, Aggelos K Katsaggelos, *Machine Learning Refined Foundations, Algorithms & Applications*, Cambridge University Press, , 2016.
2. Ethem Alpaydin, *Introduction to Machine Learning*, MIT Press Cambridge, 2010.
3. Andreas C. Muller and Sarah Guido, *Introduction to Machine Learning with Python*, O'Reilly Media, First Edition, 2016.

E -Resources:

1. https://nptel.ac.in/courses/106/106/106106139/
2. https://onlinecourses.nptel.ac.in/noc22_cs58/preview

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	3	3	9	9	**37**
CO2	9	1	3	3	3	9	9	**37**
CO3	9	1	3	3	3	9	9	**37**
CO4	9	1	9	3	3	9	9	**43**
CO5	9	3	9	9	3	9	9	**51**
Total	**45**	**7**	**27**	**21**	**15**	**45**	**45**	**205**

Low-1 Medium-3 High-9

Core XV - Project

(For Students Admitted from 2022-23)

Semester: IV **Hours/week: 18**

Subject Code: IMCSC43PW **Credit: 5**

Course Objectives:

1. To understand the fundamental principles of Project management and be familiar with the different methods and techniques used for project development
2. To get good knowledge of the issues and challenges faced while doing the project and to do the Project Scheduling, tracking, Risk analysis, Quality management and Project Cost estimation using different techniques

Students have to undergo an individual project work either on campus or in an industry and appear for the viva voce examination with the software developed and document prepared by them

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Identify goals, constraints, deliverables, performance criteria and resource requirements in consultation with stakeholders

CO2: Implement the plan by executing the code

CO3: Integrate the various aspects of software development for the total project

CO4: Construct the entire software project according to the specific problem

CO5: Check the software project by executing with the various data

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	9	9	9	9	**63**
CO2	9	9	3	9	9	3	3	**45**
CO3	9	9	9	3	9	9	9	**57**
CO4	9	9	9	3	9	9	3	**51**
CO5	9	9	3	9	9	9	9	**57**
Total	**45**	**45**	**33**	**33**	**45**	**39**	**33**	**273**

Low-1 Medium-3 High-9

Extra Credit I - RDBMS Lab

(For Students Admitted from 2022-23)

Semester: I

Subject Code: IMCSX1P **Credit: 2**

Course Objectives:

1. To explain basic database concepts, applications, data models, schemas and instances and emphasize the importance of normalization in databases
2. To demonstrate the use of constraints and relational algebra operations and describe the basics of SQL and construct queries using SQL

LIST OF PROGRAMS

SQL DDL

1. Create an address table with fields name, doorno , street & city
   - describe its structure
   - alter the table to include pincode
   - alter the table to modify street column
   - drop the table

DML

2. Create a student table with regno, name, age and dept.
   - insert records
   - delete the students with age above 20
   - truncate and drop the table

Functions

3. Create an employee table with fields eno , ename , sex ,age & years of experience
   - find out the no. of female employees
   - find out the employees with age ranging between 30 and 35
   - list out the employees who are working more than 5 years
4. Create a library file with fields accno,title,author,cost & no of copies
   - arrange the books according to accno
   - find out the TOTAL no. of books available in the library
   - find out the book of minimum cost
5. Create a player table with fields name,sports(cricket,hockey,etc.),age & country
   - find out the eldest and youngest player
   - group players according to sports
   - list out the Indian players
6. Write the SQL queries to illustrate all number functions
7. Write the SQL queries to illustrate date functions
8. Write the SQL queries to illustrate all string functions
9. Create an item table with field's itemno, itemname, quantity & price and insert records.
10. Illustrate the comparison operators (between, like, in & isnull)
11. Create a table with the fields clientno, clientname & phoneno. Illustrate the set operators union , unionall, minus & intersect
12. Create a student table with fields' regno, name, English, Tamil, Maths and TOTAL
    - insert records
    - arrange all records according to TOTAL
    - find the student who got first mark in Maths
    - list out the students whose name starts with 'S'
13. Create an inventory table with fields' itemno, itemname, qnty, price and reorder level
    - insert records
    - update the qnty when it goes less than reorderlevel
    - list the items with price less than 100
14. Create an employee table with fields ecode, ename, age & salary and create a department table with fields ecode, designation, deptcode & dept. Illustrate joins and sub queries using the above tables.

Constraints

15. Create a vendormaster table with fields vencode,venname,place and phoneno
    Create an ordermaster table with fields item no, itemcode, vencode, qnty and orderdate.
    Illustrate the following constraints using the above tables
    - vencode as primary key in vendormaster
    - vencode as foreign key in ordermaster
    - phoneno as unique
    - place as notnull &
    - qnty > 100

Note: - Questions for the internal examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Demonstrate DDL, DML and TCL Commands

CO2: Apply the basic concepts of Database Systems and Applications

CO3: Illustrate the use of implementing constraints in tables

CO4: Implement normalization queries using SQL in database creation and interaction

CO5: Design ER-models to represent simple database application scenarios

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	9	1	3	9	9	**41**
CO2	9	1	9	1	3	9	9	**41**
CO3	9	1	9	1	3	9	9	**41**
CO4	9	1	9	1	3	9	9	**41**
CO5	9	1	9	1	3	9	9	**41**
Total	**45**	**5**	**45**	**5**	**15**	**45**	**45**	**205**

Low- 1 Medium-3 High-9

Extra Credit II - Internship

(For Students Admitted from 2022-23)

Semester: II

Subject Code: IMCSX2P **Credit: 2**

Course Objectives:

1. To articulate and apply principles learned in and outside of the classroom to a specific internship site experience
2. To get the practical knowledge to apply programming skills for developing a project

Students have to undergo an internship in an industry and submit document prepared by them about the internship programme. It can be a group work with a group size of maximum two members. The Internship should be completed and submitted before the commencement of III Semester and viva will be conducted in the first week of III Semester.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand self-understanding, self-confidence, and interpersonal skills

CO2: Assess Strengths, Weaknesses, Opportunities and Threats (SWOT) and explore career options and gain general work experience

CO3: Examine any specific learning outcomes identified in supplemental documentation provided as part of the internship application process

CO4: Apply various soft skills such as time management, positive attitude and communication skills during performance of the tasks assigned in internship organization

CO5: Create the document which contains company profile by compiling the brief history, management structure, products / services offered, key achievements and market performance for organization of internship

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	9	3	3	9	**39**
CO2	9	3	3	9	1	1	9	**35**
CO3	3	3	3	9	1	1	9	**29**
CO4	9	1	3	9	1	1	9	**33**
CO5	9	3	1	9	1	3	9	**35**
Total	**39**	**13**	**13**	**45**	**7**	**9**	**45**	**171**

Low-1 Medium-3 High-9

Extra Credit IV – Document Preparation Lab (LATEX)

(For Students Admitted from 2022-23)

Semester: IV

Subject Code: IMCSX4P **Credit: 2**

Course Objectives:

1. To get practical knowledge on preparing documents containing mathematical formulas
2. To prepare a technical and scientific documentation

LIST OF PROGRAMS

1.Create a document using an input file
2.Create a document using special symbols, dashes, line breaks & footnotes
3.Create a document using the sectioning command
4.Create a document using quotations, typestyle, commands & environments
5.Create a document using the mathematical symbol
6.Create a document using arrays and table
7.Create a document using a bibliography
8.Create a document using clauses and page style
9.Create a document using pictures and colors

10.Create a document using basics of the math index
11.Create a document using fine print and bibliography database
12.Create a document using math mode, tabbing environment, and files
Note: - Questions for the External examination will be based on the concepts learnt

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Identify bibliography database
CO2: Relate math mode, and fine print
CO3: Apply mathematical symbol to create the document
CO4: Select clauses, typestyle, commands, and page style
CO5: Create Latex documents

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	3	3	3	3	**25**
CO2	9	1	1	3	3	3	3	**23**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	1	9	3	9	9	9	**49**
CO5	9	3	9	3	9	9	9	**51**
Total	**45**	**9**	**25**	**15**	**33**	**33**	**33**	**193**

Low- 1 Medium-3 High-9

B Sc Information Technology

(Three Year Regular Programme)
(For students admitted from 2022 -23)

Programme Specific Outcomes (PSO):

On completion of this programme, student will be able to gain

PSO1: Exhibit technical skills and excel as computer professionals, academicians, researchers and entrepreneurs

PSO2: Implement professional practice along with ethical values to serve the society

PSO3: Developing strong problem solving, analyzing and decision-making abilities. Identify the informationand apply their disciplinary knowledge and professional skills to meet required specification

PSO4: Extract computing solutions for real-world problems with the help of interdisciplinary area

PSO5: Apply strong communication and interpersonal skills, to reveal their ideas effectively in **a** working environment

PSO6: Engage in life-long learning, to remain stable in their profession and update themselves to enhance their career positions in IT industries

PSO7: Impart students to develop the programming knowledge

PREAMBLE

The Board of Studies of Computer Science revamped the curriculum with the following changes

Core Courses

- Data Structures and Algorithm, Artificial Intelligence and Expert System has been introduced
- The allied course Digital electronics and Lab shifted from III semester to I semester as Core course
- New syllabus has been framed for Programming in C Language, RDBMS and RDBMS Lab
- Software Engineering has been shifted from VI Semester to V Semester
- The Course Programming in Java and Programming in java Lab shifted from V Semester to VI Semester

Ability Enhancement Compulsory Course (AECC)

- Core courses Mathematics for Computer Science I and Mathematics for Computer Science II removed from semester III andIV and Discrete Mathematics and Statistics has been introduced

Discipline Specific Elective

- Computer System Architecture, Cloud and Distributed Computing, Block Chain Technology, Web Technology has beenintroduced and framed the syllabus

Skill Enhancement Course

- New syllabus has been framed for Designing Lab in Semester II
- Linux and Shell Programming Lab has been shifted from II Semester to Vth Semester
- New syllabus framed for Web Designing Lab(HTML and JAVA Scripting) replaced with Multimedia Lab
- PHP Lab has been shifted from III Semester to IV Semester and renamed Programming

in PHP LAB

- Software Development Framework Lab (ASP.NET) has been shifted from VI Semester to V Semester
- Visual Programming Lab has been shifted from IV Semester to V Semester and converted to Skill Based Elective

Extra Credit

- The Course Skills for Employability renamed as Employability Skills shifted from VI semester to V Semester andreframed the syllabus

General Interest Course

- The Course Environmental Studies converted into Environmental Science
- The Course Women Studies converted into Women Entrepreneurship

Others

- Course Objectives included for all the courses
- Programme Outcomes and Programme Specific Outcomes modified
- Elective course renamed as Discipline Specific Elective (DSE)
- Skill Based Elective renamed as Skill Enhancement Course(SEC)
- Allied renamed as Ability Enhancement Compulsory Course (AECC)
- Mapping of course outcomes to programme outcomes table included for all the courses

PROGRAMME STRUCTURE – PROGRAM CODE : UIT

Sem	Subject Code	Course	Subject Title	Hours / Week	Credit	CIA	ESE	Total Marks
I	IBLT11/ IBLA11/ IBLH11	LanguageI	Tamil I/ Arabic I/ Hindi I	5	3	40	60	100
	IBLEI12/IBLEII12	LanguageII	English I a (or) b	5	3	40	60	100
	IBITC11	Core I	Principles of Information Technology	5	4	40	60	100
	IBITC12	Core II	Digital Electronics	6 (T-4 P-2)	5	40 (T-20 P-20)	60	100
	IBITA13	AECC I	Accounting Principles & Package	5	4	40	60	100
	IBITS14P	SEC I	Office Automation Lab	2	2	-	50	50
			Library/Browsing	1	-	-	-	-
			Remedial/Games	1	-	-	-	-
			TOTAL	**30**	**21**	**200**	**350**	**550**
II	IBLT21/ IBLA21/ IBLH21	Language I	Tamil II/ Arabic II/ Hindi II	5	3	40	60	100
	IBLEI22/ IBLEII22	Languages	English II a (or) b	5	3	40	60	100

	IBITC21	Core III	Programming in C	5	5	40	60	100
	IBITC22P	Core IV	Programming in C Lab	4	4	40	60	100
	IBITA23	AECCII	Costing Accounting & Package	5	4	40	60	100
	IBITS24P	SEC II	Designing Lab	2	2	-	50	50
	IBES2	GIC I	Environmental Science	2	2	-	50	50
			Library/Browsing	1	-	-	-	-
			Remedial/Games	1	-	-	-	-
	IBITX2P/ IBITX2O	Extra Credit I	Corel Draw Lab/ * Online Course	-	2	-	100	100
			TOTAL	**30**	**23+2**	**200**	**400+ 100**	**600+ 100**
III	IBLT31/ IBLA31/ IBLH31	LanguageI	Tamil III / Arabic III / Hindi III	5	3	40	60	100
	IBLEI32/ IBLEII32	Language II	English III a (or) b	5	3	40	60	100
	IBITC31	Core V	Programming in C++	4	4	40	60	100
	IBITC32P	Core VI	Programming in C++ Lab	4	4	40	60	100
	IBITA33	AECCIII	Discrete Mathematics	4	4	40	60	100
	IBITS34P	SEC III	Web Designing Lab (HTML and Java Script Language)	2	2	-	50	50
		OEC		2	2	-	50	50
	IBHR3	GIC II	Human Rights	2	2	-	50	50
	IBXTN3	Extension	NSS / CSS	2	2	100	-	100
	IBITX3P/ IBITX3O	Extra Credit II	Visual Basic Lab/ * Online Course	-	2	-	100	100
			TOTAL	**30**	**26+2**	**300**	**450+ 100**	**750+ 100**
IV	IBLT41/ IBLA41/ IBLH41	Language I	Tamil IV / Arabic IV / Hindi IV	5	3	40	60	100
	IBLEI42/ IBLEII42	Language II	English IV a (or) b	5	3	40	60	100
	IBITC41	Core VII	○ RDBMS	5	4	40	60	100
	IBITC42P	Core VIII	RDBMS Lab	4	4	40	60	100
	IBITA43	AECCIV	Statistics	5	4	40	60	100
	IBITS44P	SEC IV	Programming in PHP Lab	2	2	-	50	50
	IBLVE4	GIC III	Life Skills and Value Education	2	2	-	50	50
		OEC		2	2	-	50	50
	IBITX4P/ IBITX4O	Extra Credit III	#R Tool Lab Internship	-	2	-	100	100

			TOTAL	**30**	**24+2**	**200**	**450+100**	**650+100**
V	IBITC51	Core IX	Software Engineering	6	5	40	60	100
	IBITC52	Core X	Operating Systems	6	5	40	60	100
	IBITC53	Core XI	○Data Structures and Algorithms	6	5	40	60	100
	IBITE5A/ IBITE5B	DSE I	a)Computer System Architecture b)Cloud and DistributedComputing	4	4	40	60	100
	IBITE5C/ IBITE5D	DSE II	a)Blockchain Technology b)Internet of Things	4	4	40	60	100
	IBITS54P	SEC V	Linux and Shell Programming Lab	2	2	-	50	50
	IBWE5	GIC IV	Women Entrepreneurship	2	2	-	50	50
	IBITX5/ IBITX5O	Extra Credit IV	Employability Skills	-	2	100	-	100
			TOTAL	**30**	**27+2**	**200+100**	**400**	**600+100**
VI	IBITC61	Core XII	Computer Networks	6	5	40	60	100
	IBITC62	Core XIII	Programming in Java	6	4	40	60	100
	IBITC63P	CoreXIV	Programming in Java Lab	5	4	40	60	100
	IBITC64PW	Core XV	Project	6	5	40	60	100
	IBITE6A/ IBITE6B	DSE III	a)Artificial Intelligence and Expert System b)Organizational Behavior	4	4	40	60	100
	IBITS65P	SEC VI	Open Technology Lab	2	2	-	50	50
	IBITX6P/ IBITX6O	Extra Credit V	Data Mining Lab/*Online Course	-	2	-	100	100
			Library / Browsing	1	-	-	-	-
			TOTAL	**30**	**24+2**	**200**	**350+100**	**550+100**
			Grand Total	**180**	**145+10**	**1300+100**	**2400+400**	**3700+500**

*****For Online Course credit alone will be assigned on submission of certificate obtained by appearing for online examination from EdX, Spoken Tutorial, NPTEL or Coursera etc.

#For internship course, refer www.internshala.com

- For online course integration, syllabus will be taken from spoken tutorial.

AECC - Ability Enhancement Compulsory Course
SEC - Skill Enhancement Course
DSE - Discipline Specific Elective

OEC - Open Elective Course
GIC – General Interest Course

Core I – Principles of Information Technology

(For Students Admitted from 2022-23)

Semester: I **Hours/week: 5**
Subject Code:IBITC11 **Credit: 4**

Course Objectives:

1. To know the generation of computers and various I/O devices
2. To understand new developments in the digital communication and Networks

Unit I **(15 hours)**

Computer System: Algorithms-Simple model of Computer - Characteristics of a Computer - Problem solvingof a computer. **Data Representation:** Representation of a computer-Integer-Fractions-Hexadecimal-Decimal to Binary Conversion-Error Detecting Code. Input/output Units: Traditional Computer Input/output Units- other Input Technologies-Computer Output Devices.

Unit II **(15 hours)**

Computer Memory: Memory Cell-Memory Organization-ROM-Serial Access Memory-Physical Devices Used to Construct Memories-Magnetic Hard Disk-CDROM-Magnetic Tape Drive-Memory Hierarchy. Computer Generation: First Generation-second Generation-Third Generation-Fourth Generation-FifthGeneration-Moore Law-Classification of Computers.

Unit III **(15 hours)**

Computer Architecture: Interconnection of Units-Processor to Memory Communication-I/O Devices to processor Communication-Interrupt Structures-Multiprogramming. **Operating systems:** Batch Operating System-Multiprogramming Operating system-Time sharing Operating System-On-Line and Real Time systems-UNIX Operating Systems.

Unit IV **(15 hours)**

Computer Network: Communication Protocols-LAN-Using Public switched Telephone Network to Connect Computers-Interconnecting Networks-Internet and WWW-Internet Security. Voice and Data Communications: Communication Channels-Allocation of Communication Channel- Physical Communication Media-Public Switched Telephone Networks-Cable Modems-Cellular Communication Systems-Spread Spectrum Technology-Wireless LAN-WiMAX.

Unit V **(15 hours)**

Multimedia Data Acquisition: Image Acquisition-Storage formats for pictures-Compression of Video Data- MPEG Compression Standard-Acquiring and Storing Audio Signals-Compression of Audio Signals-Audio Signal Processing. Emerging Computing Environments: Current Computing Scenario-Peer to peer computing- Grid computing-Cloud Computing.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Summarize the concept of computer system, architecture, network, memory
CO2: Explain how computers are networked and how an operating system interacts with hardware
CO3: Illustrate the working of voice and data communication systems and networks
CO4: Evaluate and measure the performance of computer security and virus
CO5: Develop the applications in multimedia and cloud computing

Text Book:

1. V Raja Raman, Neeharika Adabala, *Fundamentals of Computers***,** PHI Learning Private Limited, 2018.

Reference Books:

1. Alex Leon, Methew Leons, *Fundamentals of Information Technology*, Tata McGraw Hill, Fourth Edition, 2007.
2. Bethesda MD, *Planning for Integrated Academic Information Management Systems*, Proceedings of a symposium sponsored by the National Library of Medicine, 1984.

E-Resources:

1. https://www.coursera.org/courses?query=computer%20fundamentals
2. https://www.classcentral.com/course/swayam-computer-fundamentals-13950
3. http://osou.ac.in/eresources/dca01-block01-computer-fundamental.pdf

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	3	9	3	9	**37**
CO2	9	3	3	3	3	9	9	**39**
CO3	9	1	9	9	3	3	9	**43**
CO4	3	1	3	9	9	3	3	**31**
CO5	9	1	9	3	3	9	9	**43**
Total	**39**	**9**	**25**	**27**	**27**	**27**	**39**	**193**

Low-1 Medium-3 High-9

Core II - Digital Electronics

(For Students Admitted from 2022-23)

Semester: I **Hours/week: 6(T: 4 P: 2)**
Subject Code: IBITC12 **Credit: 5**

Course Objectives:

1. To know the concepts of Combinational circuits.
2. To understand the concepts of flip flops, registers and counters

Unit I **(12 hours)**

Number Systems and Codes: Introduction- binary, octal, decimal, and hexadecimal number system- decimal to binary, octal to binary, hexadecimal to binary – hexadecimal to octal conversions and vice versa-binary arithmetic-1s and 2s complement representations-BCD

addition and subtraction-weighted and un- weighted codes- alphanumeric codes.

Unit II **(12 hours)**

Basic Boolean functions: AND, OR, NOT Functions- Boolean theorems and laws-use of Boolean algebra for simplification of logical expressions- minterm and maxterm- canonical sum of products and product of sum simplifications- minimization of logical expressions using K-map-logic gates- AND,OR,NOT,EX- OR,NAND,NOR gates.

Unit III **(12 hours)**

Introduction to combinational logic circuits: arithmetic circuits –half adder, full adder, half subtractor, full subtractor, parallel binary adder - subtractor, serial adder, multiplier and divider-encoder, decoder.

Unit IV **(12 hours)**

Introduction to sequential circuits-flipflops-SR,JK,D and T flipflops-master-slave flipflops-level and edge triggering-synchronous and asynchronous counters- up/down counters- modulo-n- counters- shift registers- serial in serial out-serial in parallel out,parallel in serial out and parallel in parallel out shift counters- ring counters.

Unit V **(12 hours)**

Read only memory- architecture of ROM, PROM, EPROM, EEPROM, ROM applications-RAM- RAMarchitecture-static and dynamic RAM.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Remember the basic structure of number system methods like binary, octal and hexadecimal

CO2: Apply the functions to simplify the logical expressions

CO3: Analyze the operations of various logical circuits

CO4: Evaluate the functions of the memory organization

CO5: Create the sequential and combinational logic circuits

Text Book:

1. S. Salivahanan, S. Arivazhagan, *Digital Circuits and Design*, Oxford University Press, 2018.

Reference Books:

1. M. Morris Mano, Michael D. Ciletti, *Digital Design*, Pearson Education, Fifth Edition, 2014.
2. A.Anand Kumar, *Fundamentals of Digital Circuits*, PHI Learning Private Limited, Fourth Edition, 2016.
3. Anil K.Maini, *Digital Electronics*, Wiley Publishers, 2014.
4. Charles H.Roth., *Fundamentals of Logic Design*, Thomson Learning, Sixth Edition, 2013.

E-Resources:

1. https://nptel.ac.in/courses/108/105/108105113/
2. https://www.classcentral.com/course/swayam-digital-electronic-circuits-12953
3. https://onlinecourses.swayam2.ac.in/cec21_cs16/preview

4. https://tutorialsinhand.com/tutorials/digital-electronics-tutorial/digital-electronics-basics/digital- electronics-introduction.aspx
5. https://www.udemy.com/course/introduction-to-digital-electronics/
6. https://www.udemy.com/course/basics-of-digital-electronics/

Digital Electronics (Lab)

Hours/Week: 2

Program List

Logic Gates

1. Verification of AND Gate using ICs
2. Verification of OR Gate using ICs
3. Verification of NOT Gate using ICs
4. Verification of NAND Gate using ICs
5. Verification of NOR Gate using ICs
6. Verification of EX-OR Gate using ICs

Universal Gates

7. Universality of NAND gates using IC 7400
8. Universality of NOR gates using IC 7402

Boolean algebra and Theorem

9. Verification of Boolean Expression using ICs
10. Verification of Demorgan's theorems using ICs

Combinational Logic Circuits

11. Binary half and full adder using ICs
12. Binary half and full subtractor using ICs

Note: - Questions for Internal examination will be based on concept learnt

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	3	9	**37**
CO2	9	3	3	1	9	3	9	**37**
CO3	9	3	3	1	9	3	9	**37**
CO4	9	3	3	1	9	3	9	**37**
CO5	9	3	3	1	9	3	9	**37**
Total	**45**	**15**	**15**	**5**	**45**	**15**	**45**	**185**

Low-1 Medium-3 High-9

SEC I - Office Automation Lab

(For Students Admitted from 2022-23)

Semester: I **Hours/week: 2**

Subject Code: IBITS14P **Credit: 2**

Course Objectives:

1. To acquire knowledge about word processing, spread sheet, Data base creation and slide preparation

2. To improve creative thinking in presentations

Program List

Word Processing:

1. Create a word processing document consists two pages in a Book named "XX" and then do the following:
    a. Formatting Text, Alignment and Font Style
    b. Perform Find and Replace
    c. Add Header and Footer option to specify name of the Book Chapter Heading and Page number of total pages
2. Create a word processing document having details of our College courses using bulleted and number lists.Type the title using Word Art.
3. Design a Letter to felicitate Farewell Address to our seniors with Font Setting/Page Borders/Word Art/Clip Art/Symbols.
4. Create a Newsletter Article (using Columns, Drop cap)
5. Create a time table for your Internal Exam Schedule (using Table)
6. Type Business letter and send it to more using Mail Merge
7. Create your own Resume

Spread Sheet:

1. Create a spreadsheet consists of Student details and then do the following:
    a. Calculate student wise total and subject wise total
    b. Find the Maximum and Minimum marks of the subject
2. Grade is calculated as
    i. If %>=90, then grade A
    ii. If %>=80 and <90, then grade B
    iii. If %>=70 and <80, then grade C
    iv. If %>=60 and <70, then grade D
    v. If %<60, then grade F
2. Create a spreadsheet having Employee details suitably and then do the following
    a. Use functions to calculate Net Pay and Gross Pay
    b. Perform conditional formatting and validation
3. Create a purchase order list for a company.
    a. Prepare a purchased item list with price
    b. Prepare a flowchart for the price wise item.
4. Create a macro

Presentation:

1. Create a presentation showing your various activities of the department a Performslide translation and Setting background designs
2. Create a presentation showing various aspect of your college and perform custom animation and import sound.
3. Create a presentation using design templates and then perform the following one:
    a. Include Table and chart from file
    b. Include Picture and run the presentation using auto play
4. Perform Hyperlink within slides and link other documents

Database:

1. Create a Student Database having Name, Regno, Tamil, English, Maths, Total, and Average Perform to findtotal and average and check data entered.

2. Create an Inventory database having Item Name, Item no. Quantity and Price. Perform query operation toretrieve data.
3. Create a form to enter the details of the Book database.
4. Create a report for the Book database.

Note:- Questions for Internal and External examination will be based on concept learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Illustrate various options of office application
CO2: Demonstrate different types of formats, formulas and transition in office application
CO3: Develop reports to solve the problems of manual report handling
CO4: Compare the options of different Microsoft office applications to use appropriately
CO5: Build a presentation, advertisement, reports etc for enterprises

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	3	9	3	9	**45**
CO2	9	9	3	9	9	9	9	**57**
CO3	9	9	3	9	9	9	9	**57**
CO4	9	3	3	3	9	3	9	**39**
CO5	9	9	3	3	9	3	9	**45**
Total	**45**	**39**	**15**	**27**	**45**	**27**	**45**	**243**

Low-1 Medium-3 High-9

Core III - Programming in C

(For Students Admitted from 2022-23)

Semester: II **Hours/week: 5**
Subject Code: IBITC21 **Credit: 5**

Course Objectives:

1. To improve the knowledge of complete understanding of Programming language C
2. To understand the main features of operators, input/ output statements, control statementsand program structure

Unit I **(15 hours)**

Introduction to C Programming: C Character Set – Writing first program of C- Identifiers and Keywords-A more useful C Program - Entering the program into the computer -Data types- Constants -Variables and Arrays- Declarations- Expressions -Statements- Symbolic constants.**Operators and Expressions:** Arithmetic Operators- Unary Operators Relational and logical Operators-Assignment Operators – The conditional Operators- Library functions.

Unit II **(15 hours)**

Data Input and Output: Preliminaries - The getchar function -The putchar function - The scanf function-The printf function- gets and puts function -Interactive programming.**Control Statements:** Preliminaries - Branching: The If-else Statement -Looping-while statement- do-while statement- for statement -nested control structures - switch statement – break statement

– continuestatement- coma operator -goto statement.**Functions:** A brief overview- Defining a function-Accessing a function -Function prototypes -Passing arguments to a function - Recursion.

Unit III **(15 hours)**

Program Structure: Storage classes – Automatic variables – External variables – Static variables – Multi File programs – More about library functions.**Arrays:** Defining an Array – Processing an Array – Passing arrays to Functions – Multidimensional arrays.

Unit IV **(15 hours)**

Strings: Defining a String – NULL Character – Initialization of Strings – Reading and writing a string – Processing strings – Character arithmetic – Searching and sorting of strings – Some more library Functions for strings.**Pointers:** Fundamentals – Pointer Declarations – Passing pointers to a function – Pointers and one dimensional arrays – Dynamic memory allocation – Operations on pointers - Pointers and multidimensionalarrays – Arrays of Pointers - Passing functions to other functions – More about pointer declarations.

Unit V **(15 hours)**

Structures and Unions: Defining a Structure – Processing a Structure – User defined data types – Structuresand pointers – Passing structures to functions – Self Referential structures – Unions.**File Handling:** Why Files - Opening and closing a Data file – Reading and writing a data file – Processing a data file – Unformatted data files – Concept of binary files – Accessing the file randomly.

Course Outcomes:

After successful completion of this course, the student will be able to

CO1: Describe the basic programming knowledge of C, operators and expressions
CO2: Demonstrate data input and output, control statements & functions
CO3: Analyse program structure and arrays
CO4: Evaluate strings and pointers
CO5: Formulate structures, unions and file handling

Text Book:

1. Byron Gottfried, *Programming with C*, Tata McGraw Hill, Fourth Edition, 2018.

Reference Books:

1. Balagurusamy E**,** *Programming in ANSI C*, Tata McGraw Hill, Sixth Edition, 2012.
2. Venugopal K R , Sudeep R Prasad, *Programming with C*, Tata McGraw Hill ,2008.
3. Mullish, Henry Cooper, Herbert, *The Spirit of C - An Introduction to Modern Programming*, Jaico Publishing House, Third Edition, 2006.

E - Resources:

1. https://onlinecourses.nptel.ac.in/noc19_cs42/preview
2. https://nptel.ac.in/courses/106/105/106105171/
3. https://onlinecourses.nptel.ac.in/noc21_cs01/preview
4. https://spoken-tutorial.org/tutorial-search/?search_foss=C+and+Cpp&search_language=English

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	9	9	3	9	**45**
CO2	9	3	3	3	9	3	9	**39**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	3	3	3	9	3	9	**39**
CO5	9	9	9	3	9	9	9	**57**
Total	**45**	**21**	**21**	**21**	**45**	**27**	**45**	**225**

Low-1 Medium-3 High-9

Core IV- Programming in C Lab

(For Students Admitted from 2022-23)

Semester: II **Hours/week: 4**
Subject Code: IBITC22P **Credit: 4**

Course Objectives

1. To introduce the field of programming using C language
2. To enhance the analyzing and problem solving skills and use the same for writing programs in C

Program List

Formula substitution

1. Develop a C Program to check whether the given number is odd or even
2. Develop a C Program to find sum of the digits and reverse the digits
3. Develop a C Program to generate the Fibonacci series
4. Develop a C Program to generate Prime number within range
5. Develop a C Program to find whether a given number is Armstrong or not
6. Develop a C Program to count the number of positive, negative and zero in the list
7. Develop a C Program to solve the Quadratic Equation
8. Develop a C Program to find the area of various shapes using switch case

Array

9. Develop a C Program to Find Matrix Addition , Subtraction, Multiplication and Transpose of a matrix using switch case
10. Develop a C Program to Check whether the element is present in the given list or not
11. Develop a C Program to sort numbers in ascending and descending order
12. Develop a C Program to sort names in Alphabetical order

Functions & Structures

13. Develop a C Program to find the factorial of a given number using function declaration
14. Develop a C Program to find the factorial of a given number using recursion function
15. Develop a C Program to Prepare student mark list using structure
16. Develop a C Program to Prepare electricity bill using structure

String Manipulation

17. Develop a C Program to count the vowels in the given string
18. Develop a C Program to convert the case of given string from upper case to lower case

and vice versa

Pointers

19. Develop a C Program to sort numbers in ascending order using pointers
20. Develop a C Program to find average of two numbers using pointers

Note:-Questions for Internal and External examination will be based on concept learnt

Course Outcomes:

After successful completion of the course, student will be able to

CO1: Remember the control structures and loops
CO2: Apply the concepts of functions and pointers
CO3: Analyze the concepts of structures and arrays
CO4: Evaluate string handling functions
CO5: Create programs with pointers, arrays and structures

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	9	9	**43**
CO2	9	3	3	1	9	9	9	**43**
CO3	9	3	3	1	9	9	9	**43**
CO4	9	3	3	1	9	9	9	**43**
CO5	9	3	3	1	9	9	9	**43**
Total	**45**	**15**	**15**	**5**	**45**	**45**	**45**	**215**

Low-1 Medium-3 High-9

SEC II –Designing Lab

(For Students Admitted from 2022-23)

Semester: II **Hours/week: 2**
Subject Code: IBITS24P **Credit: 2**

Course Objectives:

1. To understand the basic concepts of GIMP
2. To gain knowledge about various tools of GIMP

GIMP

1. Design a Business card
2. Create a logo
3. Convert an image into pencil drawing
4. Design a scenery using various brushes
5. Design a greeting card
6. Create clipping mask – place an image inside text
7. Create passport size photo
8. Animate a still photo
9. Create a shadow effect for an object
10. Create a mirror effect for an image
11. Apply the following tools in an image:

i) Smudge ii)Blur/Sharpen iii)Dodge/Burn

12.Create a mosaic photo collage

Note:-Questions for Internal and External examination will be based on concept learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Recognize the uses of various tools and effects in GIMP

CO2: Identify the steps to start designing with images

CO3: Simplify the process of designing, editing, masking etc. to solve the difficulties of designers

CO4: Support studios to create passport size photo

CO5: Design visiting card, ID card, birthday card, logo etc.

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	9	9	1	**43**
CO2	9	1	9	9	3	9	3	**43**
CO3	9	3	9	9	3	9	9	**51**
CO4	9	1	3	9	3	9	3	**37**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**17**	**39**	**39**	**27**	**45**	**25**	**237**

Low-1 Medium-3 High-9

Core V- Programming in C++

(For Students Admitted from 2022-23)

Semester: III **Hours/week: 4**

Subject Code: IBITC31 **Credit: 4**

Course Objectives:

1.To enhance the knowledge of complete understanding of programming language C++

2.To understand the main features of operators and control statements

Unit I **(12 hours)**

Principles of Object-Oriented Programming Paradigm: Basic Concepts of Object Oriented Programming-Benefits of OOP - Object Oriented languages - Application of OOP.**Beginning with C++:** What is C++ - Applications of C++ - A Simple C++ program – More C++ statements-An example with Class – Structure of C++ program – Creating the source file – Compiling and Linking.**Tokens, Expressions and Control Structure**: Introduction – Tokens – Keywords – Identifiers and Constants-Data types – Operators in C++ - Operator Overloading – Operator Precedence – Control structures.

Unit II **(12 hours)**

Functions in C++: Introduction- The main function- Function prototyping- Call by Reference- Return by Reference- Inline Functions- Default Arguments- Const Arguments-

Function Overloading- Function and Virtual Functions- Math Library Functions.**Classes and Objects:** Introduction , Specifying a Class, Defining Member Functions, A C++ Program with Class, Making an Outside Function Inline, Nesting of Member Functions, Private Member Functions, Array within a Class, Memory Allocation for Objects, Static Data Members, Static Member Functions, Array of Objects, Objects as Function Arguments, Friendly Functions, Returning Objects, Const Member Functions.

Unit III **(12 hours)**

Operator Overloading and Type Conversions: Introduction, Defining Operator Overloading – Overloading Unary, Binary Operators – Overloading Binary Operators using Friends – Manipulation of Strings using Operators - Rules for Overloading Operators.**Inheritance:** Extending Classes: Introduction, Defining Derived Class, Single Inheritance, Making Private Member Inheritable, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Virtual Base Class, Abstract Classes, Constructors in Derived Classes, Member Classes: Nestingof Classes.

Unit IV **(12 hours)**

Pointers, Virtual Functions and Polymorphism: Introduction, Pointers, Pointers to Objects, this Pointer, Pointer to Derived Classes, Virtual Functions, pure Virtual functions.**Managing Console I/O Operations:** Introduction, C++ Streams, C++ Stream classes, Unformatted I/O Operations, Formatted Console I/O Operations, Managing Output with Manipulators.

Unit V **(12 hours)**

Working with files: Introduction – classes for file stream operations- opening and closing a file – DetectingEnd of file – more about open - File modes.**Templates:** Introduction – class Templates – class templates – class templates with multiple parameters-function templates – function templates with multiple parameters.**Exception Handling:** Introduction- Basics of Exception Handling – Exception Handling Mechanism- throwing Mechanism-catching mechanism.

Course Outcomes:

After successful completion of this course, the student will be able to

CO1: Describe the principles of object oriented programming paradigm, C++ tokens, expressions andcontrol structures

CO2: Illustrate functions in C++, the concept of classes and objects

CO3: Analyse operator overloading, type conversions and inheritance extending classes

CO4: Relate pointers, virtual functions, polymorphism and managing console I/O operations

CO5: Formulate working with files, templates and exception handling

Text Book:

1. E. Balagurusamy, *Object - Oriented Programming with C++*, Eighth Edition, Tata McGraw- HillPublishing Company Limited, 2020.

Reference Books:

1. Ivor Horton, *Beginning C++ The Complete Language*, Shroff Publishers and Distributors Private Limited, 2007.
2. Venugopal K R, Rajkumar B, and RaviShankar T, *Mastering C++*, Tata McGraw Hill**,** Fifth

Reprint, 2006.

E - Resources:

1. NPTEL: https://onlinecourses.nptel.ac.in/noc21_cs02/preview
2. NPTEL: https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-cs38/
3. NPTEL: https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs17/
4. NPTEL: https://nptel.ac.in/courses/106/101/106101208/
5. https://spoken-tutorial.org/tutorial-search/?search_foss=C+and+Cpp&search_language=English

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	9	9	3	9	**45**
CO2	9	3	3	3	9	3	9	**39**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	3	3	3	9	3	9	**39**
CO5	9	9	9	3	9	9	9	**57**
Total	**45**	**21**	**21**	**21**	**45**	**27**	**45**	**225**

Low-1 Medium-3 High-9

Core VI - Programming in C++ Lab

(For Students Admitted from 2022-23)

Semester: III **Hours/week: 4**
Subject Code: IBITC32P **Credit: 4**

Course Objectives

1. To solve simple programs using C++
2. To implement operator overloading and inheritance

Program List

Formula Substitution

1. To check a given number is odd or even
2. To check a given number is palindrome or not using class
3. To sort the list of numbers using class

Functions

4. To check a given number is positive or negative using function
5. To find sum of digit using nesting of member function
6. To demonstrate unary operator using friend function

Constructors

7. To find reverse of digit using constructor

Overloading

8. To find area of shapes using function overloading
9. To add two complex numbers using binary operator overloading

Inheritance

10. To perform student mark list using single inheritance
11. To prepare electricity bill using multilevel inheritance

Pointer

12. To searching an element in the list using pointer
13. To checking a given number is prime or not using pointer to object

File Handling

14. To create a new files to store content and display number of words in the files

Exception Handling

15. To demonstrate user defined exception

Note: - Questions for Internal and External examination will be based on concept learnt

Course Outcomes:

After successful completion of the course, student will be able to

CO1: Remember the different programming paradigm such as procedure oriented and object-oriented programming methodology and conceptualize elements of OO methodology
CO2: Apply the concepts of object oriented programming
CO3: Analyze the usage of pointers and exception handling
CO4: Evaluate the concepts of inheritance and overloading features.
CO5: Create programs with the usage of files, templates and exception Handling

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	9	9	**43**
CO2	9	3	3	1	9	9	9	**43**
CO3	9	3	3	1	9	9	9	**43**
CO4	9	3	3	1	9	9	9	**43**
CO5	9	3	3	1	9	9	9	**43**
Total	**45**	**15**	**15**	**5**	**45**	**45**	**45**	**215**

Low-1 Medium-3 High-9

SEC III – Web Designing Lab (HTML and Java Script Language)

(For Students Admitted from 2022-23)

Semester: III **Hours/week: 2**
Subject Code:IBITS34P **Credit: 2**

Course Objectives:

1. Analyze a web page and identify its elements and attributes
2. Build dynamic web pages by using Java script

Program List

HTML

1. Create a HTML page for displaying the personal information by using various tags such as backgroundcolor, heading tag, font tag

2. Create a HTML page, which includes images and audio for any application.
3. Create a HTML page for displaying the Tender notice which is given to you
4. To create a Time Table of your class using HTML.
5. Create mark sheet preparation using table
6. Creation of Lists in HTML
7. Create web site for your company product advertisement in HTML
8. Create your own website for your personal information

Frames

9. To create a simple website for our college
10. To create a dictionary using frames. The words are displayed in one frame and when you click the word,the meaning will be displayed on the other frame

Java Script:

11. Write a JavaScript program to display the current day and time in the following format: Today is: Tuesday. Current time is : 10 AM : 30 : 38
12. Write a JavaScript program to check whether a string starts with 'Java' and false otherwise
13. Write a JavaScript program to find the largest of three given integers
14. Write a JavaScript program to reverse a given string
15. Write a JavaScript program to create a simple Calculator

Note: Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of the course, the students will be able to

CO1: Understand the basic tags in HTML and create the programs in that tags
CO2: Create a web page by applying frames and own personal web pages
CO3: Develop a web page for advertising purposes
CO4: Design web pages for own company and institution
CO5: Create interactive web page using script

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	9	9	**45**
CO2	3	3	9	9	3	9	9	**45**
CO3	3	3	9	9	1	9	9	**43**
CO4	3	3	9	9	3	3	3	**33**
CO5	3	3	3	9	1	9	3	**31**
Total	**21**	**15**	**33**	**39**	**17**	**39**	**33**	**197**

Low-1 Medium-3 High-9

Core VII- RDBMS

(For Students Admitted from 2022-23)

Semester: IV **Hours/Week: 5**
Subject Code: IBITC41 **Credit: 4**

Course Objectives:

1. To understand the basic concepts, applications of database systems, relational database

design principles and SQL queries
2. To understand the different issues involved in the design and implementation of a database system, security, integrity and concurrency

Unit I **(15 hours)**

Introduction: Database System Applications-Purpose of Database System-View of Data-Database Design- **Data Storage and Quering**-Transaction Management-Database Architechture .**Relational Databases:** Introduction to the Relational Model-Introduction to SQL-Intermediate SQL: Join Expressions-Views- Transactions-Integrity constraints-Schemas-Authorization.

Unit II **(15 hours)**

Database Design: Database design and E-R Model: Overview -ER-Model-Constraints- ER-Diagrams- Reduction to Relational Schemas – Design Issues-.Relational database model: Logical view of data- keys- integrity rules. **Relational Database design:** Features of good relational database design- Atomic domain and Normalization (1NF- 2NF- 3NF-BCNF).Database-Design Process-Modeling Temporal Data.

Unit III **(15 hours)**

Data Storage and Querying: Storage and File Structure: Overview of Physical Storage-Magnetic Disk and Floppy Disk-RAID- Organization of Records in Files-**Indexing and Hashing:** Basic Concepts-Ordered Indices-Multiple Key Access-Static Hashing-Dynamic Hashing-Bit Map Indices. **Query Processing**: Overview-Selection Operation-Sorting-Join Operation.

Unit IV **(15 hours)**

Transaction Management: Transaction: Transaction Concept-Simple Transaction Model-Storage Structure- Transaction Atomicity and Durability-Transaction Isolation-Serializablity-**Concurrency Control:** Lock- Based Protocols-Deadlock Handling-Multiple Granularity-Time Stamp Protocols-Valuation Based Protocols. **Recovery System:** Failure Classification-Recovery and Atomicity-Recovery Algorithm-Failure Management.

Unit V **(15 hours)**

System Architechture Text: Database –System Arhittechture Centralisedand Client-Server Architecture- Server System Architechture-Parallel System-Distributed System-Distributed System-Network Types-**ObjectBased Databases:** Complex Data Types –Table Inheritance-Implementing O-R Features-**Advanced Topics, Advanced Application Development:** Performance Tuning-Performance Benchmarks-Standardization.

Course Outcomes:

After successful completion of this course, the student will be able to

CO1:Explore about DBMS architecture, database designs, database modeling
CO2:Extend about ER-Diagram and UML, Relational Algebra and Relational Calculus
CO3:Distinguish the normalization theory
CO4:Apply Structured query language (SQL) and Constraints
CO5:Evaluate various transaction processing, concurrency control mechanisms and database protection mechanisms

Text Book:

1. A Silberschatz , H Korth, S Sudarshan, *Database System and Concepts*, Mc Graw-Hill, Sixth Edition,2019.

Reference Books:

1. Raghu Ramakrishnan and Johannes Gehrke, *Database Management Systems (3/e)*, McGraw Hill, 2003.
2. Atul Kahate, *Introduction to Database Management Systems*, Pearson Education, Tenth Impression, 2012.
3. C.J Date, *An Introduction to Database System*, Addison- Wesley Publishing, Third Edition, 1998.

E-Resources:

1. https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm
2. https://www.coursera.org/projects/introduction-to-relational-database-and-sql
3. https://onlinecourses.nptel.ac.in/noc21_cs04/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	3	3	3	3	**25**
CO2	9	1	1	3	3	3	3	**23**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	1	9	3	9	9	9	**49**
CO5	9	3	9	3	9	9	9	**51**
Total	**45**	**9**	**25**	**15**	**33**	**33**	**33**	**193**

Low-1 Medium-3 High-9

Core VIII-RDBMS Lab

(For Students Admitted from 2022-23)

Semester: IV **Hours/week: 4**
Subject Code: IBITC42P **Credit: 4**

Course Objectives:

1. The Students get practical knowledge on designing and creating Relational Database Management
2. To understand various advanced queries such as relational constraints, joins, set operations, aggregatefunctions, trigger, views and embedded SQL

SQL PROGRAMS:

DDL

1. Create an address table with fields name , doorno , street & city
   - describe its structure
   - alter the table to include pincode
   - alter the table to modify street column

- drop the table

DML

2. Create a student table with regno, name, age and dept.
   - insert records
   - delete the students with age above 20
   - truncate and drop the table

Functions

3. Create an employee table with fields eno , ename , sex ,age & years of experience
   - find out the no. of female employees
   - find out the employees with age ranging between 30 and 35
   - list out the employees who are working more than 5 years
4. Create a library file with fields accno,title,author,cost & no of copies
   - Arrange the books according to accno
   - Find out the total no. of books available in the library
   - Find out the book of minimum cost
5. Create a player table with fields name,sports(cricket,hockey,etc.),age & country
   - find out the eldest and youngest player
   - group players according to sports
   - list out the Indian players
6. Write the SQL queries to illustrate all number functions
7. Write the SQL queries to illustrate date functions
8. Write the SQL queries to illustrate all string functions
9. Create an item table with field's itemno, itemname, quantity & price and insert records.
10. Illustrate the comparison operators (between, like, in & isnull)
11. Create a table with the fields clientno , clientname & phoneno Illustrate the set operators union ,unionall, minus & intersect
12. Create a student table with fields' regno, name, English, Tamil, Maths and total & insert records
    - Arrange all records according to total
    - Find the student who got first mark in Maths
    - List out the students whose name starts with 'S'
13. Create an inventory table with fields' itemno, itemname, qnty, price and reorderlevel
    - insert records
    - update the qnty when it goes less than reorderlevel
    - list the items with price less than 100
14. Create an employee table with fields ecode, ename, age & salary and create a department table withfields ecode, designation, deptcode & dept. Illustrate joins and sub queries using the above tables.

Constraints

15. Create a vendormaster table with fields vencode,venname,place and phoneno
    Create an ordermaster table with fields item no, itemcode,vencode,qnty and orderdate .
    Illustrate the following constraints using the above tables
    - vencode as primary key in vendormaster
    - vencode as foreign key in ordermaster
    - phoneno as unique
    - place as notnull &qnty > 100

TCL

16. SQL queries to illustrate TCL commands (savepoint, rollback and commit)

PL / SQL:

Formula Substitution

17. PL / SQL block to find out the largest among threenumbers
18. PL/SQL block to print the multiplication table for given multiplier

Functions

19. Write a PL/SQL block to find the sum of digits of a given number. Use function
20. Write a PL/SQL block to find the factorial of a given number using a function

Cursor

21. Create a library table with fields acc no,title author and price & insert records, write a PL/SQL blockto illustrate implicit cursor

Procedure

22. Create a student table with fields regno,name, maths ,physics&biology and insert records ,write a PL/SQL block to find the total , average & grade using procedure
23. Create an electricity bill table with fields Custcode, custname, custtype, prevreading, currreading, UNITs,cost per UNIT & total amount. Write a PL/SQL block to find the total amount for all customers using the following condition

Cust type.	Cost per UNIT
i.Domestic	Rs. 3 /-
ii.Office	Rs. 4/-
iii.Factory	Rs. 6/-

Exception Handling

24. Write a PL/SQL block to illustrate the following predefined exceptions
    a. too_many_rows
    b. no_data_found
25. Create a table with fields itemno, itemname, qntyordered & qntydelivered, write a PL/SQL blockusing userdefined exception to indicate when more items have been delivered than ordered

Triggers

26. Creating and executing triggers

Note: - Questions for Internal and External examination will be based on concept learnt

Course Outcomes:

After successful completion of the course, the students will be able to

CO1: Build DDL, DML and TCL commands
CO2: Make use of implementing constraints in tables
CO3: Apply to create block structure programming language
CO4: Create the concepts of functions.
CO5: Develop the procedures, exceptions, triggers in PL/SQL block

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	3	3	3	3	**25**
CO2	9	1	1	3	3	3	3	**23**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	1	9	3	9	9	9	**49**
CO5	9	3	9	3	9	9	9	**51**
Total	**45**	**9**	**25**	**15**	**33**	**33**	**33**	**193**

Low-1 Medium-3 High-9

SEC IV – Programming in PHP Lab

(For Students Admitted from 2022-23)

Semester: IV **Hours/week: 2**
Subject Code: IBITS44P **Credit : 2**

Course Objectives:

1. To understand the concepts of regular expressions including modifiers, operators and metacharacters
2. To develop PHP programs that use various PHP library functions and that manipulate files anddirectories

Program List:

1. To print Sum of digits
2. To print factorial of a number
3. To display count, from 10 to 20 using loop
4. To print prime number
5. To check Armstrong number
6. To check Palindrome number
7. To swap two numbers with and without using third variable
8. To find if the given year is leap year or not
9. To reverse the number with strrev ()
10. To show day of the week (for eg: Monday) based on numbers using Switch/casestatements
11. To print number triangle
12. To print alphabet triangle
13. To check student grade based on the marks using if-else statement
14. Using nested for loop that creates a chess board

Note: - Questions for Internal and External examination will be based on concept learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe the fundamentals of PHP language in trivial problem solving.
CO2: Determine solution to a problem and apply control structures.
CO3: Simplify the use of strings and string handling functions.
CO4: Justify real time applications using PHP language features.
CO5: Build skill on problem solving by constructing algorithms

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	9	1	1	**25**
CO2	9	3	3	3	9	3	3	**33**
CO3	9	3	1	3	9	9	3	**37**
CO4	9	3	3	3	9	9	3	**39**
CO5	9	3	3	3	9	9	3	**39**

Total	**45**	**15**	**11**	**13**	**45**	**31**	**13**	**173**

Low-1 Medium-3 High-9

Core IX - Software Engineering

(For Students Admitted from 2022-23)

Semester: V **Hours/week: 6**
Subject Code: IBITC51 **Credit: 5**

Course Objectives:

1. To provide the idea of decomposing the given problem into analysis, design, implementation, testing and maintenance phases and provide an idea of using various process models in the software industryaccording to given circumstances
2. To gain the knowledge of how analysis, design, implementation, testing and maintenance processes are conducted in a software project

Unit I **(18 hours)**

Introduction: The Nature of Software – Changing nature of software – **Software Engineering:** The SoftwareProcess - Software Engineering Practice - Software Development Myths - **Software Process Structure:** A Generic Process Model - Defining a Framework Activity - Identifying a Task set - Process Patterns –**ProcessModels:** - Prescriptive Process Models – Specialized Process Models.

Unit II **(18 hours)**

Understanding Requirements: - Requirements Engineering - Eliciting requirements-Developing Use Cases-Building the Analysis Model-Negotiating Requirements-Requirements Monitoring Validating Requirements **- Requirements Modeling: - S**cenario Based Modeling.**Design Engineering:** Design within the context of software engineering - Design Process – Design Concepts-Design Model – **Architectural Design: -** Architectural Styles **-** Architectural Design.

Unit III **(18 hours)**

Software Testing Strategies: A strategic approach to software testing – strategic issues- test strategies for conventional software – test strategies for object- oriented software -validation testing-system testing- the art of debugging.**Testing Conventional Applications:** Software Testing Fundamentals -White-Box testing – Basis Path Testing- Control Structure Testing-Black-Box Testing- Model-Based Testing-Testing for Real-Time Systems - Patterns for Software Testing.

Unit IV **(18 hours)**

Risk Management: Reactive Versus Proactive Risk Strategies – Software Risks - Risk Identification – Risk Projection – Risk Refinement – Risk Mitigation, Monitoring and Management – RMMM Plan.**Quality concepts**: – Software Quality – Achieving Software Quality – **Review Techniques:** – Review Metricsand Their Use – Informal Reviews - Formal Technical Reviews – **Software Quality Assurance**: - Elements of Software Quality Assurance – SQA Processes and Product Characteristics - SQA Tasks, Goals, and Metrics.Formal Approaches to SQA – Statistical Software Quality Assurance - Software Reliability – The ISO 9000quality standards – SQA plan.

Unit V **(18 hours)**

Agile Development: - Agility and the Cost of Change- Agile Process - Extreme Programming- Other Agile Process Models - A Tool Set for the Agile Process. **Human Aspects of Software Engineering:** - Characteristics of a Software Engineer - The Software Team - Team Structures - Agile Teams - Software Engineering Using the Cloud - Collaboration Tools - Global Teams.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain a process model for a software project development

CO2: Apply project management and requirement analysis, principles to software project development

CO3: Analyze the cost estimate and problem complexity using various estimation techniques

CO4: Compare the SRS, design document, project plan of given software system

CO5: Generate test cases using the techniques involved in selecting: (a) White Box testing (b) Block Box testing

Text Book:

1. Roger S. Pressman, *Software Engineering A Practitioner's Approach*, Tata McGraw Hill, Eighth Edition, 2015.

Reference Books:

1. Ian Sommerville, *Software Engineering*, Pearson Education, Seventh Edition, 2004.
2. Samarjeet kaur, Sandhir Sharma, P.P Singh, *Software Engineering – Complete Course Book*, Deep &Deep Publications, 2006.
3. Waman S Jawadekar, *Software Engineering -Principles and Practice*, Tata McGraw Hill, 2004.

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105182/
2. https://www.coursera.org/courses?query=software%20engineering

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	3	9	9	3	**45**
CO2	9	9	9	3	9	9	9	**57**
CO3	9	9	9	3	9	9	9	**57**
CO4	9	9	3	3	9	9	9	**51**
CO5	9	9	9	3	9	9	9	**57**
Total	**45**	**45**	**33**	**15**	**45**	**45**	**39**	**267**

Low-1 Medium-3 High-9

Core X - Operating Systems

(For Students Admitted from 2022-23)

Semester: V **Hours/week: 6**

Subject Code: IBITC52 **Credit: 5**

Course Objectives:

1. To understand the services provided by and the design of an operating system.
2. To understand what a process is and how processes are synchronized and scheduled

Unit I **(18 hours)**

Introduction: What is an Operating System -Mainframe systems- desktop systems- Multiprocessor Systems-Distributed systems- Clustered Systems- Real time systems- Hand held systems.**Operating System Structure:** System components- Operating System services- System calls- - System structure.

Unit II **(18 hours)**

Processes: Process concept- process scheduling- operations on processes- Inter process Communication**. CPU Scheduling**: Basic Concepts- Scheduling Criteria- Scheduling algorithms **Process Synchronization**: Background- The critical section problem- Mutex Locks-semaphores- Monitors.

Unit III **(18 hours)**

Deadlock: System Model-Deadlock Characterization- Methods of Handling Deadlock- Deadlock Prevention- Deadlock Avoidance- Deadlock Detection- Recovery from Deadlock.**Memory management**: Background- Contiguous memory allocation- Swapping.

Unit IV **(18 hours)**

Virtual memory: Background- Demand paging-Copy-on-Develop -Page replacement-Thrashing.**File system interface**: File concepts- access methods- Directory structure.**Mass storage structure**: Overview of mass storage structure-HDD Scheduling-NVM Scheduling.

Unit V **(18 hours)**

Protection: Goals of protection- domain of protection- Access matrix- Implementation of Access matrix- revocation of access rights. **Security:** The security problem- User authentication- Program threats- System threats- securing systems and facilities- Intrusion detection- Cryptography.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Remember the structure of operating system and scheduling algorithms
CO2: Apply the concept of process scheduling, deadlocks and its recovery
CO3: Analyze the background of memory with segmentation and paging
CO4: Evaluate file management with file organization, and disk scheduling
CO5: Create Securing systems and facilitites

Text Book:

1. Abraham G Silberschatz, *Operating System***,** Wiley Publisher, Tenth Edition, 2017.

Reference Books:

1. Milan Milenkovic, *Operating System Concepts & Design*, Tata McGraw Hill, Second Edition,1997.
2. Peter Baer Galvin and Robert Neilson Boyd, *Applied Operating system concepts*, John Wiley & Sons, First Edition, 2000.

3. Dhananjay M. Dhamdhere, *Operating System A Concept-Based Approach*, Tata McGraw Hill, Third Edition, 2012.
4. W. Stallings, *Operating Systems, Internals & Design Principles*, Prentice Hall of India, Fifth Edition, 2008.

E-Resources:

1.https://nptel.ac.in/courses/106/105/106105214/
2.https://nptel.ac.in/courses/106/106/106106144/
3.https://onlinecourses.nptel.ac.in/noc21_cs44/preview
4.https://www.udacity.com/course/introduction-to-operating-systems--ud923
5.https://onlinecourses.nptel.ac.in/noc21_cs72/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	9	3	9	9	**45**
CO2	9	3	3	3	9	9	9	**45**
CO3	9	3	9	9	3	9	9	**51**
CO4	9	3	9	3	9	9	9	**51**
CO5	9	3	9	9	9	9	9	**57**
Total	**45**	**15**	**33**	**33**	**33**	**45**	**45**	**249**

Low-1 Medium-3 High-9

Core XI - Data Structures and Algorithms

(For Students Admitted from 2022-23)

Semester: V **Hours/week: 6**
Subject Code: IBITC53 **Credit: 5**

Course Objectives:

1. To understand the fundamental design, analysis, implementation of basic data structures, specificationand analysis of programs
2. To understand about significance of algorithms in the computer field and various aspects of algorithmdevelopment

Unit I **(18 hours)**

Introduction: History of Algorithms - Data structures and Algorithms - Data structure - Definition and Classification. Stacks: Introduction - stack Operation - Application. **Queues:** Introduction - Operation - circularQueues - Other Types of Queues – Application.

Unit II **(18 hours)**

Linked Lists: Introduction - Singly Linked Lists - Circularly Linked List - Doubly Linked List - Multiply Linked List - Application. **Trees and Binary Trees:** Introduction -Trees: Definition and Basic Terminologies-Representation of Trees -Binary Tree Traversals - Threaded Binary Trees – Applications.

Unit III **(18 hours)**

Graphs: Introduction-Definitions and Basic Terminologies - Representations of Graphs - Graph Traversals - Single-source & All pairs shortest paths problem - Minimum cost spanning trees. Bi**nary Search Trees and AVL Trees**: Introduction - Binary Search Trees: Definition and Operations - AVL Trees: Definition and Operations – Applications.

Unit IV **(18 hours)**

Red-Black Trees and Splay Trees: Red-Black Trees - Applications. Hash Tables: Introduction-Hash Table Structure - Hash Functions - Linear Open Addressing - Chaining - Applications. **Searching:** Introduction-Linear Search-Transpose Sequential Search-Interpolation Search - Binary Search - Fibonacci Search - OtherSearch Techniques.

Unit V **(18 hours)**

Internal Sorting: Introduction - Bubble Sort - Insertion Sort - Selection Sort - Merge Sort - Shell Sort - Quick Sort - Heap Sort - Radix Sort - Algorithms: Algorithm Specification - Performance analysis - Asymptotic notation.

Course Outcomes:

After successful completion of this course, the student will be able to

CO1: Explain the basics concept of data structures and algorithm stacks, queues and lists
CO2: Distinguish about knowledge of tree and graphs concepts
CO3: Analyze the concepts about searching and sorting techniques
CO4: Demonstrate the types of trees
CO5: Evaluate about algorithm and step by step approach in solving problems with the help of fundamental data structure

Text Books:

1. Vijayalakshmi Pai G A, *Data structures and Algorithms, Concepts, Techniques and Application,* Tata McGraw-Hill Education, 2008.
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, *Fundamentals of Computer Algorithms,*Universities Press, Second Edition, 2008.

Reference Books:

1. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, *Data Structures and Algorithms*, Dorling Kindersley(India), 2013.
2. Patel R B, *Expert Data Structures with C*, Khanna Book Publishing, Third Edition, 2000.

E-Resources:

1. http://www.dave-reed.com/csc427.F04/
2. http://www.math.tau.ac.il/~matias/ds03.html
3. https://onlinecourses.nptel.ac.in/noc22_cs26/preview
4. https://nptel.ac.in/courses/106/106/106106127/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	3	1	1	**19**
CO2	9	3	9	1	9	1	3	**35**

CO3	9	1	9	9	1	1	3	**33**
CO4	9	3	3	3	3	3	3	**27**
CO5	9	1	1	9	9	9	3	**41**
Total	**45**	**11**	**23**	**23**	**25**	**15**	**13**	**155**

Low-1 Medium-3 High-9

DSE I – a) Computer System Architecture

(For Students Admitted from 2022-23)

Semester : V **Hours/week: 4**
Subject Code: IBITE5A **Credit: 4**

Course Objectives:

1. To understand the structure, function and characteristics of computer systems and understand the design of the various functional units and components of computers
2. To identify the elements of modern instructions sets and their impact on processor design, explain the function of each element of a memory hierarchy and identify and compare different methods for computer I/O

Unit I **(12 hours)**

Basic Computer Organization and Design: Instruction Codes – Computer Registers-Computer Instructions-Timing and Control –Instruction Cycle– Memory Reference Instructions – Input-Output and Interrupts.

Unit II **(12 hours)**

Micro programmed Control: Control Memory – Address Sequencing – Micro program Examples – Designof Control Unit.

Unit III **(12 hours)**

Central Processing Unit: Introduction – General Register Organization – Instruction Formats – Addressing Modes-Data Transfer and Manipulation-Program Control-RISC **Pipeline and Vector Processing:** Parallel Processing-Pipeline-Arithmetic Pipeline-Instruction Pipeline-Vector Processing.

Unit IV **(12 hours)**

Input-Output Organization: Peripheral Devices – I/O interface – Asynchronous Data Transfer – Modes of Transfer -Direct Memory Access – Input Output Processor (Excluding IBM and Intel IOPs).

Unit V **(12 hours)**

Memory Organization: Memory-Main Memory – Auxiliary Memory - Associative Memory – CacheMemory -Virtual Memory-Memory Management Hardware.

Course Outcomes:

After successful completion of this course, student will be able to
CO1: Define the fundamental organization of a computer system
CO2: Explain the concept of sequencing, designing, pipeline and vector processing methods
CO3: Examine the function of input-output organization

CO4: Compare various pipeline concepts
CO5: Distinguish the organization of various parts of a system memory hierarchy

Text Book:
1. Morris Mano M. *Computer System Architecture*. Prentice Hall of India, 2011.

Reference Books:
1. William Stallings, *Computer Organization and Architecture*, Pearson Education, Eighth Edition, 2010.
2. Morris Mano, *Digital Login and Computer Design*, Prentice Hall of India,2001.

E-Resource:
1. https://nptel.ac.in/courses/106/105/106105163/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	1	3	3	3	**31**
CO2	9	3	3	3	9	9	3	**39**
CO3	3	9	3	3	3	3	3	**27**
CO4	9	3	9	3	3	3	3	**33**
CO5	3	9	3	3	9	3	3	**33**
Total	**33**	**33**	**21**	**13**	**27**	**21**	**15**	**163**

Low-1 Medium-3 High-9

DSE I - b) Cloud and Distributed Computing

(For Students Admitted from 2022-23)

Semester: V **Hours/Week: 4**
Subject Code: IBITE5B **Credit: 4**

Course Objectives:
1. To impart the complete understanding of cloud, virtualization and distributed clouds
2. To understand the leader election in cloud and distributed systems

Unit I **(12 hours)**

Introduction to Cloud, Virtualization, and Virtual Machine: Introduction to Cloud Computing - Features of Today's Cloud - Introduction to Virtualization - Mitigation Techniques for VM Migration

Network Virtualization and Geo-Distributed Clouds: Introduction - Cloud Computing and Server Virtualization - Networking of Virtual Machines Inside the Hypervisor – Docker - Software-Defined Network-Network Virtualization in Multi-Tenant Data Centers: VL2 - Network Virtualization in Multi-Tenant Data Centers: NVP - Geo-Distributed Cloud Data Centers.

Unit II **(12 hours)**

Leader Election in Cloud, Distributed Systems, and Industry Systems: Introduction -

Leader Election in Rings (Classical Distributed Algorithms) - Ring Leader Election and Bully Leader Election Algorithms - Classical Algorithm: Ring Election Algorithm - Classical Algorithm: Bully Election - Industry Systems: Google Chubby and Apache ZooKeeper - Design of ZooKeeper

Classical Distributed Algorithms and the Industry Systems: Introduction - Time and Clock Synchronization in Cloud Data Center - Key Challenges - Clock Synchronization - Algorithms for Recording Global State and Snapshot - Mutual Exclusion Algorithms for Distributed Systems.

Unit III **(12 hours)**

Consensus, Paxos, and Recovery in Clouds: Introduction – Consensus – Byzantine Agreement – Failures and Recovery approaches in Distributed systems. **Cloud Storage:** Key-Value Stores/NoSQL Stores and HBase: Design of Key-Value Stores - Design of HBase.

Unit IV **(12 hours)**

P2P Systems and Their applications in Industry systems: Introduction -itcoin crypto currency system -Blockchain technology and its applications beyond bitcoin solutions

Cloud Applications: MapReduce, Spark, and Apache Kafka - MapReduce -Spark-Kafka.

Unit V **(12 hours)**

Cloud-Native Computing: Introduction – Micro services – Docker – Kubernetes - Introduction to Edge Computing - Classification of Edge Computing. **Software-Defined Networking and Network Function Virtualization:** Introduction - Software-Defined Networking - Applications and Use Cases - Software-Defined NFV - Network Slicing - Ongoing Research Opportunities.

Course Outcomes:

After successful completion of this course, the student will be able to

CO1: Identify the features of cloud computing and virtualization
CO2: Demonstrate the leader election and classical distributed algorithms
CO3: Classify types of consensus, paxos, recovery in clouds and cloud storage
CO4: Justify P2P systems and cloud applications
CO5: Formulate the cloud native computing, software-defined networking and network function virtualization

Text Book:

1. Rajiv Misra and Yashwant Singh Patel, *Cloud and Distributed Computing: Algorithms and Systems*, Wiley Emerging Technology Series, 2020.

Reference Books:

1. Chris Dotson, *Practical Cloud Security: A Guide for Secure Design and Deployment*, O'Reilly Media, First Edition, 2019.
2. Rajkumar Buyya, Christian Vecchiola and Thamarai Selvi, *Mastering Cloud Computing*, Tata McGrawHill, 2017.
3. Rajkumar Buyya, James Broberg, Andrzej Goscinski, *Cloud Computing Principles and Paradigms*, JohnWiley & Sons Publishers, 2011.
4. Toby Velte, Anthony Velte and Robert Elsenpeter, *Cloud Computing-A Practical Approach*, TataMcGraw Hill, 2010.

E - Resources:

1. https://nptel.ac.in/courses/106/104/106104182/
2. https://www.amazon.in/Cloud-Distributed-Computing-Algorithms-Systems/dp/8126520272?asin=B086V7Q2KW&revisionId=&format=4&depth=1

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	9	3	1	9	**35**
CO2	9	1	9	9	3	1	3	**35**
CO3	9	3	3	9	3	1	9	**37**
CO4	3	9	9	9	9	3	9	**51**
CO5	3	9	9	9	9	3	9	**51**
Total	**33**	**23**	**33**	**45**	**27**	**9**	**39**	**209**

Low-1 Medium-3 High-9

DSE II - a) Blockchain Technology

(For Students Admitted from 2022-23)

Semester: V **Hours/week: 4**
Subject Code: IBITE5C **Credit: 4**

Course Objectives:

1. To understand how blockchain System (Bitcoin and Ethereum) works
2. To integrate ideas from blockchain technology into their own projects

Unit I **(12 hours)**

Introduction of Block chain: Block 101-Distributed Systems-Consensus-The history of block chain- Introduction of block chain-Features of blockchain-Applications of block chain technology-Tiers of Blockchain technology-Consensus in block chain-CAP theorem and block chain-Benefits and limitations of Blockchain.

Unit II **(12 hours)**

Cryptography and Technical Foundations: Introduction-Mathematics – Cryptography - Confidentiality- Integrity-Authentication-Non repudiation-Accountability-Block Ciphers-DES-AES-Public and Private keys- RSA-hash Functions-Secure hash algorithms-Merkle trees-Patricia trees-DHT-ECDSA-Financial markets andtrading-Trading-Exchanging.

Unit III **(12 hours)**

Bitcoin: Bitcoin definitions-transactions-types of transactions-What is UTXO-Block chain-The genesis of Block-The bitcoin network-wallets-Alternative coins: Theoretical Foundations-Alternatives of Proof of Work-Proof of stake-Name coin-Litecoin.

Unit IV **(12 hours)**

Ethereum101: Introduction-Ethereum block chain-The consensus mechanism-The world state-the account state-Transactions-Contract creation transaction-Message call transaction-Elements of ethereum block chain-EVM-Execution Environment-Opcodes and their

meaning-Accounts-Block-Block header.

Unit V **(12 hours)**

BlockChain–Outside of Currencies: Internet of things-IoT Block chain experiment-Government-Health- Finance-EmergingTrends:ABC's-Enterprise-gradeblockchains-PrivateBlockchains-startups-standardization- Enhancements-Real world Implementations-Consortia-Education in block chain technologies-Employment-Crypto Economics.

Course Outcomes:

After successful completion of this course, the student will be able to

CO1: Explain the fundamental concept of block chain and consensus algorithm
CO2: Apply cryptography algorithms in protecting the block chain
CO3: How transactions held in bitcoin
CO4: Develop an application in ethereum framework
CO5: Design block chain technology in popular fields

Text Book:

1. Imran Bashir, *Mastering Block chain: Deeper insights into decentralization, Cryptography, Bitcoinand Popular block chain frameworks***,** Packt Publishing, 2017.

Reference Books:

1. Andreas Antonopoulos, Satoshi Nakamoto, *Mastering Bitcoin*, O'Reilly, 2014.
2. Roger Wattenhofer**,** *The Science of the Block chain***,** Create Space Independent Publishing, 2016.
3. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, *Bitcoin and Cryptocurrency Technologies:A Comprehensive Introduction*, Princeton University Press, 2016.

E-Resources:

1. https://nptel.ac.in/courses/106/104/106104220/#
2. https://www.udemy.com/course/build-your-blockchain-az/
3 .https://www.mygreatlearning.com/academy/learn-for-free/courses/blockchain-basics

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	9	9	3	3	9	9	51
CO2	9	3	9	9	9	9	9	57
CO3	9	3	9	3	9	9	9	51
CO4	9	3	9	3	9	9	9	51
CO5	9	3	9	3	9	3	9	45
Total	45	21	45	21	39	39	45	255

Low-1 Medium-3 High-9

DSE II - b) Internet of Things

(For Students Admitted from 2022-23)

Semester: V **Hours/week: 4**
Subject Code: IBITE5D **Credit: 4**

Course Objectives:

1. Students will be explored to the interconnection and integration of the physical world and the cyberspace. They are also able to design & develop IoT devices
2. Make the students to apply IoT data for business solution in various domains in secured manner

Unit I **(12 hours)**

Introduction to IoT: Introduction to IoT- Enabling technologies of IoT - AI and Machine Learning - Physical and logical design of IoT - IoT Reference Architecture - IoT Functional Architecture - IoT levels and deployment templates.

Unit II **(12 hours)**

IoT and M2M: Introduction to M2M – Difference between IoT and M2M- SDN and NFV for IoT- IoT System Management with NETCONF-YANG- Need for IoT Systems Management-SNMP.

Unit III **(12 hours)**

IoT Platforms Design Methodology: Step 1 to Step 10- Case Study on IoT System for Weather Monitoring- Motivation for Using Python- IoT Systems Logical Design using Python- Introduction.

Unit IV **(12 hours)**

Installing Python- Python Data Types and Data Structures-Control Flow-Functions-Modules- Packages-File Handling-Date/Time Operations- Classes- Python Packages of Internet for IoT.**IoT Physical Devices and Endpoints:** What is an IoT Device- Exemplary Device: Raspberry Pi- About theboard-Linux and Raspberry Pi- Raspberry Pi Interfaces.

Unit V **(12 hours)**

IOT Physical Servers and Cloud Offerings: Introduction to Cloud Storage Models and Communication API-WAMP-AutoBahn for IoT-Xively Cloud for IoT-Python Web Application Framework--Amazon Web Services for IoT- Home Automation-Cities-Environment-Agriculture-Productivity Applications.

Course Outcomes:

After successful completion of this course, the student will be able to

CO1: Recall the importance of smart objects and smart environment
CO2: Define IoT and M2M
CO3: Create IoT platforms using design methodology
CO4: Perform WiFi data communications, remote data storage in cloud and handle the data using web applications
CO5: Develop potential problems and solutions using IoT

Text Book:

1. Arshdeep Bahga, Vijay Madisetti, *Internet of Things: A Hands-On Approach*, Universities Press, 2015.

Reference Books:

1. Charles Platt, *Make Electronics – Learning by discovery*, O'Reilly Media, 2015.
2. Michael Miller, *The Internet of Things*, Pearson India, 2015.

E-Resources:

1. NPTEL: https://nptel.ac.in/courses/106/105/106105166/
2. https://www.classcentral.com/course/swayam-introduction-to-internet-of-things-10093

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	3	3	9	9	**51**
CO2	9	3	9	9	9	9	9	**57**
CO3	9	3	9	3	9	9	9	**51**
CO4	9	3	9	3	9	9	9	**51**
CO5	9	3	9	3	9	3	9	**45**
Total	**45**	**21**	**45**	**21**	**39**	**39**	**45**	**255**

Low-1 Medium-3 High-9

SEC V - Linux and Shell Programming Lab

(For Students Admitted from 2022-23)

Semester: V **Hours/week: 2**
Subject Code: IBITS54P **Credit: 2**

Course Objectives:

1. To understand and make effective use of linux utilities and shell scripting language to solve problems
2. To develop the skills necessary for systems programming including file system programming,process and signal management and inter-process communication

Program List

Built-in Commands

1. Write a shell program to use who commands
2. Write a shell program to use list commands
3. Write a shell program to use sort commands
4. Write a shell program to use wc commands
5. Write a shell program to use cat commands

Formula Substitution

6. Write a shell program to find odd or even number
7. Write a shell program to find smallest among three numbers
8. Write a shell program to find the factorial value
9. Write a shell program to display multiplication table

Switch case

10. Write a shell program to use case statement

Functions

11. Write a shell program to display username, pwd using function
12. Find age of a person using set date

Checking

13. To check the given file is a directory or not

String Manipulation

14. Convert lowercase to uppercase using tr statement

Note: - Questions for the Internal/External examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Summarize shell commands, scripts, managing files, pipes and redirections

CO2: Apply appropriate linux commands to make effective use of the environment to solve problems

CO3: Illustrate shell scripts to perform repetitive tasks using while and for loops

CO4: Evaluate shell functions

CO5: Derive command-line arguments

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	1	9	9	9	**49**
CO2	9	9	3	1	9	9	9	**49**
CO3	9	9	3	1	9	9	9	**49**
CO4	9	9	3	1	9	9	9	**49**
CO5	9	9	3	1	9	9	9	**49**
Total	**45**	**45**	**15**	**5**	**45**	**45**	**45**	**245**

Low-1 Medium-3 High-9

Core XII - Computer Networks

(For Students Admitted from 2022-23)

Semester: VI **Hours/week: 6**

Subject Code: IBITC61 **Credit: 5**

Course Objectives:

1. To build an understanding of the fundamental concepts of computer networking
2. To identify the different types of network topologies and protocols and enumerate the layers of the OSI and TCP/IP model

Unit I **(18 hours)**

Introduction: Uses of Computer Networks-Network Hardware-Network Software-Reference Models- ExampleNetworks-Network Standardization.**Physical Layer:** Guided Transmission Media-Wireless transmission.

Unit II **(18 hours)**

Data Link Layer: Data Link Layer Design Issues-Error Detection and Correction-Elementary Data link Protocols-Sliding Window Protocols-Example Data Link Protocols.**Medium Access Control Sublayer:** Channel Allocation Problem-Multiple Access Protocols-Ethernet-Wireless LANs-Data Link Layer Switching.

Unit III **(18 hours)**

Network Layer: Network layer Design Issues-Routing Algorithms-Congestion Control Algorithms-Qualityof Service-Internetworking-Network Layer in the Internet.

Unit IV **(18 hours)**

Transport Layer: Transport Service-Elements of Transport Protocols-Congestion Control-Internet TransportProtocols: UDP -TCP

Unit V **(18 hours)**

Application Layer: Domain Name System-Electronic Mail-World Wide Web: HTTP-Streaming Audionand Video.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain concepts of computer networks
CO2: Apply the protocols of computer networks in network design and implementation
CO3: Analyse functions of each layer in the OSI and TCP/IP reference model
CO4: Compare the working principle of various layer protocols
CO5: Design networks by using protocols of computer networks

Text Book:

1. Andrew S Tanenbaum, David. J. Wetherall, *Computer Networks*, PearsonEducation, Fifth Edition, 2021.

Reference Books:

1. Behrouz A Forouzan, *Data Communications & Networking*, Tata McGraw Hill, Fourth Edition, 2003.
2. Douglas E Comer, *Computer Networks and Internets*, Pearson Education, Fourth Edition, 2004.

E-Resources:

1. https://onlinecourses.swayam2.ac.in/ugc19_cs10/preview
2. https://onlinecourses.swayam2.ac.in/cec19_cs07/preview
3. https://nptel.ac.in/courses/106/105/106105081/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	1	3	9	**31**
CO2	9	1	3	3	1	3	9	**29**
CO3	9	1	3	3	1	9	9	**35**
CO4	9	1	3	3	1	9	9	**35**
CO5	9	3	3	3	1	9	9	**37**
Total	**45**	**9**	**15**	**15**	**5**	**33**	**45**	**167**

Low-1 Medium-3 High-9

Core XIII - Programming in Java

(For Students Admitted from 2022-23)

Semester: VI **Hours/week: 6**
Subject Code: IBITC62 **Credit: 4**

Course Objectives:

1. To gain knowledge about basic Java language syntax and semantics to develop java programs and use concepts such as variables, conditional and iterative execution methods etc
2. To understand the fundamentals of object-oriented programming in Java, including defining classes, objects,invoking methods etc and exception handling mechanisms

Unit I **(18 hours)**

Fundamentals of Object Oriented Programming: Introduction, object oriented paradigm – basic concepts of oops – benefits of oops – applications of OOPs**. Java Evolution:** java features –java Versus C and C++ - java and internet – java and WWW – web browsers **Overview of Java Language**: simple java program - more of java – application with two classes –java program structure – java tokens – java statements- implementing a java program - java virtual machine - command line arguments.

Unit II **(18 hours)**

Constants, Variables, data types: Declaration of variables- giving values to variables- scope of variables –symbolic constants – type casting – getting values of variables- standard default values- **Operators and Expressions**: Arithmetic operators –Relational operators- logical operators – assignment operators – incrementand decrement operators –conditional operator – bitwise operator – special operators –arithmetic expressions.–evaluation of expressions – precedence of arithmetic operators-type conversion in expression – operator precedence and associativity – mathematical functions.- **Decision making and Branching:** if statement – switch - ? : operator –**Decision Making and Looping:** while statement – do statement – for statement – jumpsin loops - labeled loops.

Unit III **(18 hours)**

Classes, Objects and Methods: Introduction – defining a class, field declaration– methods declaration –creating objects – accessing class members – constructors – methods overloading – static members – nesting of methods – inheritance – overriding methods – final variables and methods – final classes –finalizer methods-abstract methods and classes – visibility control - **Arrays Strings and Verctors** : one dimensional array – creating an array –two dimensional arrays –strings –vectors –wrapper classes – **Interfaces, Multiple Inheritance**: defining interfaces – extending interfaces –implementing interfaces – accessing interface variables.

Unit IV **(18 hours)**

Packages , Putting classes together : Introduction - java API packages : using system packages- naming conventions –creating packages –accessing a package –using a package – adding a class to a package–hiding classes – **Multithreaded Programming** : creating threads- extending the thread class – stopping and blockinga thread - life cycle of a thread- using thread methods -thread exceptions –thread priority – synchronization–implementing the runnable interface.

Unit V **(18 hours)**

Managing Errors and Exception: Introduction – types of errors –exceptions -syntax of exception handling code – multiple catch statements –using finally statement –throwing our own exceptions –using exceptions for debugging- **Applet Programming:** introduction –how applets differ from applications –building applet code–applet life cycle – creating an executable applet –designing a web page - applet tag – adding applet to html file –running the applet – more about applet tags –passing parameters to Applets –aligning the display.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Remember the importance of java with its data types, control statements and class fundamentals.

CO2: Apply the concepts of inheritance, method overriding and implement packages and interfaces

CO3: Analyze the concept of exception handling and multithreading

CO4: Evaluate string buffer handling functions

CO5: Create applet programming through awt controls, layout managers and menus

Text Book:

1. E. Balaguruswamy, *Programming with JAVA* - A Primer, McGraw Hill Professional, 2015

Reference Books:

1. Herbert Schildt, *Java: The Complete Reference*, McGraw Hill Professional, 2017.
2. Robert Sedgewick & Kevin Wayne *Introduction to Programming in Java*, Addison Wesley, 2017.
3. Y. Daniel Liang, *Introduction to Java Programming*, Pearson Education, 2017.

E-Resources:

1.https://spoken-tutorial.org/tutorial-search/?search_foss=Java&search_language=English
2.https://onlinecourses.swayam2.ac.in/aic20_sp13/preview
3.https://spoken-tutorial.org/watch/Java/First+Java+Program/English/
4. https://spoken-tutorial.org/tutorial-search/?search_foss=Java&search_language=English

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	1	9	9	9	**49**
CO2	9	9	3	1	9	9	9	**49**
CO3	9	9	3	1	9	9	9	**49**
CO4	9	9	3	1	9	9	9	**49**
CO5	9	9	3	1	9	9	9	**49**
Total	**45**	**45**	**15**	**5**	**45**	**45**	**45**	**245**

Low-1 Medium-3 High-9

Core XIV - Programming in Java Lab

(For Students Admitted from 2022-23)

Semester: VI **Hours/week: 5**
Subject Code:IBITC63P **Credit: 4**

Course Objectives:

1. To make the students to understand programming language Java and able to create programs to solve simplecalculations
2. To implement sorting and searching programs, develop the programs for string manipulations (case conversion,reversing, etc.)

Program List

Formula Substitution

1. Find the factorial and binomial coefficient
2. Calculate mean, variance and standard deviation
3. Develop the programs for Number conversions

Checking

4. Develop the programs for Number checking (prime, perfect, etc.)

Generation

5. Develop the programs for Number generation (prime, perfect, etc.)

Array

6. Arrange numbers and names in order
7. Develop the program for performing matrix addition, subtraction, multiplication & transpose

Searching

8. Develop the programs for implementing linear search and binary search

String

9. Develop the programs for doing String manipulation (case conversion, reversing, etc.)

OOP Concepts

10. Develop the programs for implementing inheritance concepts
11. Develop the programs for implementing exception handling
12. Develop the programs for implementing multithreading

Applet

13. Develop the programs to handle Keyboard events
14. Simulate a calculator (arithmetic operations) using GUI components

Note: - Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Outline Java programs that solve simple Mathematical problems, number checking and numbergeneration.
CO2: Demonstrate the concepts of string manipulation, linear search and binary search.
CO3: Illustrate OOP in Java programming like inheritance.
CO4: Evaluate the multi-threaded programs
CO5: Develop exception handling and GUI components.

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	3	3	3	9	3	9	39
CO2	9	3	3	3	9	3	9	39
CO3	9	9	3	9	9	9	9	57
CO4	9	9	9	9	9	9	9	63
CO5	9	9	9	9	9	9	9	63
Total	45	33	27	33	45	33	45	261

Low-1 Medium-3 High-9

Core XV- Project

(For Students Admitted from 2022-23)

Semester: VI **Hours/Week: 6**
Subject Code: IBITC64PW **Credit: 5**

Course Objectives:

1. To impart the students to implement the project by data collection, tool selection
2. To enhance the students to select the programming language for implementing the project

Project shall be a group project (group consisting of maximum of two members)

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Identify goals, constraints, deliverables, performance criteria and resource requirements in consultation with stakeholders
CO2: Apply the plan by executing the code
CO3: Illustrate the various aspects of software development for the total project
CO4: Evaluate the entire software project according to the specific problem
CO5: Develop the software project by executing with the various data.

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	9	9	9	9	3	9	57
CO2	9	3	9	3	9	9	9	51
CO3	9	3	9	9	9	9	9	57
CO4	9	3	9	9	9	9	9	57
CO5	9	9	9	9	9	9	9	63
Total	45	27	45	39	45	39	45	285

Low-1 Medium-3 High-9

DSE III – a) Artificial Intelligence and Expert System

(For Students Admitted from 2022-23)

Semester: VI **Hours/Week: 4**
Subject Code: IBITE6A **Credits: 4**

Course Objectives:

1. To introduce the basic principles, techniques, and applications of Artificial Intelligence
2. To gain a historical perspective of AI and its foundations

Unit I **(12 hours)**

Introduction to Artificial Intelligence-Intelligent Agents, Approaches in Artificial Intelligence, Definitions of Artificial Intelligence, AI problems, Features of AI Programs, Importance of AI, Advantages and Disadvantages of AI.

Unit II **(12 hours)**

Applications of Artificial Intelligence- Finance, Hospitals and Medicine, Robotics, Expert systems, Diagnosis,Pattern Recognition, Natural Language Processing, Game Playing, Image Processing, Data mining, Big Data Mining. Introduction to the state space search- State space search, search techniques, Types of searching techniques.

Unit III **(12 hours)**

Heuristic Search Strategies-Types of Heuristic Search techniques,Hill Climbing Search, Simulated Annealing search, A* Algorithm, AND-OR Graphs, Properties of the Heuristic Search Algorithm, Adversary Search, TheMINIMAX Algorithm.

Unit IV **(12 hours)**

Expert Systems-Definitions of Expert Systems, Features of Good Expert systems, Architecture and Components of Expert systems, Roles of the Individuals who interact with the system, Advantages of Expert systems, Disadvantages of Expert Systems.

Unit V **(12 hours)**

Knowledge Representation-Definitions of Knowledge Representation, Characteristics of Good Knowledge Representation, Basics of Knowledge representation, Properties of the Symbolic representation of knowledge, Properties of the Good knowledge representation systems, Categories of knowledge representation schemes, types of knowledge representation schemes.

Course Outcomes:

After successful completion of the course, the students will be able to

CO1: Demonstrate fundamental understanding of the history of artificial intelligence and its foundations

CO2: Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning

CO3: Analyze their gaming skills and learn about expert system

CO4: Evaluate the learners for aspiring careers in the field of Artificial Intelligence

CO5: Develop the game playing and planning of expert systems

Text Book:

1. I.Gupta , G.Nagpal,*Artificial Intelligence and Expert Systems* , Laxmi Publications ,2018.

Reference Books:

1. V.S. Jankiraman, Foundations *of Artificial Intelligence and Expert Systems*, Laxmi Publications, 2017.
2. Joseph C.Giarratano, Gary D.Riley ,*Expert Systems: Principles and Programming*, Fourth Edition ,2018.
3. Lavika Goel, Artificial *Intelligence:Concepts and Applications*, Wiley India Private Limited.

E-Resource:

1. NPTEL: https://nptel.ac.in/courses/106/102/106102220/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	1	9	9	3	9	**49**
CO2	9	9	3	9	3	9	1	**43**
CO3	3	9	9	3	9	3	3	**39**
CO4	9	1	3	9	3	9	1	**35**
CO5	9	9	9	9	9	3	3	**51**
Total	**39**	**37**	**25**	**39**	**33**	**27**	**17**	**217**

Low-1 Medium-3 High-9

SEC VI – Open Technology Lab

(For Students Admitted from 2022-23)

Semester: VI **Hours/week: 2**
Subject Code: IBITS65P **Credits: 2**

Course Objectives:

1. To develop technical solutions for problems using the open source software(s)
2. To learn programming in Python

List of Programs

Display Text

1. To display any given text message

Formula Substitution

2. To display Fibonacci series

Array

3. To count the number of vowel in the string

Function

4. To convert a date read from the user, given in DD/MM/YYYY format into writtenformat. For example, Enter a date in DD/MM/YYYY Format: 16/7/2003 Output: 16 July, 2003
5. To print the contents of a file in uppercase using function
6. To sort the contents of a file using function

Operator Overloading

7. To implement Operator Overloading

Script

8. To implement Arithmetic Quiz
9. To create a button with the text, "Hello World"
10. To create a combo box with three elements. When the selection is changed theselected item is to be printed
11. To create a simple application window with menus and submenus
12. To create a simple application window with displaying lines
13. To create your own website for displaying message
14. To create a simple blog using models

Note: Questions for the Internal/External examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Recall the basics of displaying numbers and string
CO2: Apply the concepts of control structures and function (Predefined and user defined)
CO3: Analyzing the concept of array and file
CO4: Explain operator overloading
CO5: Create GUI programming and website

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	1	9	9	9	**55**
CO2	9	9	9	1	9	9	9	**55**
CO3	9	9	9	1	9	9	9	**55**
CO4	9	9	9	1	9	9	9	**55**
CO5	9	9	9	1	9	9	9	**55**
Total	**45**	**45**	**45**	**5**	**45**	**45**	**45**	**275**

Low-1 Medium-3 High-9

Extra Credit I- Corel Draw Lab

Semester: II
Subject Code: IBITX2P **Credit: 2**

Course Objectives:

1. To understand various menu bars and graphic tools of Corel Draw
2. To make designs with very great accuracy

Corel Draw

1. Create a newspaper advertisement using CorelDraw's text formatting tools.
2. Create a Bitmap Image and apply the auto tracing technique to that image.
3. Create an object and apply transformation technique.
4. Create a Parachute using the given special fills methods such as
   a) Filling object using foundation fills b) Pattern Fill c) Interactive Fill Tool
5. Create a certificate template & merged with data files.

6. Create any kind of invitation.
7. Create a Mirror object using Mirror command.
8. Create any kind of LOGO using Fit Text to Path technique.
9. Create a Flyer design.
10. Design a magazine cover.

Note: Questions for the external examination will be based on concept learnt

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Describe the concepts of tools and techniques in CorelDraw
CO2: Apply the concept of Creation and modification of objects for graphic design purposes
CO3: Analyze various tools to design Flyers
CO4: Develop any kind of LOGO using techniques in CorelDraw
CO5: Build design magazine and presentations

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	9	1	1	**25**
CO2	9	3	3	1	9	1	3	**29**
CO3	9	3	3	3	9	3	3	**33**
CO4	9	3	3	3	9	3	3	**33**
CO5	9	3	9	3	9	3	9	**45**
Total	**45**	**15**	**19**	**11**	**45**	**11**	**19**	**165**

Low-1 Medium-3 High-9

Extra Credit II –Visual Basic Lab

Semester: III
Subject Code: IBITX3P **Credit: 2**

Course Objectives:
1. To understand the concept of visual programming
2. To make designs with GUI

Program List

1. Write a Visual basic program to find the simple and compound interest
2. Write a Visual Basic program to check whether the given number is perfect or not
3. Write a Visual Basic program to check given number is prime or not
4. Write a Visual Basic program to check given number is Armstrong or not
5. Write a Visual basic program to implement all date & time functions
6. Write a Visual basic program to calculate the age of a person using calendar control
7. Write a Visual basic program to perform all string manipulations
8. Write a Visual basic program to arrange the numbers in order
9. Write a Visual basic program to implement menus

Note: -Questions for the External examination will be based on the concepts learnt

Course Outcomes

After successful completion of this course, student will be able to

CO1: Demonstrate the basics in Visual basic programming in terms of constructs, control statements and functions

CO2: Apply visual studio software

CO3: Enhance problem solving, programming and debugging skills

CO4: Plan the VB programming language

CO5: Analyze and implement the various events of VB

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	1	9	9	3	**43**
CO2	9	3	9	3	9	9	9	**51**
CO3	3	9	1	1	3	1	9	**27**
CO4	9	3	9	1	9	9	3	**43**
CO5	9	1	9	3	9	9	3	**43**
Total	**39**	**25**	**31**	**9**	**39**	**37**	**27**	**207**

Low-1 Medium-3 High-9

Extra Credit III- R Tool Lab

Semester: IV

Subject Code: IBITX4P **Credit: 2**

Course Objectives:

1. To understand the concept of R Tool
2. To implement statistics analysis

Program List

1. Write a Program to implementing correlation analysis
2. Write a Program to implementing regression analysis
3. Write a Program to implementing t-test
4. Write a Program to implementing z-test
5. Write a Program to implementing f-test
6. Write a Program to implementing chi-square test
7. Write a Program to implementing kruskal-wallis test
8. Write a Program to implementing likert scaling techniques
9. Write a Program to implementing analysis of variance (ANOVA)

Note: - Questions for External examination will be based on concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Demonstrate the basics in R programming in terms of constructs, control statements and functions

CO2: Apply data analytics software
CO3: Enhance problem solving, programming and debugging skills
CO4: Plan the R programming from a statistical perspective
CO5: Analyze and implement the various data structures of R

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	1	9	9	3	**43**
CO2	9	3	9	3	9	9	9	**51**
CO3	3	9	1	1	3	1	9	**27**
CO4	9	3	9	1	9	9	3	**43**
CO5	9	1	9	3	9	9	3	**43**
Total	**39**	**25**	**31**	**9**	**39**	**37**	**27**	**207**

Low-1 Medium-3 High-9

Extra Credit V-Data Mining Lab

Semester: VI
Subject Code: IBITX6P **Credit: 2**

Course Objectives:
1. To understand the concept of data mining tool
2. To implement various data mining algorithm

Program List
1. Create data-set in .arff file format. Demonstration of preprocessing on WEKA data-set.
2. Demonstration of Association rule process on data-set contact lenses.arff / supermarket using apriori algorithm.
3. Demonstration of classification rule process on WEKA data-set using j48 algorithm
4. Demonstration of classification rule process on WEKA data-set using Naive Bayes algorithm.
5. Demonstration of clustering rule process on data-set iris.arff using simple k-means.

Note: - Questions for Internal and External examination will be based on concepts learnt

Course Outcomes:
After successful completion of this course, student will be able to
CO 1: Describe Data mining concept.
CO 2: Apply the knowledge of data mining techniques
CO 3: Adapt to new data mining tools.
CO 4: Explore recent trends in data mining such as web mining, spatial-temporal mining
CO5: Build different types of algorithm

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	9	1	1	**25**
CO2	9	3	3	1	9	1	3	**29**
CO3	9	3	3	3	9	3	3	**33**
CO4	9	3	3	3	9	3	3	**33**
CO5	3	3	9	3	9	3	9	**39**
Total	**39**	**15**	**19**	**11**	**45**	**11**	**19**	**159**

Low-1 Medium-3 High-9

B Sc Computer Science

Three Years Regular Programme

(For Students Admitted from 2022 -23)

Programme Specific Outcomes:

On completion of this programme, student will be able to gain

PSO 1: Demonstrate the aptitude of Computer Programming and Computer based problem solving skills

PSO2: Display the knowledge of appropriate theory, practices and tools for the specification, design, and implementation

PSO3: Apply the knowledge of Statistics and Operations Research in the development of computational solutions

PSO4: Ability to link knowledge of Computer Science and Mathematics.

PSO5: Ability to formulate, to model, to design solutions, to appreciate emerging technologies and to use software tools

PSO6: Ability to design, develop and implement computer programs to solve real world problems in various domains

PSO7: Ability to pursue higher studies of specialization and to take up technical employment

PREAMBLE

The Board of Studies of Computer Science revamped the curriculum with the following changes

Core courses

- Computer Organization, .NET Programming, .NET Programming Lab, Data Structures using C++ Lab and Statistics has been introduced
- New Syllabus framed for the courses Fundamentals of Computer, .NET Programming, Software Engineering, Computer Networks, RDBMS, PHP, Operating Systems and Open Technology
- New Syllabus framed for the lab courses Office Automation Lab, Multimedia Lab -I, Multimedia Lab -II, Data Structures using C++ Lab, RDBMS Lab, PHP Lab, Programming in Java Lab
- The Courses Digital Electronics, Programming in C, Microprocessor and Programming in Java syllabus has been reframed
- The Lab Courses Digital Electronics Lab, Programming in C Lab, Microprocessor Lab and .NET Lab syllabus has been reframed
- The Courses Software Engineering and Computer Networks shifted form VI Semester to V Semester
- The Course Programming in Java and Programming in java Lab shifted from V Semester to VI Semester

Discipline Specific Elective

- Block Chain Technology, PHP Programming, Mobile Application Development, Cryptography and Network Security, Cloud and distributed Computing and Artificial Intelligence and Expert Systems has been introduced and framed the syllabus

Extra Credit

- The Course Skills for Employability renamed as Employability Skills shifted from VI semester to V Semester and reframed the syllabus

General Interest Course

- The Course Environmental Studies converted into Environmental Science
- The Course Women Studies converted into Women Entrepreneurship

Others

- Programme Outcomes and Programme Specific Outcomes included
- Course Objectives included for all the courses
- Elective course renamed as Discipline Specific Elective (DSE)
- Skill Based Elective renamed as Skill Enhancement Course
- Allied renamed as Ability Enhancement Compulsory Course (AECC)
- Mapping of course outcomes to programmme outcomes table included for all the courses

PROGRAMME STRUCTURE - PROGRAM CODE : UCS

Sem	Subject Code	Course	Subject Title	Hours / week	Credit	CIA	ESE	Total Marks
I	IBLT11/ IBLA11/ IBLH11	Language I	Tamil I /Arabic I/ Hindi I	5	3	40	60	100
	IBLEI12/ IBLEII12	Language II	English I a or b	5	3	40	60	100
	IBCSC11	Core I	Fundamentals of Computers	4	4	40	60	100
	IBCSC12	Core II	Computer Organization	4	3	40	60	100
	IBCSC13P	Core III	Office Automation Lab	3	2	40	60	100
	IBCSA14	AECC I	Digital Electronics	5 (T-3 P-2)	4	40 (T-20 P-20)	60	100
	IBCSS15P	SEC I	Multimedia Lab - I	2	2	-	50	50
			Library/Browsing	1	-	-	-	-
			Remedial/Games	1	-	-	-	-
			Total	**30**	**21**	**240**	**410**	**650**
II	IBLT21/ IBLA21/ IBLH21	Language I	Tamil II /Arabic II /Hindi II	5	3	40	60	100
	IBLEI22/ IBLEII22	Language II	English II a or b	5	3	40	60	100
	IBCSC21	Core IV	○ Programming in C	5	5	40	60	100
	IBCSC22P	Core V	Programming in C Lab	4	4	40	60	100
	IBCSA23	AECC II	Microprocessor	5 (T-3 P-2)	4	40 (T-20 P-20)	60	100

	IBCSS24P	SEC II	Multimedia Lab - II	2	2	-	50	50
	IBES2	GIC I	Environmental Science	2	2	-	50	50
			Library/Browsing	1	-	-	-	-
			Remedial/Games	1	-	-	-	-
	IBCSX2P/ IBCSX2O	Extra Credit I	Coral Draw Lab/ *Online Course	-	2	-	100	100
			Total	**30**	**23+2**	**200**	**400+ 100**	**600+ 100**
III	IBLT31/ IBLA31/ IBLH31	Language I	Tamil III /Arabic III / Hindi III	5	3	40	60	100
	IBLEI32/ IBLEII32	Language II	English III a or b	5	3	40	60	100
	IBCSC31	Core VI	.NET Programming	4	4	40	60	100
	IBCSC32P	Core VII	.NET Programming Lab	4	4	40	60	100
	IBCSA33	AECC III	Statistics	4	4	40	60	100
	IBCSS34P	SEC III	Web Designing Lab (HTML and Scripting Language)	2	2	-	50	50
		OEC		2	2	-	50	50
	IBHR3	GIC II	Human Rights	2	2	-	50	50
	IBXTN3	Extension Activities	NSS / CSS	2	2	100	-	100
	IBCSX3P/ IBCSX3O	Extra Credit II	Programming in Visual Basic Lab / *Online Course	-	2	-	100	100
			Total	**30**	**26+2**	**300**	**450+ 100**	**750+ 100**
IV	IBLT41/ IBLA41/ IBLH41	Language I	Tamil IV /Arabic IV / Hindi IV	5	3	40	60	100
	IBLEI42/ IBLEII42	Language II	English IV a or b	5	3	40	60	100
	IBCSC41	Core VIII	○ Data Structures and Algorithms	5	4	40	60	100
	IBCSC42P	Core IX	Data Structures using C++ Lab	4	4	40	60	100
	IBCSA43	AECC IV	Operations Research	5	4	40	60	100
	IBCSS44P	SEC IV	Linux and Shell Programming Lab	2	2	-	50	50
	IBLVE4	GIC III	Life Skills and Value Education	2	2	-	50	50
		OEC		2	2	-	50	50
	IBCSX4P/ IBCSX4O	Extra Credit III	R Tool Lab /# Internship	-	2	-	100	100

			Total	**30**	**24+2**	**200**	**450+ 100**	**650+ 100**
V	IBCSC51	Core X	Software Engineering	5	4	40	60	100
	IBCSC52	Core XI	Computer Networks	5	4	40	60	100
	IBCSC53	Core XII	RDBMS	4	4	40	60	100
	IBCSC54P	Core XIII	RDBMS Lab	4	3	40	60	100
	IBCSE5A/ IBCSE5B	DSE I	a) Blockchain Technology b) PHP Programming	4	4	40	60	100
	IBCSE5C/ IBCSE5D	DSE II	a) Mobile Application Development b) Cryptography and Network security	4	4	40	60	100
	IBCSS55P	SEC V	PHP Programming Lab	2	2	-	50	50
	IBWE5	GIC IV	Women Entrepreneurship	2	2	-	50	50
	IBCSX5/ IBCSX5O	Extra Credit IV	Employability Skills	-	2	100		100
			Total	**30**	**27+2**	**240+ 100**	**460**	**700+ 100**
VI	IBCSC61	Core XIV	Operating Systems	5	4	40	60	100
	IBCSC62	Core XV	Programming in Java	4	3	40	60	100
	IBCSC63P	Core XVI	Programming in Java Lab	4	3	40	60	100
	IBCSC64	Core XVII	Open Technology	4	3	40	60	100
	IBCSC65PW	Core XVIII	Project	6	5	40	60	100
	IBCSE6A/ IBCSE6B	DSE III	a) Cloud and Distributed Computing b) Artificial Intelligence and Expert Systems	4	4	40	60	100
	IBCSS66P	SEC VI	Open Technology Lab	2	2	--	50	50
	IBCSX6P/ IBCSX6O	Extra Credit V	Data Mining Lab / *Online Course	--	2	--	100	100
			Library/Browsing	1	--	--	--	--
			Total	**30**	**24+2**	**240**	**410+ 100**	**650+ 100**
			Grand Total	**180**	**145 +10**	**1420+ 100**	**2580 +400**	**4000 +500**

*****For Online Course credit alone will be assigned on submission of certificate obtained by appearing for online examination from EdX, Spoken Tutorial, NPTEL or Coursera etc.
#For internship course, refer www.internshala.com

- For online course integration, syllabus will be taken from spoken tutorial.

AECC - Ability Enhancement Compulsory Course
SEC - Skill Enhancement Course

DSE - Discipline Specific Elective
OEG - Open Elective Course
GIC - General Interest Course

Core I – Fundamentals of Computers

(For Students Admitted from 2022 -23)

Semester: I **Hours/Week 4**
Subject Code: IBCSC11 **Credit: 4**

Course Objectives:

1. To understand the basics of computers
2. To understand the working of input/output interfaces

Unit I **(12 hours)**

Computer Basics: Algorithms – Simple Model of a Computer – Characteristics of Computers – Problem Solving Using Computers. **Data Representation:** Representation of Characters in Computers – Representation of Integers – Representation of Fractions – Hexadecimal Representation of Numbers – Decimal to Binary Conversion – Error Detecting Codes.

Unit II **(12 hours)**

Input/Output Units: Traditional Computer Input/Output Units – Other Input Technologies – Computer Output Devices – Choosing a Printer. **Computer Memory:** Memory Cell – Memory Organization – Read Only Memory – Serial Access Memory – Physical Devices used to construct memories – Magnetic Hard Disk – Compact Disk Read Only memory – Magnetic Tape Drive – Memory Hierarchy.

Unit III **(12 hours)**

Binary Arithmetic: Binary Addition – Binary Subtraction – Signed Numbers – Two's Complement Representation of Numbers – Addition/ Subtraction of Numbers in 2's Complement Notation – Binary Multiplication – Binary Division – Floating Point Representation of Numbers – Arithmetic Operations with Normalized Floating-Point Numbers.

Unit IV **(12 hours)**

Programming Languages: Why Programming Language? – Assembly language – Higher Level Programming Languages – Compiling a High Level Language Program – Some High Level Languages. **Microcomputers:** Ideal Microcomputer – Actual Microcomputer - Memory Systems for Microcomputers – Reduced Instruction Set Computers. **Computer Generations and Classification:** First Generation of Computers – Second generation – Third Generation – Fourth Generation – Fifth Generation –Classification of Computers.

Unit V **(12 hours)**

Advanced Input/Output Interfaces: Graphical User Interface – Vector Graphics – Raster Graphics – Accelerated Graphics with GPU – Stereo Display Units – Other Visual Displays – Input Devices for Interaction – **Multimedia Data Acquisition and Processing:** Image Acquisition and Storage – Storage formats for pictures – Image Acquisition with a Digital

Camera – Capturing a movie image with a Video Camera – Compression of Video Data – MPEG Compression Standard.

Course Outcomes:
After successful completion of this course, students will be able to
CO1: Summarize the basics of computers and its generations
CO2: Illustrate number systems and its conversions
CO3: Analyze the uses of internal and external components of computers
CO4: Select appropriate input and output devices for digital literacy according to its intended use
CO5: Formulate the methods to handle Multimedia Applications

Text Book:
1. V Rajaraman, Neeharika Adabala, *Fundamentals of Computers*, PHI Learning Private Limited, Sixth Edition, 2018.

Reference Books:
1. James A. O'Brien, George M. Marakas, *Introduction to Information Systems*, McGraw Hill Company, Fifteenth Edition, 2010.
2. ITL Education Solutions Limited, *Introduction to Information Technology*, Pearson Education, Fourth Edition, 2007.
3. Alexis Leon, Mathews Leon, *Fundamentals of Information Technology*, L&L Consultancy Services Private Limited, Second Edition, 1999.

E-Resources:
1. NPTEL: https://nptel.ac.in/courses/106/105/106105163/
2. https://www.coursera.org/courses?query=computer%20fundamentals
3. https://cstutorialpoint.com/computer-fundamentals-notes/
4. https://ecomputernotes.com/fundamental
5. https://testbook.com/learn/computer-fundamentals/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	9	9	9	9	**45**
CO2	9	1	9	3	9	9	9	**49**
CO3	9	3	3	9	9	9	3	**45**
CO4	9	9	3	9	9	9	9	**57**
CO5	9	3	9	9	9	9	3	**51**
Total	**39**	**19**	**27**	**39**	**45**	**45**	**33**	**247**

Low-1 Medium-3 High-9

Core II – Computer Organization

(For Students Admitted from 2022 -23)

Semester: I **Hours/Week: 4**
Subject Code: IBCSC12 **Credit: 3**

Course Objectives:

1. To understand the structure, function and characteristics of computer systems and understand the design of the various functional units and components of computers
2. To identify the elements of modern instructions sets and their impact on processor design

Unit I **(12 hours)**

Basic Computer Organization and Design: Instruction Codes-Computer Registers-Computer Instructions-Timing and Control-Instruction Cycle-Memory Reference Instructions -Input-Output and Interrupts.

Unit II **(12 hours)**

Micro programmed Control: Control Memory- Address Sequencing- Micro program Examples- Design of Control Unit.

Unit III **(12 hours)**

Central Processing Unit: Introduction- General Register Organization - Instruction Formats -Addressing Modes-Data Transfer and Manipulation-Program Control-**RISC Pipeline and Vector Processing:** Parallel Processing-Pipeline-Arithmetic Pipeline-Instruction Pipeline-Vector Processing.

Unit IV **(12 hours)**

Input-Output Organization: Peripheral Devices- /O interface-Asynchronous Data Transfer -Modes of Transfer -Direct Memory Access- Input Output Processor (Excluding IBM and Intel IOPs).

Unit V **(12 hours)**

Memory Organization: Memory-Main Memory- Auxiliary Memory -Associative Memory-Cache Memory -Virtual Memory-Memory Management Hardware.

Course Outcomes:

After successful completion of this course, students will be able to

CO 1: Define the fundamental organization of a computer system
CO 2: Explain the concept of sequencing, designing, pipeline and vector processing methods
CO 3: Examine the function of input-output organization
CO 4: Compare various pipeline concepts
CO 5: Distinguish the organization of various parts of a system memory hierarchy

Text Book:

1. Morris Mano M, *Computer System Architecture*, Prentice Hall of India, 2011.

Reference Books:

1. William Stallings, *Computer Organization and Architecture*, Pearson Publication, Eighth Edition, 2010.
2. Morris Mano, *Digital Login and Computer Design*, Prentice Hall of India, 2001.

E-Resources:

1. NPTEL: https://nptel.ac.in/courses/106/105/106105163/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	1	3	3	3	**31**
CO2	9	3	3	3	9	9	3	**39**
CO3	3	9	3	3	3	3	3	**27**
CO4	9	3	9	3	3	3	3	**33**
CO5	3	9	3	3	9	3	3	**33**
Total	**33**	**33**	**21**	**13**	**27**	**21**	**15**	**163**

Low-1 Medium-3 High-9

Core III – Office Automation Lab

(For Students Admitted from 2022 -23)

Semester: I **Hours/Week: 3**
Subject Code: IBCSC13P **Credit: 2**

Course Objectives:

1. To acquire knowledge about word processing, spread sheet, Data base creation and slide preparation
2. To improve creative thinking in presentations

List of Programs

Word Processing

1. Create a word processing document consists two pages in a Book named "XX" and then do the following:
    a. Formatting Text, Alignment and Font Style
    b. Perform Find and Replace
    c. Add Header and Footer option to specify name of the Book Chapter Heading and Page number of total pages
2. Create a word processing document having details of our College courses using bulleted and number lists. Type the title using Word Art
3. Design a Letter to felicitate Farewell Address to our seniors with Font Setting/Page Borders/Word Art/Clip Art/Symbols
4. Create a Newsletter Article (using Columns, Drop cap)
5. Create a time table for your Internal Exam Schedule (using Table)
6. Type Business letter and send it to more using Mail Merge
7. Create your own Resume

Spreadsheet

1. Create an spreadsheet consists of Student details and then do the following:
    a. Calculate student wise total and subject wise total
    b. Find the Maximum and Minimum marks of the subject
    c. Grade is calculated as
        i.f %>=90, then grade A
        ii. If %>=80 and <90, then grade B
        iii. If %>=70 and <80, then grade C

iv. If %>=60 and <70, then grade D
v. If %<60, then grade F

2. Create a spreadsheet having Employee details suitably and then do the following.
   a. Use functions to calculate Net Pay and Gross Pay
   b. Perform conditional formatting and validation
3. Create a purchase order list for a company
   a. Prepare a purchased item list with price
   b. Prepare a flowchart for the price wise item
4. Create a macro

Presentation

1. Create a presentation showing your various activities of the department a Perform slide translation and Setting background designs
2. Create a presentation showing various aspect of your college and perform custom animation and import sound
3. Create a presentation using design templates and then perform the following one:
   a.Include Table and chart from file
   b.Include Picture and run the presentation using auto play
4. Perform Hyperlink within slides and link other documents

Database

1. Crate a Student Database having Name, Regno, Tamil, English, Maths, Total, and Average Perform to find total and average and check data entered
2. Create an Inventory database having Item Name, Item no. Quantity and Price. Perform query operation to retrieve data
3. Create a form to enter the details of the Book database
4. Create a report for the Book database

Note: Questions for Internal and External examination will be based on concept learnt

Course Outcomes:

After successful completion of this course, students will be able to

CO 1: Illustrate various options of Office Application
CO 2: Demonstrate different types of formats, formulas and transition in office application
CO 3: Develop reports to solve the problems of manual report handling
CO 4: Compare the options of different Microsoft Office Applications to use appropriately
CO 5: Build a presentation, Advertisement, Reports etc. for enterprise

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	3	9	3	9	**45**
CO2	9	9	3	9	9	9	9	**57**
CO3	9	9	3	9	9	9	9	**57**
CO4	9	3	3	3	9	3	9	**39**
CO5	9	9	3	3	9	3	9	**45**
Total	**45**	**39**	**15**	**27**	**45**	**27**	**45**	**243**

Low-1 Medium-3 High-9

AECC I – Digital Electronics

(For Students Admitted from 2022 -23)

Semester: I **Hours/Week: 5 (T: 3 P: 2)**
Subject Code: IBCSA14 **Credit: 4**

Course Objectives:

1. To know the concepts of Combinational circuits
2. To understand the concepts of flipflops, registers and counters

Unit I **(9 hours)**

Number Systems and Codes: Introduction- binary, octal, decimal, and hexadecimal number system- decimal to binary, octal to binary, hexadecimal to binary – hexadecimal to octal conversions and vice versa-binary arithmetic-1s and 2s complement representations-BCD addition and subtraction-weighted and un- weighted codes- alphanumeric codes.

Unit II **(9 hours)**

Basic Boolean functions: AND,OR,NOT Functions- Boolean theorems and laws-use of Boolean algebra for simplification of logical expressions- minterm and maxterm- canonical sum of products and product of sum simplifications- minimization of logical expressions using K-map-logic gates- AND,OR,NOT,EX-OR,NAND,NOR gates.

Unit III **(9 hours)**

Introduction to combinational logic circuits : arithmetic circuits –half adder, full adder, half subtractor, full subtractor, parallel binary adder - subtractor, serial adder, multiplier and divider-encoder, decoder.

Unit IV **(9 hours)**

Introduction to sequential circuits-flipflops-SR,JK,D and T flipflops-master-slave flipflops-level and edge triggering-synchronous and asynchronous counters- up/down counters-modulo-n- counters- shift registers- serial in serial out-serial in parallel out,parallel in serial out and parallel in parallel out shift counters- ring counters.

Unit V **(9 hours)**

Read only memory- architecture of ROM, PROM, EPROM, EEPROM, ROM applications-RAM- RAM architecture-static and dynamic RAM.

Course Outcomes:

After successful completion of this course, students will be able to

CO 1: Remember the basic structure of number system methods like binary, octal and hexadecimal
CO 2: Apply the functions to simplify the logical expressions
CO 3: Analyze the operations of various logical circuits
CO 4: Evaluate the functions of the memory organization
CO 5: Create the sequential and combinational logic circuits

Text Book:

1. S. Salivahanan, S. Arivazhagan, *Digital Circuits And Design*, Oxford University Press, 2018.

Reference Books:

1. M. Morris Mano,Michael D. Ciletti, *Digital Design*, Pearson Education, Fifth Edition, 2014.
2. A.Anand Kumar, *Fundamentals of Digital Circuits*, PHI Learning Private Limited, Fourth Edition, 2016
3. Anil K.Maini, *Digital Electronics*, Wiley Publications, 2014.
4. Charles H.Roth, *Fundamentals of Logic Design*, Thomson Learning, Sixth Edition, 2013.

E-Resources:

1. NPTEL: https://nptel.ac.in/courses/108/105/108105113/
2. SWAYAM:https://www.classcentral.com/course/swayam-digital-electronic-circuits-12953
3. SWAYAM: https://onlinecourses.swayam2.ac.in/cec21_cs16/preview
4.https://tutorialsinhand.com/tutorials/digital-electronics-tutorial/digital-electronics-basics/digital-electronics-introduction.aspx
5. https://www.udemy.com/course/introduction-to-digital-electronics/
6. https://www.udemy.com/course/basics-of-digital-electronics/

Digital Electronics (Lab)

Hours/Week: 2

List of Programs

Logic Gates

1. Verification of AND Gate using ICs
2. Verification of OR Gate using ICs
3. Verification of NOT Gate using ICs
4. Verification of NAND Gate using ICs
5. Verification of NOR Gate using ICs
6. Verification of EX-OR Gate using ICs

Universal Gates

7. Universality of NAND gates using IC 7400
8. Universality of NOR gates using IC 7402

Boolean algebra and Theorem

9. Verification of Boolean Expression using ICs
10. Verification of Demorgan's theorems using ICs

Combinational Logic Circuits

11. Binary half and full adder using ICs
12. Binary half and full subtractor using ICs

Note: Questions for Internal examination will be based on concept learnt

Course Outcomes:

After successful completion of this course, students will be able to

CO 1: Recognize logic functions
CO 2: Identify the steps for truth tables, and Boolean algebra expressions
CO 3: Simplify the process of the laws of Boolean algebra to simplify circuits and Boolean algebra expressions
CO 4: Support combinational logic circuits
CO 5: Build the Diodes Characteristics

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	3	9	**37**
CO2	9	3	3	1	9	3	9	**37**
CO3	9	3	3	1	9	3	9	**37**
CO4	9	3	3	1	9	3	9	**37**
CO5	9	3	3	1	9	3	9	**37**
Total	**45**	**15**	**15**	**5**	**45**	**15**	**45**	**185**

Low-1 Medium-3 High-9

SEC I – Multimedia Lab – I

(For Students Admitted from 2022 -23)

Semester: I **Hours/Week: 2**

Subject Code : IBCSS15P **Credit: 2**

Course Objectives:

1. To understand the basic concepts of GIMP
2. To gain knowledge about various tools of GIMP

List of Programs

1. Design a business card
2. Create a logo
3. Convert an image into pencil drawing
4. Design scenery using various brushes
5. Design a greeting card
6. Create clipping mask – place an image inside text
7. Create passport size photo
8. Animate a still photo
9. Create a shadow effect for an object
10. Create a mirror effect for an image
11. Apply the following tools in an image:
    i)Smudge ii)Blur/Sharpen iii)Dodge/Burn
12. Create a mosaic photo collage

Note: Questions for the External Examinations shall be based on the concepts learnt

Course Outcomes:

After successful completion of this course, students will be able to

CO 1: Recognize the uses of various tools and effects in GIMP

CO 2: Identify the steps to start designing with images

CO 3: Simplify the process of designing, editing and masking to solve the difficulties of designers

CO 4: Support studios to create passport size photo

CO 5: Design Visiting card, ID card, Birthday card, logo etc.

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	9	9	1	**43**
CO2	9	1	9	9	3	9	3	**43**
CO3	9	3	9	9	3	9	9	**51**
CO4	9	1	3	9	3	9	3	**37**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**17**	**39**	**39**	**27**	**45**	**25**	**237**

Low-1 Medium-3 High-9

Core IV – Programming in C

(For Students Admitted from 2022 -23)

Semester: II **Hours/Week: 5**
Subject Code: IBCSC21 **Credit: 5**

Course Objectives:

1. To understand the main features of operators, input/ output statements, control statements and program structure
2. To enhance the students to understand the significance of functions, arrays, strings, pointers and structures

Unit I **(15 hours)**

Introduction to C Programming: C Character Set-Writing first program of C- Identifiers and Keywords- A more useful C Program -Entering the program into the computer -Data types- Constants -Variables and Arrays- Declarations - Expressions- Statements- Symbolic constants- **Operators and Expressions:** Arithmetic Operators-Unary Operators - Relational and logical Operators-Assignment Operators-The conditional Operators-Library functions.

Unit II **(15 hours)**

Data Input and Output: Preliminaries – The getchar function- The putchar function - The scanf function-The printf function- gets and puts function-Interactive programming.**Control Statements:** Preliminaries -**Branching:** The If-else Statement-Looping- while statement- do-while statement- for statement -nested control structures- switch statement - break statement- continue statement- coma operator -goto statement.**Functions:** A brief overview- Defining a function -Accessing a function -Function prototypes- Passing arguments to a function- Recursion.

Unit III **(15 hours)**

Program Structure: Storage classes – Automatic variables – External variables – Static variables – Multi File programs – More about library functions.**Arrays:** Defining an Array – Processing an Array – Passing arrays to Functions – Multidimensional arrays.

Unit IV **(15 hours)**

Strings: Defining a String – NULL Character – Initialization of Strings – Reading and writing a string – Processing strings – Character arithmetic – Searching and sorting of strings – Some more library Functions for strings.**Pointers:** Fundamentals – Pointer Declarations – Passing pointers to a function – Pointers and one dimensional arrays – Dynamic memory

allocation – Operations on pointers - Pointers and multidimensional arrays – Arrays of Pointers - Passing functions to other functions – More about pointer declarations.

Unit V **(15 hours)**

Structures and Unions: Defining a Structure – Processing a Structure – User defined data types – Structures and pointers – Passing structures to functions – Self Referential structures – Unions.**File Handling:** Why Files - Opening and closing a Data file – Reading and writing a data file – Processing a data file – Unformatted data files – Concept of binary files – Accessing the file randomly.

Course Outcomes:

After successful completion of this course, students will be able to

CO 1: Describe the basic programming knowledge of C, operators and expressions
CO 2: Demonstrate data input and output, control statements & functions
CO 3: Analyse program structure and arrays
CO 4: Evaluate strings and pointers
CO 5: Formulate structures, unions and file handling

Text Book:

1. Byron Gottfried, *Programming with C*, Tata McGraw Hill Education, Fourth Edition, 2018.

Reference Books:

1. Balagurusamy E, *Programming in ANSI C*, Tata McGraw-Hill Publishing Company, Sixth Edition, 2012.
2. Venugopal K R , Sudeep R Prasad, *Programming with C*, Tata McGraw-Hill Publishing Company ,2008.
3. Mullish, Henry Cooper, Herbert, *The Spirit of C - An introduction to modern programming*, Jaico Publishing House, Third Edition, 2006.

E - Resources:

1. NPTEL: https://onlinecourses.nptel.ac.in/noc19_cs42/preview
2. NPTEL: https://nptel.ac.in/courses/106/105/106105171/
3. NPTEL: https://onlinecourses.nptel.ac.in/noc21_cs01/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	9	9	3	9	**45**
CO2	9	3	3	3	9	3	99	**39**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	3	3	3	9	3	9	**39**
CO5	9	9	9	3	9	9	9	**57**
Total	**45**	**21**	**21**	**21**	**45**	**27**	**45**	**225**

Low-1 Medium-3 High-9

Core V – Programming in C Lab

(For Students Admitted from 2022 -23)

Semester: II **Hours/Week: 4**
Subject Code: IBCSC22P **Credit: 4**

Course Objectives:

1. To introduce the field of programming using C language
2. To enhance the analyzing and problem solving skills and use the same for writing programs in C

List of Programs

Formula substitution

1. Develop a C Program to check whether the given number is odd or even
2. Develop a C Program to find sum of the digits and reverse the digits
3. Develop a C Program to generate the Fibonacci series
4. Develop a C Program to generate Prime number within range
5. Develop a C Program to find whether a given number is Armstrong or not
6. Develop a C Program to count the number of positive, negative and zero in the list
7. Develop a C Program to solve the Quadratic Equation
8. Develop a C Program to find the area of various shapes using switch case

Array

9. Develop a C Program to Find Matrix Addition , Subtraction, Multiplication and Transpose of a matrix using switch case
10. Develop a C Program to Check whether the element is present in the given list or not
11. Develop a C Program to sort numbers in ascending and descending order
12. Develop a C Program to sort names in Alphabetical order

Functions & Structures

13. Develop a C Program to find the factorial of a given number using function declaration
14. Develop a C Program to find the factorial of a given number using recursion function
15. Develop a C Program to Prepare student mark list using structure
16. Develop a C Program to Prepare electricity bill using structure

String Manipulation

17. Develop a C Program to count the vowels in the given string
18. Develop a C Program to convert the case of given string from upper case to lower case and vice versa

Pointers

19. Develop a C Program to sort numbers in ascending order using pointers
20. Develop a C Program to find average of two numbers using pointers

Note: Questions for Internal and External examination will be based on concept learnt

Course Outcome:

After successful completion of this course, students will be able to

CO 1: Remember the control structures and loops
CO 2: Apply the concepts of functions and pointers
CO 3: Analyze the concepts of Structures and arrays
CO 4: Evaluate string handling functions
CO 5: Create programs with pointers, arrays, structures

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	9	9	**43**
CO2	9	3	3	1	9	9	9	**43**
CO3	9	3	3	1	9	9	9	**43**
CO4	9	3	3	1	9	9	9	**43**
CO5	9	3	3	1	9	9	9	**43**
Total	**45**	**15**	**15**	**5**	**45**	**45**	**45**	**215**

Low-1 Medium-3 High-9

AECC II – Microprocessor

(For Students Admitted from 2022 -23)

Semester: II **Hours/Week: 5 (T: 3 P: 2)**
Subject Code: IBCSA23 **Credit: 4**

Course Objectives:

1. To understand the programming and interfacing of microprocessors and microcontrollers
2. To provide strong foundation for designing real world applications using microprocessors and microcontrollers

Unit I **(9 hours)**

Introduction of Microprocessors: Evolution of Microprocessors-Basic Functional Blocks of Microprocessors-Microprocessor based Systems. **Intel 8086 pins, signals and Architecture:** Introduction to INTEL8086-Pins and Signal of INTEL8086-Architecture of 8086-Bus cycles and Timing Diagram.

Unit II **(9 hours)**

Instruction set of 8086: Format of 8086 Instructions-Instructions execution time-Instructing affecting flags-Classification of 8086 Instructions-**Memory and I/O Interfacing:** memory-Semiconductor Memory-Static RAM and EPROM-Memory organization in 8086 based system-IO Structure of a typical Microcomputer-Example of Memory and IO Interface in 8086.

Unit III **(9 hours)**

Interrupt: Introduction-Classification of Interrupt-Sources-Interrupt of 8086-Implementing and Interrupt scheme in8086-INTR and its expansion-Programmable Interrupt Controller-INTEL 8259-Introduction of Assembly Language-Assembly language program development tools.

Unit IV **(9 hours)**

Modular Programming: Stacks-Macros-Procedures-**Peripheral Devices and Interfacing:** Parallel data communication Interface-Serial Data Communication Interface-Keyboard and Display Interface-Programmable Timer-INTEL8254-DAC Interface-ADC Interface.

Unit V **(9 hours)**

INTEL 80 X 86 Families of Processors: INTEL 80186 Microprocessor- INTEL 80286 Microprocessor- INTEL 80386 Microprocessor- INTEL 80486 Microprocessor- Pentium Microprocessor-8086 Microprocessor-**Based System:** Basic Configuration-Multiprocessor Configurations.

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Discussion on 8086 microprocessor, Peripheral devices and 80186, 80286 Microprocessors

CO2: Use the concepts of I/O Interfacing and Peripheral Devices in real world electrical Problems

CO3: Classify the instruction sets and programming structure in 8086

CO4: Evaluate assembly language program that will provide ADC, DAC Interface

CO5: Design different interfacing applications using microcontrollers and peripherals

Text Book:

1. A.Nagoor Kani, *8086 Microprocessor and Applications*, CBS Publishing & Distributors , Third Edition,2022.

Reference Books:

1. Walter A.Triebel, Avtar Singh, *The 8088 and 8086 Microprocessors Programming Interfacing Software Hardware and Applications*, Prentice Hall of Publication, Fourth Edition, 2003.
2. Aditya P.Mathur, *Introduction to Microprocessor*, McGraw Hill Publishing, Third Edition, 1989.
3. M.Rafiquzzaman, *Microprocessor Theory and Application*, Prentice Hall of India, 1996.

E- Resources:

1. NPTEL: https://nptel.ac.in/courses/108/107/108107029/
2. NPTEL: https://nptel.ac.in/courses/117/104/117104072/
3. NPTEL: https://nptel.ac.in/courses/108/105/108105102/
4. NPTEL: https://onlinecourses.nptel.ac.in/noc21_ee41/preview

Microprocessor (Lab)

Hours/Week: 2

List of Programs

Arithmetic Operations

1. Addition / Subtraction of 8/16 bit Data
2. Multiplication / Division of 8 bit Data Formula Substitution
3. Smallest / Largest of N Numbers
4. Sum of Odd/Even Numbers
5. Factorial of a Number
6. Fibonacci Series
7. Reverse a Number
8. Square root of a given number

Binary Conversion

9. One's complement and Two's complement of given numbers Array
10. To arrange in ascending / descending order

String Manipulation

11. Program for searching for a number or character in a string for 8086.
12. Program for String manipulations for 8086.

Note: Questions for Internal examination will be based on concept learnt

Course Outcomes:

After successful completion of this course, students will be able to

CO 1: Understand to solve basic binary operations using assembly languages
CO2: Demonstrate programming proficiency using the various addressing modes and data transfer instructions
CO 3: Apply knowledge using internal registers
CO 4: Evaluate Interface Programs in 8086
CO 5: Design and Implement interface programs

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	3	9	9	45
CO2	9	3	9	3	9	9	9	51
CO3	9	3	9	9	9	9	9	57
CO4	9	3	3	9	9	9	9	51
CO5	9	3	9	9	9	9	9	57
Total	**45**	**15**	**39**	**33**	**39**	**45**	**45**	**261**

Low-1 Medium-3 High-9

SEC II - Multimedia Lab – II

(For Students Admitted from 2022 -23)

Semester: II **Hours/Week: 2**
Subject Code: IBCSS24P **Credit: 2**

Course Objectives:

1. To understand the basic concepts of animation
2. To gain knowledge about creating animated pictures using Blender

List of programs

1. Create a coffee cup
2. Create a dinner table fork
3. Create a cup with wooden texture
4. Create a wooden table
5. Model a leather couch
6. Create a teddy bear
7. Create a photo realistic ring
8. Create a simple character

9. Create a stylized number animation
10. Animate a bouncing ball
11. Animate a shape of an object into another shape

Note: Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, students will be able to

CO 1: Recognize the uses of various tools in Blender
CO 2: Predict the steps that are needed to create animation
CO 3: Critically analyze the required options to create animation with respect to its nature
CO 4: Evaluate the use of 'Motion tween' in the givenconcept
CO 5: Create animated scenes, animated logos, animated cartoon characters etc

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	3	3	9	3	**31**
CO2	9	1	9	3	3	9	3	**37**
CO3	9	1	9	3	9	9	9	**49**
CO4	9	1	3	3	9	9	9	**43**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**13**	**33**	**21**	**33**	**45**	**33**	**223**

Low-1 Medium-3 High-9

Core VI – .NET Programming

(For Students Admitted from 2022 -23)

Semester: III **Hours/Week: 4**
Subject Code: IBCSC31 **Credit: 4**

Course Objectives:

1. To understand the code solutions and compile C# projects within the .NET Framework
2. To design and develop professional console and window based .NET Application

Unit I **(12 hours)**

The .NET Framework: .Net programming Framework-VB.NET,C#.NET and the .NET Languages-The Common Language Runtime-The .NET Class Library-ASP.NET-Visual Studio .NET.**Learning the .NET Languages:**The .NET Languages-Data Types-Declaring Variables-Scope and Accessibility-Variable Operations-Object-Based Manipulation-Conditional Structures-Loop Structures.Functions and SubroutinesTypes ,**Objects and Namespaces:** The Basics about classes –Value Types and Reference Types-Advanced Class Programming-Understanding Namespaces and Assemblies.

Unit II **(12 hours)**

ASP.NET Applications: ASP.NET Applications-Code-Behind-The Global.asax Application File-Understanding ASP.NET Classes-ASP.NET Configuration. **Web Form Fundamentals:** A Simple Page Applet-A Deeper Look at HTML Control Classes-The Page Class.Accessing HTML Server Controls.**Web Controls:** Stepping Up to Web Controls-Web control Classes-

AutoPostBack and Web Control Events.

Unit III **(12 hours)**

Using Visual Studio .NET: The promise of Visual Studio.NET-Starting a Visual Studio.Net Project – The Web form Designer-Writing Code-Visual Studio.NET Debugging.**Working Without Visual Studio.NET Validation and Rich Controls:** Validation-A simple Validation Example-Understanding Regular Expressions-A Validated Customer Form-**Other Rich Controls State Management:** The Problem of State-Viewstate-Transferring Information-CustomCookies-Session State.

Unit IV **(12 hours)**

Tracing, Logging and Error Handling: Common Errors-The .NET Exception Object-Handling exceptions-Throwing Your Own Exceptions-Logging Exceptions-Error Pages-Page Tracing. **Overview of ADO.NET:** Introducing ADO.NET and DataManagement-Characteristics of ADO.Net-The ADO.NET Object Model. **ADO.NET Data Access:** About the ADO.NET Examples-SQL Basics-The SQL Select Statement-Update-Insert-Delete-Accessing Data the Easy Way-Creating a connection-Defining a Select Command-Using a Command with a DataReader-Updating Data-Accessing Disconnected Data-Selecting Multiple Tables.

Unit V **(12 hours)**

Data Binding: Introduction-Single-Value Data Binding-Repeated-Value Data Binding-Data Binding with Databases. **The DataList, DataGrid and Repeater:** Introducing Templates-Using Templates with the DataList-Data Binding with Multiple Templates-Comparing the Template Controls-Selecting Items-Editing Items-Paging with the DataGrid.**Sorting with the DataGrid Using XML:** XML's Hidden Role in .NET-XML Explained- The XMLClasses-XML Validation-XML Display and Transforms-XML in ADO.NET.

Course Outcomes:

After successful completion of this course, students will be able to

CO 1: Interpret the basic concepts of .NET, Problem of the state, data, Management Validation and Rich controls

CO 2: Determine types, objects and namespaces, Enumerators and Iterators and Error Handling

CO 3: Illustrate Table Controls,ASP.Net Applications and the Web Server,Interfaces and Structures

CO 4: Evaluate on Exception Handling, Serializing objects,Direct Data Access

CO 5: Develop XML classes and XML Validation, web forms and use web controls

Text Book:

1. Matthew MacDonald, *The Complete Reference ASP.NET*, Tata McGraw-Hill Publishing Company, 2017.

Reference Books:

1. Dino Esposito, *Programming Microsoft ASP.NET*, Tata McGraw-Hill publishing Company, 2003.
2.Chris Ullman , John Kauffman, Chris Hart, David Sussman, *Beginning ASP.Net* 1.1 with VB.NET , Wiley Publishing ,First Edition, 2003.

3.Elliotte Rusty Harold, *XML 1.1 Bible*, Wesley Publications, Third Edition, 2004.

E-Resources:
1.NPTEL: https://nptel.ac.in/courses/106/104/106104220/#
2.NPTEL: https://nptel.ac.in/courses/110/105/110105033/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	9	3	3	9	**39**
CO2	9	3	3	9	1	1	9	**35**
CO3	3	3	3	9	1	1	9	**29**
CO4	9	1	3	9	1	1	9	**33**
CO5	9	3	1	9	1	3	9	**35**
Total	**39**	**13**	**13**	**45**	**7**	**9**	**45**	**171**

Low-1 Medium-3 High-9

Core VII – .NET Programming Lab

(For Students Admitted from 2022 -23)

Semester: III **Hours/Week: 4**
Subject Code : IBCSC32P **Credit: 4**

Course Objectives:

1. To understand .Net IDE Component Framework
2. To create website using ASP.Net Controls

List of Programs

Console Application

1. Calculate the area of a floor given its length and width
2. Calculate the factorial of a number N, assuming the number is more than zero
3. Check a given numbers(prime,perfect,Armstrong etc)
4. Generate the numbers(prime,perfect,Armstrong etc)
5. Calculate age for a person using properties
6. Sort a given list of numbers and find out the average of a list of numbers.
7. Display how many days are in a given month(check for leap years also)
8. Demonstrate Events, Delegates, and Interfaces

Windows Application

1. Build a simple calculator
2. Calculate the arithmetic operations using functions
3. Do String manipulation
4. Write a function that will return a approximate count of the number of words in a string
5. Create notepad
6. Create a greeting card generator

Web Application

1. Design an E-mail application form using standard controls and store these details in SQL tables
2. Create a login page and personal webpage. Enter the username and password in the login page. If the username and password are correct, the personal web page should be loaded otherwise the error page should be loaded
3. Create a student details form and validate the details using validation controls
4. Display employee details using data grid control
5. Display an Electricity bill using data list control
6. Display employee details using repeater control

Note: Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, students will be able to

CO 1: Build console applications
CO 2: Perform Windows and web Applications
CO 3: Demonstrate validation controls in web form
CO 4: Illustrate Data Grid control to database in Web application
CO 5: Compose Data Repeater and Data list Controls

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	9	3	9	9	**45**
CO2	9	3	3	3	3	9	9	**39**
CO3	3	3	3	3	3	9	9	**33**
CO4	9	1	3	9	3	9	9	**43**
CO5	9	3	1	1	1	9	9	**33**
Total	**39**	**13**	**13**	**25**	**13**	**45**	**45**	**193**

Low-1 Medium-3 High-9

SEC III – Web Designing Lab (HTML and Scripting Language)

(For Students Admitted from 2022 -23)

Semester: III **Hours/Week: 2**
Subject Code: IBCSS34P **Credit: 2**

Course Objectives:

1. To analyze a web page and identify its elements and attributes
2. To build dynamic web pages by using Java script

List of Programs

HTML

1. Create a HTML page for displaying the personal information by using various tags such as background color, heading tag, font tag
2. Create a HTML page, which includes images and audio for any application
3. Create a HTML page for displaying the Tender notice which is given to you
4. To create a Time Table of your class using HTML
5. Create mark sheet preparation using table

6. Creation of Lists in HTML
7. Create web site for your company product advertisement in HTML

Frames

8. To create a simple website for our college
9. To create a dictionary using frames. The words are displayed in one frame and when you click the word, the meaning will be displayed on the other frame

Java Script

10. Write a Java Script program to display the current day and time in the following format. Today is: Tuesday. Current time is: 10 AM : 30 : 38
11. Write a Java Script program to find the largest of three given integers
12. Write a Java Script program to reverse a given string
13. Write a Java Script program to create a simple Calculator
14. Write a Java Script Program to Count the Number of Vowels in a String

Note: Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, students will be able to

CO 1: Understand the basic tags in HTML and create the programs in that tags
CO 2: Create a web page by applying frames and own personal web pages
CO 3: Develop a web page for advertising purposes
CO 4: Design web pages for own company and institution
CO 5: Create interactive web page using Script

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	9	9	**45**
CO2	3	3	9	9	3	9	9	**45**
CO3	3	3	9	9	1	9	9	**43**
CO4	3	3	9	9	3	3	3	**33**
CO5	3	3	3	9	1	9	3	**31**
Total	**21**	**15**	**33**	**39**	**17**	**39**	**33**	**197**

Low-1 Medium-3 High-9

Core VIII – Data Structures and Algorithms

(For Students Admitted from 2022 -23)

Semester: IV **Hours/Week: 5**
Subject Code: IBCSC41 **Credit: 4**

Course Objectives:

1. To understand the fundamental design, analysis, implementation of basic data structures, specification and analysis of programs
2. To understand about Significance of algorithms in the computer field and various aspects of Algorithm Development

Unit I **(15 hours)**

Introduction: History of Algorithms - Data structures and Algorithms - Data structure - Definition and Classification. **Stacks:** Introduction - stack Operation - Application. **Queues:** Introduction - Operation - circular Queues - Other Types of Queues - Application.

Unit II **(15 hours)**

Linked Lists: Introduction - Singly Linked Lists - Circularly Linked List - Doubly Linked List - Multiply Linked List - Application. **Trees and Binary Trees:** Introduction -**Trees:** Definition and Basic Terminologies - Representation of Trees -Binary Tree Traversals - Threaded Binary Trees - Applications.

Unit III **(15 hours)**

Graphs: Introduction-Definitions and Basic Terminologies - Representations of Graphs - Graph Traversals - Single-source & All pairs shortest paths problem - Minimum cost spanning trees. **Binary Search Trees and AVL Trees:** Introduction - **Binary Search Trees:** Definition and Operations - AVL Trees: Definition and Operations - Applications.

Unit IV **(15 hours)**

Red-Black Trees and Splay Trees: Red-Black Trees - Applications. **Hash Tables:** Introduction-Hash Table Structure - Hash Functions - Linear Open Addressing - Chaining - Applications.**Searching:** Introduction-Linear Search-Transpose Sequential Search-Interpolation Search - Binary Search - Fibonacci Search - Other Search Techniques.

Unit V **(15 hours)**

Internal Sorting: Introduction - Bubble Sort - Insertion Sort - Selection Sort - Merge Sort - Shell Sort - Quick Sort - Heap Sort - Radix Sort. **Algorithms:** Algorithm Specification - Performance analysis - Asymptotic notation.

Course Outcomes:

After successful completion of the course, the students will be able to

CO 1: Explain the basics concept of data structures and Algorithm stacks, queues and lists
CO 2: Distinguish about knowledge of tree and graphs concepts
CO 3: Analyze the concepts about searching and sorting techniques
CO 4: Demonstrate the types of Trees
CO 5: Evaluate about Algorithm and step by step approach in solving problems with the help of fundamental data structure

Text Books:

1. Vijayalakshmi Pai G A, *Data structures and Algorithms, Concepts, Techniques and Application,* Tata McGraw-Hill Education Private Limited, 2008.
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, *Fundamentals of Computer Algorithms,* Universities Press, Second Edition, 2008.

Reference Books:

1. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, *Data Structures and Algorithms,* Dorling Kindersley Private Limited, 2013.
2. Patel R B, *Expert Data Structures with C,* Khanna Book Publishing, Third Edition, 2000.

E-Resources:

1. http://www.dave-reed.com/csc427.F04/

2. http://www.math.tau.ac.il/~matias/ds03.html
3. NPTEL: https://onlinecourses.nptel.ac.in/noc22_cs26/preview
4. NPTEL: https://nptel.ac.in/courses/106/106/106106127/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	3	1	1	19
CO2	9	3	9	1	9	1	3	35
CO3	9	1	9	9	1	1	3	33
CO4	9	3	3	3	3	3	3	27
CO5	9	1	1	9	9	9	3	41
Total	**45**	**11**	**23**	**23**	**25**	**15**	**13**	**155**

Low-1 Medium-3 High-9

Core IX – Data Structures Using C++ Lab

(For Students Admitted from 2022 -23)

Semester: IV **Hours/Week: 4**
Subject Code: IBCSC42P **Credit: 4**

Course Objectives:

1. To introduce the various data structure and its operation
2. To know the difference between various data structure

List of programs

1. Create a singly linked list and perform the following operations:
    a. Delete an element from linked list
    b. Display the contents of the above list after deletion
2. Create a doubly linked list and perform the following operations:
    a. Delete an element from doubly linked list
    b. Display the contents of the above list after deletion
3. Convert a given infix expression into its postfix equivalent using stack
4. Search a key element in a list of elements using linear search
5. Search a key element in a list of sorted elements using binary search
6. Implement Insertion sort algorithm to arrange a list of integers in ascending order
7. Implement selection sort algorithm to arrange a list of elements in descending order
8. Implement Quick sort algorithm to arrange a list of elements in ascending order
9. Implement Heap sort algorithm for sorting a list of integers in ascending order
10. Implement Merge sort algorithm for sorting a list of integers in ascending order

Note: Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of the course, the students will be able to
CO 1: Recall the basics of C++ to declare variable, create a class and etc.,
CO 2: Apply various structure of data
CO 3: Analyzing the difference between various data structure
CO 4: Evaluate the expression using preorder, inorder and postorder
CO 5: Elaborate the data structure operations and sort algorithm

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	1	9	9	9	55
CO2	9	9	9	1	9	9	9	55
CO3	9	9	9	1	9	9	9	55
CO4	9	9	9	1	9	9	9	55
CO5	9	9	9	1	9	9	9	55
Total	**45**	**45**	**45**	**5**	**45**	**45**	**45**	**275**

Low-1 Medium-3 High-9

SEC IV – Linux and Shell Programming Lab

(For Students Admitted from 2022 -23)

Semester: IV **Hours/Week: 2**
Subject Code: IBCSS44P **Credit: 2**

Course Objectives:

1. To understand and make effective use of Linux utilities and shell scripting language to solve problems
2. To develop the skills the necessary for systems programming including file system programming, process and signal management and inter process communication

List of Programs

Built-in Commands

1. Write a shell program to use who commands
2. Write a shell program to use list commands
3. Write a shell program to use sort commands
4. Write a shell program to use wc commands
5. Write a shell program to use cat commands

Formula Substitution

6. Write a shell program to find odd or even number
7. Write a shell program to find smallest among three numbers
8. Write a shell program to find the factorial value
9. Write a shell program to display multiplication table

Switch case

10. Write a shell program to use case statement

Functions

11. Write a shell program to display username, pwd using function
12. Find age of a person using set date

Checking

13. To check the given file is a directory or not

String Manipulation

14. Convert lowercase to uppercase using tr statement

Note: Questions for the Internal/External examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, students will be able to

CO 1: Summarize shell commands, scripts, managing files, pipes and redirections

CO 2: Apply appropriate Linux commands to make effective use of the environment to solve problems

CO 3: Illustrate shell scripts to perform repetitive tasks using while and for loops

CO 4: Evaluate shell functions

CO 5: Derive command-line arguments

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	1	9	9	9	49
CO2	9	9	3	1	9	9	9	49
CO3	9	9	3	1	9	9	9	49
CO4	9	9	3	1	9	9	9	49
CO5	9	9	3	1	9	9	9	49
Total	**45**	**45**	**15**	**5**	**45**	**45**	**45**	**245**

Low-1 Medium-3 High-9

Core X – Software Engineering

(For Students Admitted from 2022 -23)

Semester: V **Hours/Week: 5**

Subject Code: IBCSC51 **Credit: 4**

Course Objectives:

1. To provide the idea of decomposing the given problem into Analysis, Design, Implementation, Testing and Maintenance phases and provide an idea of using various process models in the software industry according to given circumstances
2. To gain the knowledge of how Analysis, Design, Implementation, Testing and Maintenance processes are conducted in a software project

Unit I **(15 hours)**

Introduction: The Nature of Software – Changing nature of software – **Software Engineering:** The Software Process - Software Engineering Practice - Software Development Myths - **Software Process Structure:** A Generic Process Model - Defining a Framework Activity - Identifying a Task set - Process Patterns – **Process Models:** - Prescriptive Process Models – Specialized Process Models.

Unit II **(15 hours)**

Understanding Requirements: Requirements Engineering - Eliciting requirements- Developing Use Cases – Building the Analysis Model – Negotiating Requirements- Requirements Monitoring - Validating Requirements - **Requirements Modeling:**Scenario

Based Modeling.**Design Engineering:** Design within the context of software engineering – Design Process – Design Concepts – Design Model – Architectural Design: - Architectural Styles - Architectural Design.

Unit III **(15 hours)**

Software Testing Strategies: A strategic approach to software testing – strategic issues – test strategies for conventional software – test strategies for object- oriented software – validation testing – system testing – the art of debugging.**Testing Conventional Applications:** Software Testing Fundamentals –White-Box testing – Basis Path Testing – Control Structure Testing – Black-Box Testing – Model-Based Testing - Testing for Real-Time Systems - Patterns for Software Testing.

Unit IV **(15 hours)**

Risk Management: Reactive Versus Proactive Risk Strategies – Software Risks - Risk Identification – Risk Projection – Risk Refinement – Risk Mitigation, Monitoring and Management – RMMM Plan.**Quality concepts:**Software Quality – Achieving Software Quality – **Review Techniques:** Review Metrics and Their Use – Informal Reviews - Formal Technical Reviews – **Software Quality Assurance:**Elements of Software Quality Assurance – SQA Processes and Product Characteristics - SQA Tasks, Goals, and Metrics - Formal Approaches to SQA – Statistical Software Quality Assurance - Software Reliability – The ISO 9000 quality standards – SQA plan.

Unit V **(15 hours)**

Agile Development: Agility and the Cost of Change- Agile Process - Extreme Programming-Other Agile Process Models - A Tool Set for the Agile Process. **Human Aspects of Software Engineering:**Characteristics of a Software Engineer - The Software Team - Team Structures - Agile Teams - Software Engineering Using the Cloud - Collaboration Tools - Global Teams.

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Explain a process model for a software project Development

CO2: Apply Project Management and Requirement analysis and Principles to software project development

CO3: Analyze the cost estimate and problem complexity using various estimation techniques

CO4: Compare the SRS, Design document, Project plan of given software system

CO5: Generate test cases using the techniques involved in selecting: (a) White Box testing (b) Block Box testing

Text Book:

1. Roger S. Pressman, *Software Engineering A Practitioner's Approach*, Tata McGraw Hill Company, Eighth Edition, 2015.

Reference Books:

1. Ian Sommerville, *Software Engineering*, Pearson Education, Seventh edition, 2004.
2. Samarjeet kaur, Sandhir Sharma , P.P Singh, *Software Engineering – Complete Course Book,* Deep & Deep Publications ,2006.

3. Waman S Jawadekar, *Software Engineering – Principles and Practice*, Tata McGraw Hill Education Private Limited, 2004.

E-Resources:

1. NPTEL: https://nptel.ac.in/courses/106/105/106105182/
2. https://www.coursera.org/courses?query=software%20engineering

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	3	9	9	3	45
CO2	9	9	9	3	9	9	9	57
CO3	9	9	9	3	9	9	9	57
CO4	9	9	3	3	9	9	9	51
CO5	9	9	9	3	9	9	9	57
Total	**45**	**45**	**33**	**15**	**45**	**45**	**39**	**267**

Low-1 Medium-3 High-9

Core XI – Computer Networks

(For Students Admitted from 2022 -23)

Semester: V **Hours/Week: 5**
Subject Code : IBCSC52 **Credit: 4**

Course Objectives:

1. To understand and describe the layered protocol model
2. To describe and analyse datalink, network, and transport layer protocols

Unit I **(15 hours)**

Introduction: Uses of Computer Networks-Network Hardware-Network Software-Reference Models-Example Networks-Network Standardization.**Physical Layer:** Guided Transmission Media-Wireless transmission.

Unit II **(15 hours)**

Data Link Layer: Data Link Layer Design Issues-Error Detection and Correction-Elementary Data link Protocols-Sliding Window Protocols-Example Data Link Protocols.**Medium Access Control Sublayer:** Channel Allocation Problem-Multiple Access Protocols-Ethernet-Wireless LANs-Data Link Layer Switching.

Unit III **(15 hours)**

Network Layer: Network layer Design Issues-Routing Algorithms-Congestion Control Algorithms-Quality of Service-Internetworking-Network Layer in the Internet.

Unit IV **(15 hours)**

Transport Layer: Transport Service-Elements of Transport Protocols-Congestion Control-**Internet Transport Protocols:** UDP-TCP.

Unit V **(15 hours)**

Application Layer: Domain Name System-Electronic Mail-**World Wide Web:** HTTP-Streaming Audion and Video.

Course Outcomes:

After successful completion of this course, students will be able to

CO 1: Understand the knowledge of the basic computer network technology
CO 2: Analyse functions of each layer in the OSI and TCP/IP reference model
CO 3: Develop skills of subnetting and routing mechanisms in networking
CO 4: Compare the working principle of various layer protocols
CO 5: Apply the protocols of computer networks in network design and implementation

Text Book:

1. Andrew S Tanenbaum, David. J. Wetherall, *Computer Networks*, Pearson Education, Fifth Edition, 2021.

Reference Books:

1. Behrouz A Forouzan, *Data Communications & Networking*, Tata McGraw Hill, Fourth Edition, 2003.
2. Douglas E Comer, *Computer Networks and Internets*, Pearson Education, Fourth Edition, 2004.

E-Resources:

1. NPTEL: https://nptel.ac.in/courses/106/105/106105081/
2. SWAYAM: https://onlinecourses.swayam2.ac.in/ugc19_cs10/preview
3. SWAYAM: https://onlinecourses.swayam2.ac.in/cec19_cs07/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	1	3	9	**31**
CO2	9	1	3	3	1	3	9	**29**
CO3	9	1	3	3	1	9	9	**35**
CO4	9	1	3	3	1	9	9	**35**
CO5	9	3	3	3	1	9	9	**37**
Total	**45**	**9**	**15**	**15**	**5**	**33**	**45**	**167**

Low-1 Medium-3 High-9

Core XII – RDBMS

(For Students Admitted from 2022 -23)

Semester: V **Hours/Week: 4**
Subject Code: IBCSC53 **Credit: 4**

Course Objectives:

1. To understand the basic concepts, applications of database systems, relational database design principles and SQL queries
2. To understand the different issues involved in the design and implementation of a database system, security, integrity and concurrency

Unit I **(12 hours)**

Introduction: Database System Applications - Purpose of Database System -View of Data - Database Design - Data Storage and Querying - Transaction Management - Database Architechture .**Relational Databases :** Introduction to the Relational Model-Introduction to SQL-Intermediate SQL:Join Expressions-Views-Transactions-Integrity constraints-Schemas-Authorization.

Unit II **(12 hours)**

Database Design: Database design and E-R Model: overview -ER-Model-Constraints- ER-Diagrams-Reduction to Relational Schemas – Design Issues-.**Relational database model:** Logical view of data- keys- integrity rules. **Relational Database design:** Features of good relational database design- Atomic domain and Normalization (1NF- 2NF- 3NF-BCNF).Database-Design Process-Modeling Temporal Data.

Unit III **(12 hours)**

Data Storage and Querying: Storage and File Structure: Overview of Physical Storage-Magnetic Disk and Floppy Disk-RAID- Organization of Records in Files-**Indexing and Hashing:** Basic Concepts-Ordered Indices-Multiple Key Access-Static Hashing-Dynamic Hashing-Bit Map Indices. **Query Processing:** Overview-Selection Operation-Sorting-Join Operation.

Unit IV **(12 hours)**

Transaction Management: Transaction Concept-Simple Transaction Model-Storage Structure-Transaction Atomicity and Durability-Transaction Isolation-Serializablity-**Concurrency Control:** Lock-Based Protocols-Deadlock Handling-Multiple Granularity-Time Stamp Protocols-Valuation Based Protocols. **Recovery System:** Failure Classification-Recovery and Atomicity-Recovery Algorithm-Failure Management.

Unit V **(12 hours)**

System Architechture Text: Database –System Architechture Centralisedand Client -Server Architecture-Server System Architechture-Parallel System-Distributed System-Distributed System-Network Types-**Object Based Databases:** Complex Data Types –Table Inheritance-Implementing O-R Features-**Advanced Topics, Advanced Application Development**: Performance Tuning-Performance Benchmarks-Standardization.

Course Outcomes:

After successful completion of the course, the students will be able to

CO1: Explore about DBMS architecture, database designs, database modeling
CO2: Extend about ER-Diagram and UML, Relational Algebra and Relational Calculus
CO3: Distinguish the normalization theory
CO4: Apply Structured query language (SQL) and Constraints
CO5: Evaluate various transaction processing, concurrency control mechanisms and database protection mechanisms

Text Book:

1. A Silberschatz, H Korth, S Sudarshan, *Database System and Concepts*, Mc Graw-Hill, Sixth Edition, 2019.

Reference Books:

1. Raghu Ramakrishnan and Johannes Gehrke, *Database Management Systems* (3/e), McGraw Hill, 2003.
2. Atul Kahate, *Introduction to Database Management Systems*, Pearson Education, Tenth Impression, 2012.
3. C J Date , *An Introduction to Database System* , Addison- Wesley publishing company, Third Edition, 1998.

E-Resources:

1. https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm
2. https://www.coursera.org/projects/introduction-to-relational-database-and-sql

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	3	3	3	3	**25**
CO2	9	1	1	3	3	3	3	**23**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	1	9	3	9	9	9	**49**
CO5	9	3	9	3	9	9	9	**51**
Total	**45**	**9**	**25**	**15**	**33**	**33**	**33**	**193**

Low-1 Medium-3 High-9

Core XIII – RDBMS Lab

(For Students Admitted from 2022 -23)

Semester: V **Hours/Week:4**
Subject Code: IBCSC54P **Credit: 3**

Course Objectives:

1. The Students get practical knowledge on designing and creating Relational Database Management
2. To understand various advanced queries such as relational constraints, joins, set operations, aggregate functions, trigger, views and embedded SQL

List of SQL Programs

DDL

1. Create an address table with fields name , doorno , street & city
   a. describe its structure
   b. alter the table to include pincode
   c. alter the table to modify street column
   d. drop the table

DML

2. Create a student table with regno, name, age and dept.
   a. insert records
   b. delete the students with age above 20
   c. truncate and drop the table

Functions

3. Create an employee table with fields eno, ename, sex, age & years of experience
   a. find out the no. of female employees
   b. find out the employees with age ranging between 30 and 35
   c. list out the employees who are working more than 5 years
4. Create a library file with field's accno, title, author, cost & no of copies
   a. arrange the books according to accno
   b. find out the TOTAL no. of books available in the library
   c. find out the book of minimum cost
5. Create a player table with fields name, sports (cricket, hockey,etc.),age & country
   a. find out the eldest and youngest player
   b. group players according to sports
   c. list out the Indian players
6. Write the SQL queries to illustrate all number functions
7. Write the SQL queries to illustrate date functions
8. Write the SQL queries to illustrate all string functions
9. Create an item table with field's itemno, itemname, quantity & price and insert records.
10. Illustrate the comparison operators (between, like, in & isnull)
11. Create a table with the fields clientno , clientname & phoneno Illustrate the set operators union , unionall, minus & intersect
12. Create a student table with fields' regno, name and English, Tamil, Maths and TOTAL & insert records
    a. arrange all records according to TOTAL
    b. find the student who got first mark in Maths
    c. list out the students whose name starts with 'S'
13. Create an inventory table with fields' itemno, itemname, qnty, price and reorder level
    a. insert records
    b. update the qnty when it goes less than reorderlevel
    c. list the items with price less than 100
14. Create an employee table with fields ecode,ename,age & salary and create a department table with fields ecode, designation, deptcode & dept. Illustrate joins and sub queries using the above tables.

Constraints

15. Create a vendormaster table with fields vencode,venname,place and phoneno
    Create an ordermaster table with fields item no, itemcode,vencode,qnty and orderdate .
    Illustrate the following constraints using the above tables
    a. vencode as primary key in vendormaster
    b. vencode as foreign key in ordermaster
    c. phoneno as unique
    d. place as notnull &
    e. qnty > 100

TCL

16. SQL queries to illustrate TCL commands (savepoint, rollback and commit)

PL / SQL

Formula Substitution

1. PL / SQL block to find out the largest among three numbers
2. PL/SQL block to print the multiplication table for given multiplier

Functions

3. Write a PL/SQL block to find the sum of digits of a given number. Use function
4. Write a PL/SQL block to find the factorial of a given number using a function

Cursor

5. Create a library table with fields such as acc no, title author and price & insert records, write a PL/SQL block to illustrate implicit cursor

Procedure

6. Create a student table with fields regno,name, maths ,physics&biology and insert records ,write a PL/SQL block to find the TOTAL , average & grade using procedure
7. Create an electricity bill table with fields Custcode, custname, custtype, prevreading, currreading, UNITs, costperUNIT & TOTALamount. write a PL/SQL block to find the TOTAL amount for all customers using the following condition

Cust type	Cost per Unit
i) Domestic	Rs. 3 /-
ii) Office	Rs. 4/-
iii) Factory	Rs. 6/-

Exception Handling

8. Write a PL/SQL block to illustrate the following predefined exceptions
   a. too_many_rows
   b. no_data_found
9. Create a table with fields itemno, itemname, qntyordered & qntydelivered, write a PL/SQL block using userdefined exception to indicate when more items have been delivered than ordered

Triggers

10. Creating and executing triggers

Note: Questions for Internal and External examination will be based on concept learnt

Course Outcomes:

After successful completion of the course, the students will be able to

CO 1: Build DDL, DML and TCL Commands
CO 2: Make use of implementing constraints in tables
CO 3: Apply to create block structure programming language
CO 4: Create the concepts of functions
CO 5: Develop the procedures, exceptions, triggers in PL/SQL block

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	3	3	3	3	**25**
CO2	9	1	1	3	3	3	3	**23**
CO3	9	3	3	3	9	9	9	**45**

CO4	9	1	9	3	9	9	9	**49**
CO5	9	3	9	3	9	9	9	**51**
Total	**45**	**9**	**25**	**15**	**33**	**33**	**33**	**193**

Low-1 Medium-3 High-9

DSE I – a) Blockchain Technology

(For Students Admitted from 2022 -23)

Semester: V **Hours/Week: 4**
Subject Code :IBCSE5A **Credit: 4**

Course Objectives:

1. To understand how blockchain System(Bitcoin and Ethereum)Work
2. To integrate ideas from blockchain technology into their own projects

Unit I **(12 hours)**

Introduction of Block chain: Block 101-Distributed Systems-Consensus-The history of block chain-Introduction of block chain-Features of blockchain-Applications of block chain technology-Tiers of Blockchain technology-Consensus in block chain-CAP theorem and block chain-Benefits and limitations of Blockchain.

Unit II **(12 hours)**

Cryptography and technical Foundations: Introduction-Mathematics-Cryptography-Confidentiality-Integrity-Authentication-Non repudiation-Accountability-Block Ciphers-DES-AES-Public and Private keys-RSA-hash Functions-Secure hash algorithms-Merkle trees-Patricia trees-DHT-ECDSA-Financial markets and trading-Trading-Exchanging.

Unit III **(12 hours)**

Bitcoin: Bitcoin definitions-transactions-types of transactions-What is UTXO-Block chain-The genesis of Block-The bitcoin network-wallets-**Alternative coins:** Theoretical Foundations-Alternatives of Proof of Work-Proof of stake-Name coin-Litecoin.

Unit IV **(12 hours)**

Ethereum101: Introduction-Ethereum block chain-The consensus mechanism-The world state-the account state-Transactions-Contract creation transaction-Message call transaction-Elements of ethereum block chain-EVM-Execution Environment-Opcodes and their meaning-Accounts-Block-Block header.

Unit V **(12 hours)**

BlockChain–Outside of Currencies: Internet of things-IoT Block chain experiment-Government-Health-Finance-EmergingTrends:ABC's-Enterprise-gradeblockchains-Private Blockchains-startups-standardization-Enhancements - Realworld Implementations-Consortia-Education in block chain technologies-Employment-Crypto Economics.

Course Outcomes:

After successful completion of the course, the students will be able to

CO 1: Explain the fundamental Concept of Block chain and Consensus Algorithm
CO 2: Apply Cryptography algorithms in protecting the block chain
CO 3: How transactions held in Bitcoin

CO 4: Develop an application in Ethereum Framework
CO 5: Design Block chain technology in popular fields

Text Book:

1.Imran Bashir, *Mastering Block chain: Deeper insights into decentralization, Cryptography, Bitcoin and Popular Block Chain Frameworks*, Packt Publishing, 2017.

Reference Books:

1. Andreas Antonopoulos, Satoshi Nakamoto, *Mastering Bitcoin*, O'Reilly, 2014
2. Roger Wattenhofer, *The Science of the Block chain*, Create Space Independent Publishing, 2016 .
3. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, *Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction*, Princeton University Press, 2016.

E-Resources:

1. NPTEL: https://nptel.ac.in/courses/106/104/106104220/#
2. https://www.udemy.com/course/build-your-blockchain-az/
3. https://www.mygreatlearning.com/academy/learn-for-free/courses/blockchain-basics

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	3	3	9	9	51
CO2	9	3	9	9	9	9	9	57
CO3	9	3	9	3	9	9	9	51
CO4	9	3	9	3	9	9	9	51
CO5	9	3	9	3	9	3	9	45
Total	**45**	**21**	**45**	**21**	**39**	**39**	**45**	**255**

Low-1 Medium-3 High-9

DSE I – b) PHP Programming

(For Students Admitted from 2022 -23)

Semester: V **Hours/Week: 4**
Subject Code: IBCSE5B **Credit: 4**

Course Objectives:

1. To learn and use open-source server, array, functions and objects
2. To create dynamic web pages and websites

Unit I **(12 hours)**

Introduction to Dynamic Web Content: HTTP and HTML-The Request/Response Procedure-The Benefits of PHP, MySQL, JavaScript, CSS, and HTML5-HTML5-The Apache Web Server-Handling Mobile Devices-Open Source-Bringing It All Together.

Unit II **(12 hours)**

Setting Up a Development Server: WAMP, MAMP, or LAMP-Installing AMPPS on Windows-Installing AMPPS on macOS-Installing a LAMP on Linux-Working Remotely-Using a Program Editor-Using an IDE.

Unit III **(12 hours)**

Introduction to PHP: Incorporating PHP within HTML-The Structure of PHP-Using Comments-Basic Syntax-Variables-Operators-Variable Assignment-Multiple-Line Commands-Variable Typing-Constants-Predefined Constants-The Difference Between the echo and print Commands-Functions-Variable Scope.

Unit IV **(12 hours)**

Expressions and Control Flow in PHP: Expressions-Operators-Conditionals-Looping-Implicit and Explicit Casting-PHP Dynamic Linking-Dynamic Linking in Action. **PHP Functions and Objects:** PHP Functions-Including and Requiring Files-PHP Version Compatibility-PHP Objects.

Unit V **(12 hours)**

PHP Arrays: Basic Access-The foreach as Loop-Multidimensional Arrays-Using Array Functions. **Practical PHP:** Using printf-Date and Time Functions-File Handling-System Calls-XHTML or HTML5

Course Outcomes:

After successful completion of this course, students will be able to

CO 1: Remember variables, data types, operator, control flow, array and file
CO 2: Apply scripting, style sheet and object concepts
CO 3: Analyze the server, function, condition and looping
CO 4: Explain control structure, looping, arrays, user defined functions, files and databases
CO 5: Develop interactive web pages

Text Book:

1. Robin Nixon, *Learning PHP, MySQL & JavaScript*, O'Reilly Media, Fifth Edition, 2018.

Reference Books:

1. Vikram Vaswani, *PHP: A Beginner's Guide*, Tata McGraw-Hill, Second Edition, 2009.
2. Steven Holzner, *PHP: The Complete Reference*, Tata McGraw-Hill, Second Edition, 2007.
3. Larry Ullman, *PHP Advanced and Object-Oriented Programming: Visual QuickPro Guide*, Pearson Education, Third Edition, 2013.

E-Resources:

1. https://www.tutorialspoint.com/php/index.htm
2. https://www.codecademy.com/catalog/language/php

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	1	3	3	9	**37**
CO2	9	9	3	1	3	9	9	**43**

CO3	9	3	3	1	9	3	9	**37**
CO4	9	9	3	1	9	9	9	**49**
CO5	9	9	3	1	9	9	9	**49**
Total	**45**	**39**	**15**	**5**	**33**	**33**	**45**	**215**

Low-1 Medium-3 High-9

DSE II – a) Mobile Application Development

(For Students Admitted from 2022 -23)

Semester: V **Hours/Week: 4**
Subject Code: IBCSE5C **Credit: 4**

Course Objectives

1. To facilitate students to understand android SDK and to help students to gain a basic understanding of Android application development
2. To inculcate working knowledge of Android Studio development tool

Unit I **(12 hours)**

Introduction-Important of Mobile strategies, Mobile development today, Mobile myths, Mobile web vs Mobile App, benefits of mobile app, creating consumable web services for mobile devices- What is a web service, Web services languages. Mobile user interface design-understanding mobile platforms, using the tools of mobile interface design.

Unit II **(12 hours)**

Introduction to Android-Android Features-Android Operating system-Downloading apps from Google play-Packages-Android Software Development Kit-Test Driving the Tip Calculator App in an Android Virtual Device-Building Great Android Apps-Android Development Resources.

Unit III **(12 hours)**

Android Studio-Introduction-Technologies overview-Creating an App-Android Studio window-Building the Apps GUI with the Layout Editor-Adding an Image to the project, adding an app icon, changing RelativeLayout to a LinearLayout, orientation,Configuring the Textview's id, textsize property, Setting the Textview'stextcolor, gravity, weight property, Adding an Imageview to display the image, Previewing the Design.

Unit IV **(12 hours)**

Tip Calculator App-Introduction, Test-driving the Tip Calculator App-Technologies overview-Class activity, Activity lifecycle methods, arranging views with a GridLayout, Creating and Customizing the GUI with the Layout editor, Implementing interface TextWatcher for Handling EditText text changes, Building the GUI, Default Theme and customizing theme colors.

Unit V **(12 hours)**

Google Play and App Business Issues-Introduction-Preparing your apps for publication-Pricing your app:free or fee-Monetizing apps with In-App Advertising-Monetizing Apps: using In-App billing to sell-Registering at Google Play-Uploading your apps to Google play-Launching Play Store from Within your app-Marketing your Apps.

Course Outcomes:

After successful completion of the course, the students will be able to
CO1: Explain the principles of Mobile strategies
CO2: Demonstrate the Android installing and configuring support tools
CO3: Build and publishing Android app
CO4: Apply the knowledge of Android user interface
CO5: Develop Mobile application using Android and IOS

Text Book:
1.Paul Deitel, Harvey Deitel, Alexander Wald, *Android 6 for Programmers– An App driven Approach*, Pearson Education, Third Edition, 2016.

Reference Books:
1. Jeff McWherter, Scott GoWell, *Professional Mobile Application Development*, John Wiley & Sons Publications, 2012.
2. DonnFelker with Joshua Dobbs, *Android Application Development for Dummies*, John Wiley & Sons Publications, 2011.
3. Jerome (J. F) DiMarzio, *Android – A Programmer's Guide*, McGraw Hill, Eighth Reprint, 2015.

E-Resources:
1. https://developer.android.com/
2. https://www.zoho.com/creator/application-development/mobile.html
3. https://spoken-tutorial.org/tutorial-search/?search_foss=Android+app+using+Kotlin&search_ language=English

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	3	9	3	9	**45**
CO2	9	9	3	9	9	9	9	**57**
CO3	9	9	3	9	9	9	9	**57**
CO4	9	3	3	3	9	3	9	**39**
CO5	9	9	3	3	9	3	9	**45**
Total	**45**	**39**	**15**	**27**	**45**	**27**	**45**	**243**

Low-1 Medium-3 High-9

DSE II – b) Cryptography and Network Security

(For Students Admitted from 2022 -23)

Semester: V **Hours/Week: 4**
Subject Code: IBCSE5D **Credit: 4**

Course Objectives:
1. To understand the basics of Cryptography and Network Security
2. To learn about how to maintain the Confidentiality, Integrity and Availability of a data

Unit I **(12 hours)**

Computer and Network Security concept: Computer security concepts-The OSI security Architecture-Security Attacks- Security Services-Security Mechanisms. **Number Theory:** The Euclidean Algorithm-Modular Arithmetic-Prime Numbers- Fermat's Euler's Theorem-Discrete Logarithms.

Unit II **(12 hours)**

Symmetric Ciphers: Classical Encryption Techniques: Symmetric Chippers Model-Substitution Techniques-Transposition Techniques-Traditional Block Cipher Structure-Block Cipher Design Principles. Finite Fields: Groups-Rings-Fields-Finite Fields of the FormGF(p).

Unit III **(12 hours)**

Advanced Encryption Standard: Finite Field Arithmetic-AES Structure-AES Tranformation Functions-AES Key Expansion. **Asymmetric Ciphers :** Principles of public – key cryptosystems-The RSA Algorithm.

Unit IV **(12 hours)**

Other Public-Key Cryptosystem: Diffie-Hellman Key Exchange-Elgmal cryptographic system-Elliptic curve arithmetic- Elliptic curve Crptography. **Digital Signature:**Digital signature-Elgmal Digital Signature Scheme-Schnorr Digital Scheme-NIST Digital signature algorithm.

Unit V **(12 hours)**

Wireless Network Security: Wireless Security-Mobile Device Security-IEEE802.11 Wireless LAN Overview- IEEE802.11 Wireless LAN Security. **Electronic Mail Security:** Internet Mail Architecture-Email Formats-Email Threats and compressive Email Security-S/MIME –DNSSEC-Sender policy Framework-Domain Keys.

Text Book:

1. William Stallings, *Cryptography and Network Security Principles and Practice*, Pearson Education, Seventh Edition, 2017.

Reference Books:

1. Wade Trappe, Lawrence C Washington, *Introduction to Cryptography with Coding Theory*, Pearson Education, Second Edition, 2007.
2. William Stallings, *Cryptography and Network Security Principles and Practices*, Pearson Education, Fourth Edition, 2006.
3. W.Mao, *Modern Cryptography – Theory and Practice*, Pearson Education, Second Edition, 2007.

E- Resource:

1. https://nptel.ac.in/courses/106/105/106105162/

Course Outcomes:

After successful completion of the course, the students will be able to

CO1: Compare various Cryptographic Techniques
CO2: Applying various data encryption techniques
CO3: Classify the encryption standard and asymmetric ciphers

CO4: Implement Hashing and Digital Signature techniques
CO5: Explain the various Security Application

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	3	9	3	9	45
CO2	9	9	3	9	9	3	9	51
CO3	3	9	3	9	9	3	9	45
CO4	9	9	3	3	9	3	9	45
CO5	9	9	3	9	9	3	9	51
Total	**39**	**45**	**15**	**33**	**45**	**15**	**45**	**237**

Low-1 Medium-3 High-9

SEC V – PHP Programming Lab

(For Students Admitted from 2022 -23)

Semester: V **Hours/Week: 2**
Subject Code: IBCSS55P **Credit: 2**

Course Objectives:

1. To understand the concepts of regular expressions including modifiers, operators and metacharacters
2. To develop PHP programs that use various PHP library functions and that manipulate files and directories

List of programs

1. Develop a PHP program to print Sum of digits
2. Develop a PHP program to print factorial of a number
3. Develop a PHP program to display count, from 10 to 20 using loop
4. Develop a PHP program to print prime number
5. Develop a PHP program to check Armstrong number
6. Develop a PHP program to check Palindrome number
7. Develop a PHP program to swap two numbers with and without using third variable
8. Develop a PHP program to find if the given year is leap year or not
9. Develop a PHP program to reverse the number with strrev ()
10. Develop a PHP program to show day of the week (for eg: Monday) based on numbers using Switch/case statements
11. Develop a PHP program to print number triangle
12. Develop a PHP program to print alphabet triangle
13. Develop a PHP program to check student grade based on the marks using if-else statement
14. Develop a PHP program Using nested for loop that creates a chess board

Note: Questions for Internal and External examination will be based on concept learnt

Course Outcomes:

After successful completion of this course, students will be able to
CO1: Describe the fundamentals of PHP Language in trivial problem solving
CO2: Determine solution to a problem and apply control structures
CO3: Simplify the use of Strings and String Handling functions
CO4: Justify real time applications using PHP language features
CO5: Build skill on problem solving by constructing algorithms

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	9	1	1	**25**
CO2	9	3	3	3	9	3	3	**33**
CO3	9	3	1	3	9	9	3	**37**
CO4	9	3	3	3	9	9	3	**39**
CO5	9	3	3	3	9	9	3	**39**
Total	**45**	**15**	**11**	**13**	**45**	**31**	**13**	**173**

Low-1 Medium-3 High-9

Core XIV – Operating Systems

(For Students Admitted from 2022 -23)

Semester: VI **Hours/Week: 5**
Subject Code: IBCSC61 **Credit: 4**

Course Objectives

1. To understand the services provided by and the design of an operating system
2. To understand what a process is and how processes are synchronized and scheduled

Unit I **(15 hours)**

Introduction: What is an Operating System -Mainframe systems- desktop systems- Multiprocessor Systems- Distributed systems- Clustered Systems- Real time systems- Hand held systems. **Operating System Structure:** System components- Operating System services- System calls- - System structure.

Unit II **(15 hours)**

Processes: Process concept- process scheduling- operations on processes- Inter process Communication. **CPU Scheduling:** Basic Concepts- Scheduling Criteria- Scheduling algorithms Process Synchronization: Background- The critical section problem- Mutex Locks-semaphores- Monitors.

Unit III **(15 hours)**

Deadlock: System Model-Deadlock Characterization- Methods of Handling Deadlock-Deadlock Prevention-Deadlock Avoidance- Deadlock Detection- Recovery from Deadlock. **Memory management:** Background- Contiguous memory allocation- Swapping.

Unit IV **(15 hours)**

Virtual memory: Background- Demand paging- Copy-on-Develop -Page replacement-Thrashing.**File system interface:** File concepts- access methods- Directory structure .**Mass storage structure:** Overview of mass storage structure-HDD Scheduling-NVM Scheduling.

Unit V **(15 hours)**

Protection: Goals of protection- domain of protection- Access matrix- Implementation of Access matrix- revocation of access rights. **Security:** The security problem- User authentication- Program threats- System threats- securing systems and facilities- Intrusion detection- Cryptography.

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Remember the structure of operating system and scheduling algorithms
CO2: Apply the concept of process scheduling, deadlocks and its recovery
CO3: Analyze the background of memory with segmentation and paging
CO4: Evaluate file management with file organization, and disk scheduling
CO5: Create Securing systems and facilitites

Text Book:

1. Abraham G Silberschatz, Operating *System*, Wiley Publisher, Tenth Edition, 2017.

Reference Books:

1. Milan Milenkovic, *Operating System Concepts & Design*, Tata McGraw Hill, Second Edition, 1997.
2. Peter Baer Galvin and Robert Neilson Boyd, *Applied Operating system concepts*, John Wiley & Sons Publisher, First Edition, 2000.
3. Dhananjay M. Dhamdhere, *Operating System A Concept-Based Approach*, Tata McGraw Hill, Third Edition, 2012.
4. W. Stallings, *Operating Systems, Internals & Design Principles*, Prentice Hall of India, Fifth Edition, 2008.

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105214/
2. https://nptel.ac.in/courses/106/106/106106144/
3. https://onlinecourses.nptel.ac.in/noc21_cs44/preview
4. https://www.udacity.com/course/introduction-to-operating-systems--ud923
5. https://onlinecourses.nptel.ac.in/noc21_cs72/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	9	3	9	9	**45**
CO2	9	3	3	3	9	9	9	**45**
CO3	9	3	9	9	3	9	9	**51**
CO4	9	3	9	3	9	9	9	**51**
CO5	9	3	9	9	9	9	9	**57**
Total	**45**	**15**	**33**	**33**	**33**	**45**	**45**	**249**

Low-1 Medium-3 High-9

Core XV – Programming in Java

(For Students Admitted from 2022 -23)

Semester: VI **Hours/Week: 4**

Subject Code: IBCSC62 **Credit: 3**

Course Objectives:

1. To gain knowledge about basic Java language syntax and semantics to Develop Java programs and use concepts such as variables, conditional and iterative execution methods etc.
2. To understand the fundamentals of object-oriented programming in Java, including defining classes,objects, invoking methods etc and exception handling mechanisms.

Unit I **(12 hours)**

Fundamentals of Object Oriented Programming: Introduction, object oriented paradigm – basic concepts of oops – benefits of oops – applications of OOPs. **Java Evolution:** java features –java Versus C and C++ - java and internet – java and WWW – web browsers **Overview of Java Language:** simple java program - more of java – application with two classes –java program structure – java tokens – java statements-implementing a java program - java virtual machine - command line arguments.

Unit II **(12 hours)**

Constants, Variables, data types: Declaration of variables- giving values to variables – scope of variables –symbolic constants – type casting – getting values of variables – standard default values – **Operators and Expressions:** Arithmetic operators –Relational operators-logical operators – assignment operators – increment and decrement operators –conditional operator – bitwise operator – special operators –arithmetic expressions –evaluation of expressions –precedence of arithmetic operators-type conversion in expression –operator precedence and associativity – mathematical functions.- Decision making and Branching: if statement –switch - ? : operator –Decision Making and Looping: while statement – do statement – for statement – jumps in loops - labeled loops.

Unit III **(12 hours)**

Classes, Objects and Methods: Introduction – defining a class, field declaration–methods declaration – creating objects – accessing class members – constructors – methods overloading – static members – nesting of methods – inheritance – overriding methods – final variables and methods – final classes –finalizer methods – abstract methods and classes – visibility control - **Arrays Strings and Verctors :** one dimensional array – creating an array –two dimensional arrays –strings –vectors –wrapper classes – Interfaces, Multiple Inheritance: defining interfaces – extending interfaces –implementing interfaces – accessing interface variables.

Unit IV **(12 hours)**

Packages, Putting classes together: Introduction - java API packages - using system packages – naming conventions –creating packages –accessing a package –using a package – adding a class to a package –hiding classes – **Multithreaded Programming:** creating threads – extending the thread class – stopping and blocking a thread - life cycle of a thread – using thread methods – thread exceptions –thread priority –synchronization –implementing the runnable interface.

Unit V **(12 hours)**

Managing Errors and Exception: Introduction – types of errors –exceptions -syntax of exception handling code – multiple catch statements –using finally statement –throwing our own exceptions –using exceptions for debugging- **Applet Programming**: Introduction –how applets differ from applications –building applet code –applet life cycle – creating an executable applet –designing a web page - applet tag – adding applet to html file –running the applet – more about applet tags –passing parameters to Applets –aligning the display.

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Remember the importance of java with its data types, control statements and class fundamentals

CO2: Apply the concepts of inheritance, method overriding and implement packages and interfaces

CO3: Analyze the concept of exception handling and multithreading

CO4: Evaluate string buffer handling functions

CO5: Create applet programming through awt controls, layout managers and menus

Text Book:

1. E. Balaguruswamy, *Programming with JAVA - A Primer*, McGraw Hill Professional, 2015.

Reference Books:

1.Herbert Schildt, *Java: The Complete Reference* , McGraw Hill Professional, 2017.

2.Robert Sedgewick, Kevin Wayne, *Introduction to Programming in Java*, Addison Wesley 2017.

3. Y. Daniel Liang, *Introduction to Java Programming*, Pearson Education ,2017.

E-Resources:

1. https://spokentutorial.org/tutorialsearch/?search_foss=Java&search_language=English
2. SWAYAM:https://onlinecourses.swayam2.ac.in/aic20_sp13/preview
3. https://spoken-tutorial.org/watch/Java/First+Java+Program/English/
4. NPTEL: https://onlinecourses.nptel.ac.in/noc19_cs84/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	9	9	43
CO2	9	3	3	1	9	9	9	43
CO3	9	3	3	1	9	9	9	43
CO4	9	3	3	1	9	9	9	43
CO5	9	3	3	1	9	9	9	43
Total	**45**	**15**	**15**	**5**	**45**	**45**	**45**	**215**

Low-1 Medium-3 High-9

Core XVI – Programming in Java Lab

(For Students Admitted from 2022 -23)

Semester: VI **Hours/Week: 4**

Subject Code : IBCSC63P **Credit: 3**

Course Objectives:

1. To make the students to understand programming language Java
2. To create programs to solve simple calculations, check whether the given number is prime, perfect or Armstrong, etc

List of Programs

Formula Substitution

1. Find the factorial and binomial coefficient
2. Calculate mean, variance and standard deviation
3. Develop the programs for Number conversions Checking
4. Develop the programs for Number checking (prime, perfect, etc.) Generation
5. Develop the programs for Number generation (prime, perfect, etc.)

Array

6. Arrange numbers and names in order
7. Develop the program for performing matrix addition, subtraction, multiplication & transpose

Searching

8. Develop the programs for implementing linear search and binary search

String

9. Develop the programs for doing String manipulation (case conversion, reversing, etc.)

OOPs Concept

10. Develop the programs for implementing inheritance concepts
11. Develop the programs for implementing exception handling
12. Develop the programs for implementing multithreading

Applet

13. Develop the programs to handle Keyboard events
14. Simulate a calculator (arithmetic operations) using GUI components

Note: Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Outline Java programs that solve simple Mathematical problems, number checking and number generation

CO2: Demonstrate the concepts of String Manipulation, Linear Search and Binary Search

CO3: Illustrate OOP in Java programming like inheritance

CO4: Evaluate the multi-threaded programs

CO5: Develop Exception handling and GUI components

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	3	9	39
CO2	9	3	3	3	9	3	99	39
CO3	9	9	3	9	9	9	9	57
CO4	9	9	9	9	9	9	9	63
CO5	9	9	9	9	9	9	9	63

Total	45	33	27	33	45	33	45	261

Low-1 Medium-3 High-9

Core XVII – Open Technology

(For Students Admitted from 2022 -23)

Semester: VI **Hours/Week: 4**

Subject Code: IBCSC64 **Credit: 3**

Course Objectives:

1. To introduce Open Source methodologies
2. To make the students to gain experience using open source tools, languages and frameworks to prepare for careers in software development

Unit I **(12 hours)**

Learn to write programs: Writing a program-Introduction to program-The building blocks of programs-What could possibly go wrong?-Debugging. **Variables, expressions, and statements:** Values and type-Variables-Variable names and keywords-Statements-Operators and operands-Expressions-Order of operations-Modulus operator-String operations.

Unit II **(12 hours)**

Conditional execution: Boolean expressions-Logical operators-Conditional execution-Alternative execution-Chained conditionals-Nested conditionals-Catching exceptions using try and except-Short-circuit evaluation of logical expressions-Debugging. **Functions:** Function calls-Built-in functions-Type conversion functions-Math functions-Random numbers-Adding new functions-Definitions and uses-Flow of execution-Parameters and arguments-Fruitful functions and void functions-Why functions?-Debugging.

Unit III **(12 hours)**

Iteration: Updating variables-The while statement-Infinite loops-Finishing iterations with continue-Definite loops using for-Loop patterns-Debugging. **Strings:** A string is a sequence-Getting the length of a string using len-Traversal through a string with a loop-String slices-Strings are immutable-Looping and counting-The in operator-String comparison-String methods-Parsing strings-Format operator-Debugging.

Unit IV **(12 hours)**

Files: Persistence-Opening files-Text files and lines-Reading files-Searching through a file-Letting the user choose the file name-Using try, except, and open-Writing files-Debugging. **Lists:** A list is a sequence-Lists are mutable-Traversing a list-List operations-List slices-List methods-Deleting elements-Lists and functions-Lists and strings-Parsing lines-Objects and values-Aliasing-List arguments-Debugging.

Unit V **(12 hours)**

Using Database and SQL: Database Definition-Database concepts-Database Browser for SQLite-Creating a database table-Structured Query Language summary-Spidering Twitter using a database-Basic data modeling-Programming with multiple tables-Three kinds of keys-Using JOIN to retrieve data. **Visualizing data:** Building an OpenStreetMap from geocoded data-Visualizing networks and interconnections-Visualizing mail data.

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Remember the concepts of data types, operators, expression, function, control structure and file

CO2: Make use of operator; continue statement and list

CO3: Analyzing the order of operations, flow of execution and list types

CO4: Evaluate the expression, loop and iteration

CO 5: Create database to store data in SQL

Text Book:

1. Dr. Charles R. Severance, *Python for Everybody Exploring Data Using Python 3*, Shroff Publisher & Distributors , 2016.

Reference Books:

1. E.Balagurusamy, *Problem Solving and Python Programming*, McGraw-Hill, First Edition.
2. Martin C. Brown, *PYTHON:The Complete reference*, McGraw-Hill, 2001.

E-Resources:

1. https:/.tutorialspoint.com/python/index.htm
2. https://www.learnpython.org/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	1	9	3	9	**43**
CO2	9	9	3	1	9	9	9	**49**
CO3	9	9	3	1	9	9	9	**49**
CO4	9	9	3	1	9	9	9	**49**
CO5	9	9	3	1	9	9	9	**49**
Total	**45**	**45**	**15**	**5**	**45**	**39**	**45**	**239**

Low-1 Medium-3 High-9

Core XVIII – Project

(For Students Admitted from 2022 -23)

Semester : VI **Hours/Week: 6**

Subject Code: IBCSC65PW **Credit: 5**

Course Objectives:

1. To impart the students to understand the data collection for the project
2. To enhance the students to select the programming language for implementing the project

Project shall be a group project (group consisting of maximum of two members)

Course Outcomes:

After successful completion of this course, students will be able to**:**

CO1: Identify goals, constraints, deliverables, performance criteria and resource requirements in consultation with stakeholders

CO2: Apply the plan by executing the code
CO3: Illustrate the various aspects of software development for the total project
CO4: Evaluate the entire software project according to the specific problem
CO5: Develop the software project by executing with the various data

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	9	9	3	9	57
CO2	9	3	9	3	9	9	9	51
CO3	9	3	9	9	9	9	9	57
CO4	9	3	9	9	9	9	9	57
CO5	9	9	9	9	9	9	9	45
Total	**45**	**27**	**45**	**39**	**45**	**39**	**45**	**285**

Low-1 Medium-3 High-9

DSE III – a) Cloud and Distributed Computing

(For Students Admitted from 2022 -23)

Semester: VI **Hours/Week: 4**
Subject Code: IBCSE6A **Credit: 4**

Course Objectives:
1. To impart the complete understanding of cloud, virtualization and distributed clouds
2. To understand the leader election in cloud and distributed systems

Unit I **(12 hours)**

Introduction to Cloud, Virtualization, and Virtual Machine: Introduction to Cloud Computing - Features of Today's Cloud - Introduction to Virtualization - Mitigation Techniques for VM Migration. **Network Virtualization and Geo-Distributed Clouds:** Introduction - Cloud Computing and Server Virtualization - Networking of Virtual Machines Inside the Hypervisor – Docker - Software-Defined Network

Unit II **(12 hours)**

Leader Election in Cloud, Distributed Systems, and Industry Systems: Introduction - Leader Election in Rings (Classical Distributed Algorithms) - Ring Leader Election and Bully Leader Election Algorithms - **Classical Algorithm**: Ring Election Algorithm - Classical Algorithm: Bully Election -**Classical Distributed Algorithms and the Industry Systems:** Introduction - Key Challenges - Algorithms for Recording Global State and Snapshot - Mutual Exclusion Algorithms for Distributed Systems.

Unit III **(12 hours)**

Consensus, Paxos, and Recovery in Clouds: Introduction – Consensus – Byzantine Agreement – Failures and Recovery approaches in Distributed systems. **Cloud Storage:** Key-Value Stores/NoSQL Stores and HBase: Design of Key-Value Stores - Design of HBase.

Unit IV **(12 hours)**

P2P Systems and Their applications in Industry systems: Introduction – Bitcoin crypto currency system- Block chain technology and its applications beyond bitcoin solutions.Cloud Applications: MapReduce, Spark, and Apache Kafka- MapReduce- Spark-Kafka.

Unit V **(12 hours)**

Cloud-Native Computing: Introduction-Micro services- Docker -Kubernetes - Introduction to Edge Computing - Classification of Edge Computing. **Software-Defined Networking and Network Function Virtualization:** Introduction - Software-Defined Networking - Applications and Use Cases - Software-Defined NFV - Network Slicing - Ongoing Research Opportunities.

Course Outcomes:

After successful completion of this course, students will be able to

CO 1: Identify the features of Cloud Computing and Virtualization
CO 2: Demonstrate the leader election and classical distributed algorithms
CO 3: Classify types of Consensus, Paxos, Recovery in Clouds and cloud storage
CO 4: Justify P2P systems and cloud applications
CO 5: Formulate the cloud native computing, Software-Defined Networking and Network Function Virtualization

Text Book:

1. Rajiv Misra and Yashwant Singh Patel, *Cloud and Distributed Computing: Algorithms and Systems*, Wiley Emerging Technology Series, 2020.

Reference Books:

1. Chris Dotson, Practical Cloud Security: *A Guide for Secure Design and Deployment*, O'Reilly Media, First Edition, 2019.
2. Rajkumar Buyya, Christian Vecchiola and Thamarai Selvi, *Mastering Cloud Computing*, Tata McGraw Hill Company, 2017.
3. Rajkumar Buyya, James Broberg, Andrzej Goscinski, *CLOUD COMPUTING Principles and Paradigms*, John Wiley & Sons Publishers, 2011.
4. Toby Velte, Anthony Velte, Robert Elsenpeter, *Cloud Computing-A Practical Approach*, Tata McGraw Hill Company, 2010.

E - Resources:

1. NPTEL: https://nptel.ac.in/courses/106/104/106104182/
2. https://www.amazon.in/Cloud-Distributed-Computing-Algorithms-Systems/dp/8126520272?asin=B086V7Q2KW&revisionId=&format=4&depth=1

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	9	3	1	9	35
CO2	9	1	9	9	3	1	3	35
CO3	9	3	3	9	3	1	9	37
CO4	3	9	9	9	9	3	9	51
CO5	3	9	9	9	9	3	9	51

Total	**33**	**23**	**33**	**45**	**27**	**9**	**39**	**209**

Low-1 Medium-3 High-9

DSE III – b) Artificial Intelligence and Expert Systems

(For Students Admitted from 2022 -23)

Semester: VI **Hours/Week: 4**
Subject Code: IBCSE6B **Credit: 4**

Course Objectives:

1. To introduce the basic principles, techniques, and applications of Artificial Intelligence
2. To gain a historical perspective of AI and its foundations. Explore the current scope, potential, limitations, and implications of intelligent systems

Unit I **(12 hours)**

Introduction to Artificial Intelligence-Intelligent Agents, Approaches in Artificial Intelligence, Definitions of Artificial Intelligence, AI problems, Features of AI Programs, Importance of AI, Advantages and Disadvantages of AI.

Unit II **(12 hours)**

Applications of Artificial Intelligence- Finance, Hospitals and Medicine, Robotics, Expert systems, Diagnosis, Pattern Recognition, Natural Language Processing, Game Playing, Image Processing, Data mining, Big Data Mining. Introduction to the state space search- State space search, search techniques, Types of searching techniques.

Unit III **(12 hours)**

Heuristic Search Strategies-Types of Heuristic Search techniques,Hill Climbing Search, Simulated Annealing search, A* Algorithm, AND-OR Graphs, Properties of the Heuristic Search Algorithm, Adversary Search, The MINIMAX Algorithm.

Unit IV **(12 hours)**

Expert Systems-Definitions of Expert Systems, Features of Good Expert systems, Architecture and Components of Expert systems, Roles of the Individuals who interact with the system, Advantages of Expert systems, Disadvantages of Expert Systems.

Unit V **(12 hours)**

Knowledge Representation-Definitions of Knowledge Representation, Characteristics of Good Knowledge Representation, Basics of Knowledge representation, Properties of the Symbolic representation of knowledge, Properties of the Good knowledge representation systems, Categories of knowledge representation schemes, types of knowledge representation schemes.

Course Outcomes:

After successful completion of the course, the students will be able to

CO1: Demonstrate fundamental understanding of the history of artificial intelligence and its foundations

CO2: Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning

CO3: Analyze their gaming skills and learn about Expert system

CO4: Evaluate the learners for aspiring careers in the field of Artificial Intelligence
CO5: Develop the game playing and planning of expert systems

Text Book:
1. I.Gupta & G.Nagpal, *Artificial Intelligence and Expert Systems*, Laxmi Publications, 2018.

Reference Books:
1. V.S. Jankiraman, *Foundations of Artificial Intelligence and Expert Systems*, Laxmi Publications ,2017.
2. Joseph C.Giarratano, Gary D.Riley, Expert *Systems: Principles and Programming*, Fourth Edition, 2018.
3. Lavika Goel, Artificial *Intelligence: Concepts and Applications*, Wiley India Private Limited.

E-Resources:
1. NPTEL:https://nptel.ac.in/courses/106/102/106102220/
2. NPTEL:https://nptel.ac.in

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	1	9	9	3	9	**49**
CO2	9	9	3	9	3	9	1	**43**
CO3	3	9	9	3	9	3	3	**39**
CO4	9	1	3	9	3	9	1	**35**
CO5	9	9	9	9	9	3	3	**51**
Total	**39**	**37**	**25**	**39**	**33**	**27**	**17**	**217**

Low-1 Medium-3 High-9

SEC VI– Open Technology Lab

(For Students Admitted from 2022 -23)

Semester: VI **Hours/week: 2**
Subject Code: IBCSS66P **Credit: 2**

Course Objectives:
1. To develop technical solutions for problems using the open-source software(s) readily available at free of cost
2. To learn programming in Python

List of programs
Display Text
1. Write a python program to display any given text message
Formula Substitution
2. Write a python program to display Fibonacci series
Array
3. Write a python program to count the number of vowel in the string
Function
4. Write a python program to convert a date read from the user, given in DD/MM/YYYY

format into written format.
For example, Enter a date in DD/MM/YYYY Format: 16/7/2003 Output: 16 July, 2003
5. Write a python program to print the contents of a file in uppercase using function
6. Write a python program to sort the contents of a file using function

Operator Overloading

7. Write a python program to implement Operator Overloading

Script

1. Write a python script that implements the Arithmetic Quiz
2. Write a python script to create a button with the text, "Hello World"
3. Write a python script that creates a combo box with three elements. When the selection is changed the selected item is to be printed
4. Write a python script that creates a simple application window with menus and submenus
5. Write a python script that creates a simple application window with displaying lines
6. Write a python program to create your own website for displaying message
7. Write a python program to create a simple blog using models

Note: Questions for the Internal/External examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, students will be able to
CO1: Recall the basics of displaying numbers and string
CO2: Apply the concepts of control structures and function (Predefined and user defined)
CO3: Analyzing the concept of array and file
CO4: Explain operator overloading
CO5: Create GUI programming and website

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	1	9	9	9	**55**
CO2	9	9	9	1	9	9	9	**55**
CO3	9	9	9	1	9	9	9	**55**
CO4	9	9	9	1	9	9	9	**55**
CO5	9	9	9	1	9	9	9	**55**
Total	**45**	**45**	**45**	**5**	**45**	**45**	**45**	**275**

Low-1 Medium-3 High-9

Extra Credit I - Corel Draw Lab

Semester: II
Subject Code: IBCSX2P **Credit: 2**

Course Objectives:

1. To understand various menu bars and graphic tools of Corel Draw
2. To make designs with very great accuracy

List of programs

1. Create a newspaper advertisement using CorelDraw's text formatting tools
2. Create a Bitmap Image and apply the auto tracing technique to that image
3. Create an object and apply transformation technique
4. Create a Parachute using the given special fills methods such as
   a) Filling object using foundation fills b) Pattern Fill c) Interactive Fill Tool
5. Create a certificate template & merged with data files
6. Create any kind of invitation
7. Create a Mirror object using Mirror command
8. Create any kind of LOGO using Fit Text to Path technique
9. Create a Flyer design
10. Design a magazine cover

Note: Questions for the external examination will be based on concept learnt

Course Outcomes:

After successful completion of this course, students will be able to

CO 1: Describe the concepts of tools and techniques in CorelDraw
CO 2: Apply the concept of Creation and modification of objects for graphic design purposes.
CO 3: Analyze various tools to design Flyers.
CO 4: Develop any kind of LOGO using techniques in CorelDraw
CO 5: Build design magazine and presentations

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	9	1	1	**25**
CO2	9	3	3	1	9	1	3	**29**
CO3	9	3	3	3	9	3	3	**33**
CO4	9	3	3	3	9	3	3	**33**
CO5	9	3	9	3	9	3	9	**45**
Total	**45**	**15**	**19**	**11**	**45**	**11**	**19**	**165**

Low-1 Medium-3 High-9

Extra Credit II – Programming in Visual Basic Lab

Semester: III
Subject Code: IBCSX3P **Credit: 2**

Course Objectives:

1. To understand the concept of visual programming
2. To make designs with GUI

List of Programs

1. Write a Visual basic program to find the simple and compound interest
2. Write a Visual Basic program to check whether the given number is perfect or not
3. Write a Visual Basic program to check given number is prime or not
4. Write a Visual Basic program to check given number is Armstrong or not
5. Write a Visual basic program to implement all date & time functions
6. Write a Visual basic program to calculate the age of a person using calendar control

7. Write a Visual basic program to perform all string manipulations
8. Write a Visual basic program to arrange the numbers in order
9. Write a Visual basic program to implement menus

Note: Questions for the External examination will be based on the concepts learnt

Course Outcomes

After successful completion of this course, students will be able to

CO1: Demonstrate the basics of visual Basic programming in terms of control statements and functions

CO2: Apply the basic concepts of user defined function

CO3: Enhance problem solving, programming and debugging skills

CO4: Plan to implement the menu creation

CO5: Analyze and implement the various data control

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	1	9	9	3	**43**
CO2	9	3	9	3	9	9	9	**51**
CO3	3	9	1	1	3	1	9	**27**
CO4	9	3	9	1	9	9	3	**43**
CO5	9	1	9	3	9	9	3	**43**
Total	**39**	**25**	**31**	**9**	**39**	**37**	**27**	**207**

Low-1 Medium-3 High-9

Extra Credit III- R Tool Lab

Semester: IV

Subject Code: IBCSX4P **Credit: 2**

Course Objectives:

1. To understand the concept of R Tool
2. To implement the statistics analysis

List of Programs

1. Write a Program to implementing correlation analysis
2. Write a Program to implementing regression analysis
3. Write a Program to implementing t-test
4. Write a Program to implementing z-test
5. Write a Program to implementing f-test
6. Write a Program to implementing chi-square test
7. Write a Program to implementing kruskal-wallis test
8. Write a Program to implementing likert scaling techniques
9. Write a Program to implementing analysis of variance (ANOVA)

Note: - Questions for External examination will be based on concepts learnt

Course Outcomes

After successful completion of this course, students will be able to

CO1: Demonstrate the basics in R programming in terms of constructs, control statements and functions

CO2: Apply data analytics software

CO3: Enhance problem solving, programming and debugging skills

CO4: Plan the R programming from a statistical perspective

CO5: Analyze and implement the various data structures of R

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	1	9	9	3	**43**
CO2	9	3	9	3	9	9	9	**51**
CO3	3	9	1	1	3	1	9	**27**
CO4	9	3	9	1	9	9	3	**43**
CO5	9	1	9	3	9	9	3	**43**
Total	**39**	**25**	**31**	**9**	**39**	**37**	**27**	**207**

Low-1 Medium-3 High-9

Extra Credit V - Data Mining Lab

Semester: VI

Subject Code: IBCSX6P **Credit: 2**

Course Objectives:

1. To understand the concept of Data Mining Tool
2. To implement the various data mining algorihms

List of Programs

1. Create data-set in .arff file format. Demonstration of preprocessing on WEKA data-set
2. Demonstration of Association rule process on data-set contact lenses.arff /supermarket using apriori algorithm
3. Demonstration of classification rule process on WEKA data-set using j48 algorithm
4. Demonstration of classification rule process on WEKA data-set using Naive Bayes algorithm
5. Demonstration of clustering rule process on data-set iris.arff using simple k-means

Note: - Questions for External examination will be based on concepts learnt

Course Outcomes:

After successful completion of this course, students will be able to

CO 1: Describe Data mining concept

CO 2: Apply the knowledge of data mining techniques

CO 3: Adapt to new data mining tools

CO 4: Explore recent trends in data mining such as web mining, spatial-temporal mining

CO 5: Build different types of algorithm

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**

CO1	9	3	1	1	9	1	1	**25**
CO2	9	3	3	1	9	1	3	**29**
CO3	9	3	3	3	9	3	3	**33**
CO4	9	3	3	3	9	3	3	**33**
CO5	3	3	9	3	9	3	9	**39**
Total	**39**	**15**	**19**	**11**	**45**	**11**	**19**	**159**

Low-1 Medium-3 High-9

B Sc CYBER SECURITY

(Three Year Regular Programme)
(For Students Admitted from 2022-23)

Programme Specific Outcomes (PSO):

On completion of this programme, student will be able to gain

PSO1: Ability to design, implement, and evaluate a security system that capable of identify, prevent and protect from malware attack

PSO2: Ability to Design and Develop Secure Structured Network Mode

PSO3: Make the graduates to become Software Developer, Web Programmer, Mobile Application Developer and Cyber Security Professional

PSO4: Ability to develop a solution to secure organization information system

PSO5: Ability to Identify Network vulnerabilities and detect attacks and resolve them

PSO6: Ability to analyze a problem, and identify and define the security related issues appropriate to its solution

PSO7: Understand the needs of society and sensitivity to societal responsibilities

PREAMBLE

The Board of Studies of Computer Science revamped the curriculum with the following changes

Core courses

- Programming in C Lab has been replaced with Data Structures using C Lab
- Malware Analysis is shifted from VI semester to V semester as Discipline Specific Elective
- Cryptography & Network Security has been shifted from IV to VI semester
- Cryptography & Network Security lab has been shifted from IV semester to VI semester as Skill Enhancement Course

Ability Enhancement Compulsory Course

- Digital Electronics lab has been removed from the syllabus
- Digital Electronics has been shifted from third semester to second semester
- Basic statistics has been shifted from second semester to third semester
- Microprocessor and Microprocessor lab have been removed from the syllabus
- Operations Research has been introduced

Discipline Specific Elective

- Information security and Data mining and warehousing have been removed

Skill Enhancement Course

- Visual Programming Lab has been replaced with Graphics and Animation Lab (Flash)
- Multimedia Lab has been replaced with Cryptography & Network Security lab

Extra Credit Papers

- Corel Draw Lab,Visual Programming Lab, RTool Lab and Data Mining Lab have been introduced

PROGRAMME STRUCTURE - PROGRAM CODE : UCY

Sem	Subject Code	Course	Subject Title	Hours / week	Credit	CIA	ESE	Total Marks
I	IBLT11/ IBLA11/ IBLH11	Language I	Tamil I/ Arabic I/ Hindi I	5	3	40	60	100
	IBLEI12/ IBLEII12	Language II	English I a or b	5	3	40	60	100
	IBCYC11	Core I	Fundamentals of Computers	6	5	40	60	100
	IBCYC12P	Core II	Office Automation Lab	5	4	40	60	100
	IBCYA13	AECC I	Discrete Mathematics	5	4	40	60	100
	IBCYS14P	SEC I	Python Lab	2	2	-	50	50
			Library/Browsing	1	-	-	-	-
			Remedial/Games	1	-	-	-	-
			Total	**30**	**21**	**200**	**350**	**550**
II	IBLT21/ IBLA21/ IBLH21	Language I	Tamil II/Arabic II/Hindi II	5	3	40	60	100
	IBLEI22/ IBLEII22	Language II	English II a or b	5	3	40	60	100
	IBCYC21	Core III	○ Data Structures using C language	5	5	40	60	100
	IBCYC22P	Core IV	Data Structures using C Lab	4	4	40	60	100
	IBCYA23	AECC II	Digital Electronics	5	4	40	60	100
	IBCYS24P	SEC II	Linux and Shell Programming Lab	2	2	-	50	50
	IBES2	GIC I	Environmental Science	2	2	-	50	50
			Library/ Browsing	1	-	-	-	-
			Remedial/ Games	1	-	-	-	-
	IBCYX2P / IBCYX2O	Extra Credit I	Corel Draw Lab / *Online Course	-	2	-	100	100
			Total	**30**	**23+2**	**200**	**400+ 100**	**600+ 100**
III	IBLT31/ IBLA31/ IBLH31	Language I	Tamil III/ Arabic III/ Hindi III	5	3	40	60	100

	IBLEI32/ IBLEII32	Language II	English III a (or) b	5	3	40	60	100
	IBCYC31	Core V	Database Security	4	4	40	60	100
	IBCYC32P	Core VI	RDBMS Lab	4	4	40	60	100
	IBCYA33	AECC III	Statistics	4	4	40	60	100
	IBCYS34P	SEC III	Web Designing Lab (HTML and Scripting Language)	2	2	-	50	50
		OEC		2	2	-	50	50
	IBHR3	GIC II	Human Rights	2	2	-	50	50
	IBXTN3	Extension Activities	NSS / CSS	2	2	100	-	100
	IBCYX3P/ IBCYX3O	Extra Credit II	Programming in Visual Basic Lab / *Online Course	-	2	-	100	100
			Total	**30**	**26+2**	**300**	**450+ 100**	**750+ 100**
IV	IBLT41/ IBLA41/ IBLH41	Language I	Tamil IV/Arabic IV/ Hindi IV	5	3	40	60	100
	IBLEI42/ IBLEII42	Language II	English IV a or b	5	3	40	60	100
	IBCYC41	Core VII	Principles of Cyber Security	4	4	40	60	100
	IBCYC42P	Core VIII	.NET Programming Lab	5	4	40	60	100
	IBCYA43	AECC IV	Operations Research	5	4	40	60	100
	IBCYS44P	SEC IV	Graphics and Animation Lab (Flash)	2	2	-	50	50
	IBLVE4	GIC III	Life Skills and Value Education	2	2	-	50	50
		OEC		2	2	-	50	50
	IBCYX4P/ IBCYX4O	Extra Credit III	R Tool Lab / # Internship	-	2	-	100	100
			Total	**30**	**24+2**	**200**	**450+ 100**	**650+ 100**
V	IBCYC51	Core IX	○ Programming in Java	6	5	40	60	100
	IBCYC52P	Core X	Programming in Java Lab	6	5	40	60	100
	IBCYC53	Core XI	Ethical Hacking	6	5	40	60	100
	IBCYE5A/ IBCYE5B	DSE I	a) Mobile Computing/ b) Malware Analysis	4	4	40	60	100
	IBCYE5C/ IBCYE5D	DSE II	a) Operating System Security b) Cyber Forensics	4	4	40	60	100

	IBCYS54P	SEC V	PHP Programming Lab	2	2	-	50	50
	IBWE5	GIC IV	Women Entrepreneurship	2	2	-	50	50
	IBCYX5/ IBCYX5O	Extra Credit IV	Employability Skills	-	2	100	-	100
			Total	**30**	**27+2**	**200+ 100**	**400**	**600+ 100**
VI	IBCYC61	Core XII	Wireless Security	6	4	40	60	100
	IBCYC62	Core XIII	Cyber Law	5	4	40	60	100
	IBCYC63	Core XIV	Cryptography and NetworkSecurity	6	5	40	60	100
	IBCYC64PW	Core XV	Project	6	5	40	60	100
	IBCYE6A/ IBCYE6B	DSE III	a) Cloud Computing and Security b) Intellectual Property Rights	4	4	40	60	100
	IBCYS65P	SEC VI	Cryptography and Network Security Lab	2	2	--	50	50
	IBCYX6P/ IBCYX6O	Extra Credit V	Data Mining Lab/ *Online Course	--	2	--	100	100
			Library/Browsing	1	--	--	--	--
			Total	**30**	**24+2**	**200**	**350+ 100**	**550 +100**
			GRAND TOTAL	**180**	**145+ 10**	**1300+ 100**	**2400 +400**	**3700+ 500**

*****For Online Course credit alone will be assigned on submission of certificate obtained by appearing for online examination from EdX, Spoken Tutorial, NPTEL or Coursera etc.

\# For internship course, refer www.internshala.com

o For online course integration, syllabus will be taken from spoken tutorial.

AECC-Ability Enhancement Compulsory Course
SEC-Skill Enhancement Course
DSE-Discipline Specific Elective
OEC-Open Elective Course
GIC – General Interest Course

Core I – Fundamentals of Computers

(For Students Admitted from 2022-23)

Semester: I **Hours/Week: 6**
Subject Code: IBCYC11 **Credit: 5**

Course Objectives:

1. To understand the basics of computers
2. To understand the working of input/output interfaces

Unit I **(18 hours)**

Computer Basics: Algorithms – Simple Model of a Computer – Characteristics of Computers - Problem Solving Using Computers. Data Representation: Representation of Characters in Computers –Representation of Integers – Representation of Fractions-Hexadecimal Representation of Numbers – Decimal to Binary Conversion – Error Detecting Codes.

Unit II **(18 hours)**

Input/Output Units: Traditional Computer Input/Output Units – Other Input Technologies – Computer Output Devices – Choosing a Printer. Computer Memory: Memory Cell – Memory Organization -Read Only Memory– Serial Access Memory – Physical Devices used to construct memories – Magnetic Hard Disk - Compact Disk Read Only memory – Magnetic Tape Drive -Memory Hierarchy. Processor: Structure of Instructions – Description of a processor – Machine Language Program – Algorithm to stimulate Hypothetical Computer – Enhancing Hypcom.

Unit III **(18 hours)**

Binary Arithmetic: Binary Addition-Binary Subtraction-Signed Numbers-Two's Complement Representation of Numbers-Addition/ Subtraction of Numbers in 2's Complement Notation-Binary Multiplication-Binary Division-Floating Point Representation of Numbers - Arithmetic Operations with Normalized Floating Point Numbers. Computer Architecture: Interconnection of Units- Processor to Memory Communication -I/O Devices to Processor Communication- Interrupt Structures- Bus Architecture of Personal Computers - Multiprogramming.

Unit IV **(18 hours)**

Programming Languages: Need of Programming Language – Assembly language – Higher Level Programming Languages – Compiling a High Level Language Program – Some High Level Languages. Microcomputers: Ideal Microcomputer – Actual Microcomputer – Memory Systems for Microcomputers – Minimum Microcomputer Configuration – Evolution of Microcomputers – Reduced Instruction Set Computers. Computer Generations and Classification: First Generation of Computers – Second generation – Third Generation – Fourth Generation – Fifth Generation – Moore's Law – Classification of Computers – Distributed Computer System – Parallel Computers.

Unit V **(18 hours)**

Advanced Input/Output Interfaces: Graphical User Interface – Vector Graphics – Raster Graphics – Accelerated Graphics with GPU – Stereo Display Units – Other Visual Displays – Input Devices for Interaction-Speech and Audio Interface – tactile Interfaces – Other Emerging Technologies. Multimedia Data Acquisition and Processing: Image Acquisition and Storage – Storage formats for pictures – Image Acquisition with a Digital Camera – Capturing a movie image with a Video Camera – Compression of Video Data – MPEG Compression Standard – Acquiring and Storing Audio Signals – Compression of Audio Signals-Audio Signal Processing.

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Summarize the basics of computers and its generations

CO2: Illustrate number systems and its conversions

CO3: Analyze the uses of internal and external components of computers

CO4: Select appropriate input and output devices for digital literacy according to its intended

use

CO5: Formulate the methods to handle multimedia applications

Text Book:

1. V Rajaraman, NeeharikaAdabala, *Fundamentals of Computers*, PHI Learning Private Limited, Sixth Edition, 2018.

Reference Books:

1. James A. O'Brien, George M. Marakas, *Introduction to Information Systems*, Tata McGraw Hill, Fifteenth Edition, 2010.
2. ITL Education Solutions Limited, *Introduction to Information Technology*, Pearson Education, Fourth Edition, 2007.
3. Alexis Leon, Mathews Leon, *Fundamentals of Information Technology*, L&L Consultancy Services,, Second Edition, 1999.

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105163/
2. https://www.coursera.org/courses?query=computer%20fundamentals
3. https://cstutorialpoint.com/computer-fundamentals-notes/
4. https://ecomputernotes.com/fundamental
5. https://testbook.com/learn/computer-fundamentals/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	9	9	9	9	**45**
CO2	9	1	9	3	9	9	9	**49**
CO3	9	3	3	9	9	9	3	**45**
CO4	9	9	3	9	9	9	9	**57**
CO5	9	3	9	9	9	9	3	**51**
Total	**39**	**19**	**27**	**39**	**45**	**45**	**33**	**247**

Low-1 Medium-3 High-9

Core II - Office Automation Lab

(For Students Admitted from 2022-23)

Semester: I **Hours/week: 5**
Subject Code: IBCYC12P **Credit: 4**

Course Objectives:

1. To acquire knowledge about word processing, spread sheet, Data base creation and slide preparation
2. To improve creative thinking in presentations

List of Programs

Word Processing

1. Create a word processing document consists two pages in a Book named "XX" and then

do the following:

a. Formatting Text, Alignment and Font Style
b. Perform Find and Replace
c. Add Header and Footer option to specify name of the Book Chapter Heading and Page number of total pages.

2. Create a word processing document having details of our College courses using bulleted and number lists
   a. Type the title using Word Art
   b. Design a Letter to felicitate Farewell Address to our seniors with Font Setting/Page Borders/Word Art/Clip Art/Symbols
3. Create a Newsletter Article (using Columns, Drop cap)
4. Create a time table for your Internal Exam Schedule (using Table)
5. Type Business letter and send it to more using Mail Merge
6. Create your own Resume

Spreadsheet

1. Create an spreadsheet consists of Student details and then do the following:
   a. Calculate student wise total and subject wise total
   b. Find the Maximum and Minimum marks of the subject
   c. Grade is calculated as
      i. if %>=90, then grade A
      ii. If %>=80 and <90, then grade B
      iii. If %>=70 and <80, then grade C
      iv. If %>=60 and <70, then grade D
      v. If %<60, then grade F
2. Create a spreadsheet having Employee details suitably and then do the following
   a. Use functions to calculate Net Pay and Gross Pay
   b. Perform conditional formatting and validation
3. Create a purchase order list for a company
   a. prepare a purchased item list with price
   b. prepare a flowchart for the price wise item
4. Create a macro

Presentation

1. Create a presentation showing your various activities of the department a Performslide translation and Setting background designs
2. Create a presentation showing various aspect of your college and perform custom animation and importsound.
3. Create a presentation using design templates and then perform the following one:
   a. Include Table and chart from file
   b .Include Picture and run the presentation using auto play
4. Perform Hyperlink within slides and link other documents

Database

1. Crate a Student Database having Name, Regno, Tamil, English, Maths, Total, and Average Perform tofind total and average and check data entered
2. Create an Inventory database having Item Name, Item no. Quantity and Price. Perform query operation to retrieve data.

3. Create a form to enter the details of the Book database
4. Create a report for the Book database

Note: Questions for Internal and External examination will be based on concept learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Illustrate various options of Office Application
CO2: Demonstrate different types of formats, formulas and transition in office application
CO3: Develop reports to solve the problems of manual report handling
CO4: Compare the options of different Microsoft Office Applications to use appropriately
CO5: Build a presentation, Advertisement, Reports etc for enterprise

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	3	9	3	9	**45**
CO2	9	9	3	9	9	9	9	**57**
CO3	9	9	3	9	9	9	9	**57**
CO4	9	3	3	3	9	3	9	**39**
CO5	9	9	3	3	9	3	9	**45**
Total	**45**	**39**	**15**	**27**	**45**	**27**	**45**	**243**

Low-1 Medium-3 High-9

SEC I – Python Lab

(For Students Admitted from 2022-23)

Semester: I **Hours/week: 2**
Subject Code: IBCYS14P **Credit: 2**

Course Objectives:

1. To develop technical solutions for problems using the open source software readily available at free of cost
2. To learn programming in Python

Program List

Display Text

1. Write a python program to display any given text message

Formula Substitution

2. Write a python program to display Fibonacci series

Array

3. Write a python program to count the number of vowel in the string

Function

4. Write a python program to convert a date read from the user, given in DD/MM/YYYY format into written format. For example, Enter a date in DD/MM/YYYY Format: *16/7/2003* *Output: 16 July, 2003*
5. Write a python program to print the contents of a file in uppercase using function
6. Write a python program to sort the contents of a file using function

Operator Overloading

7. Write a python program to implement Operator Overloading

Script

8. Write a python script that implements the Arithmetic Quiz
9. Write a python script to create a button with the text, "Hello World"
10. Write a python script that creates a combo box with three elements. When the selection is changed, the selected item is to be printed
11. Write a python script that creates a simple application window with menus and submenus
12. Write a python script that creates a simple application window with displaying lines
13. Write a python program to create your own website for displaying message
14. Write a python program to create a simple blog using models

Note: Questions for the Internal/External examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Recall the basics of displaying numbers and string
CO2: Apply the concepts of control structures and function (Predefined and user defined)
CO3: Analyzing the concept of array and file
CO4: Explain operator overloading
CO5: Create GUI programming and website

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	1	9	9	9	**55**
CO2	9	9	9	1	9	9	9	**55**
CO3	9	9	9	1	9	9	9	**55**
CO4	9	9	9	1	9	9	9	**55**
CO5	9	9	9	1	9	9	9	**55**
Total	**45**	**45**	**45**	**5**	**45**	**45**	**45**	**275**

Low-1 Medium-3 High-9

Core III -Data Structures using C Language

(For Students Admitted from 2022-23)

Semester: II **Hours/Week: 5**
Subject Code: IBCYC21 **Credit: 5**

Course Objectives:

1. To introduce the various data structures and their implementations
2. To learn various sorting algorithms

Unit I **(15 hours)**

Introduction - Overview of C - Sample program - constants - Variables - Data Types - **Input**

and Output Operations - Operator and Expressions - Control Statements**.**

Unit II **(15 Hours)**

Arrays - Strings - Built-in Functions - User defined Functions - **Structures** - Unions – Pointers.

Unit III **(15 hours)**

Introduction to Algorithms and Data Structures: Introduction to Algorithm - Asymptotic Notation-Introduction to Data Structures-Types of Data Structures-Data Structure Operations.**Linked Lists:** Introduction to Linked list-Basic concept-Linked list Implementation - Types of Linked Lists- Circular Linked List - Doubly Linked List.

Unit IV **(15 hours)**

Stacks: Introduction to Stacks – Stack Operations – Stack Implementation. **Queues:** Introduction of Queues– Queues-Basic concepts – Queue Operations – Queue Implementation.**Trees:** Introduction to Trees – Basic Concepts – Binary Tree - Binary Tree Representations – Binary Tree Traversal - Binary Search Tree.

Unit V **(15 hours)**

Graphs: Introduction – Basic Concept – Graph Terminology – Graph Traversal .**Sorting and Searching:** Introduction - Sorting Techniques – Searching Techniques.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Remember the basic concepts of C Language, structure and algorithm
CO 2: Make use of operator, structure, union and pointers
CO 3: Compare Stack, Queue, Tree, Graph, linked list and its operations
CO 4: Explain control statements, types of data structure, data structure operations, types of linked list, stack, queue, tree and graph
CO 5: Elaborate tree traversal, searching and sorting techniques

Text Book:

1. E Balagurusamy, *Data Structures using C*, McGraw Hill Education (India) Private Limited, 2013.

Reference Books:

1. Reema Thareja, *Data Structures Using C*, Oxford University Press, Second Edition, 2014.
2. Aaron M. Tenenbaum, Data Structures Using C, Pearson Education, First Edition, 1998.

E-Resources:

1. https://www.mygreatlearning.com/blog/data-structures-using-c/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	3	1	1	**19**
CO2	9	3	9	1	9	1	3	**35**

CO3	9	1	9	9	1	1	3	**33**
CO4	9	3	3	3	3	3	3	**27**
CO5	9	1	1	9	9	9	3	**41**
Total	**45**	**11**	**23**	**23**	**25**	**15**	**13**	**155**

Low-1 Medium-3 High-9

Core IV-Data Structures using C Lab

(For those who joined since 2022-23)

Semester: II **Hours/week: 4**
Subject Code:IBCYC22P **Credit: 4**

Course Objectives:

1. To introduce the various data structures and their implementations
2. To learn various sorting algorithms

Program List:

1. Array and Linked list implementation of List ADT
2. Array and Linked list implementation of Stack ADT
3. Array and Linked list implementation of Queue ADT
4. Applications of List, Stack and Queue ADTs
5. Implementation of Binary trees and operations of Binary trees
6. Implementation of Binary Search Trees
7. Implementation of AVL Trees
8. Implementation of Heaps using Priority Queues
9. Graph representation and Traversal algorithms
10. Applications of Graphs
11. Implementation of searching and sorting algorithms
12. Hashing – any two collision techniques

Note: Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Recall linear and non-linear data structures
CO2: Illustrate non-linear data structures
CO3: Perform the different operations of search trees
CO4: Relate graph traversal algorithms
CO5: Create sorting and searching algorithms

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	**9**	**1**	**9**	**3**	**1**	**3**	**1**	**27**
CO2	**1**	**1**	**3**	**9**	**1**	**3**	**3**	**21**
CO3	**3**	**3**	**3**	**9**	**3**	**1**	**3**	**25**

CO4	**3**	**3**	**3**	**9**	**3**	**1**	**3**	**25**
CO5	**9**	**3**	**1**	**1**	**1**	**3**	**3**	**21**
Total	**25**	**11**	**19**	**31**	**9**	**11**	**13**	**119**

Low-1 Medium-3 High-9

AECC II-Digital Electronics

(For Students Admitted from 2022-23)

Semester: II **Hours/week: 5**
Subject Code:IBCYA23 **Credit: 4**

Course Objectives:

1. To know the concepts of Combinational circuits
2. To understand the concepts of flipflops, registers and counters

Unit I **(15 hours)**

Number Systems and Codes: Introduction- binary, octal, decimal, and hexadecimal number system- decimal to binary, octal to binary, hexadecimal to binary – hexadecimal to octal conversions and vice versa-binary arithmetic-1s and 2s complement representations-BCD addition and subtraction-weighted and un- weighted codes- alphanumeric codes.

Unit II **(15 hours)**

Basic Boolean functions: AND,OR,NOT Functions- Boolean theorems and laws-use of Boolean algebra for simplification of logical expressions- minterm and maxterm- canonical sum of products and product of sum simplifications- minimization of logical expressions using K-map-logic gates- AND,OR,NOT,EX- OR,NAND,NOR gates.

Unit III **(15 hours)**

Introduction to combinational logic circuits: arithmetic circuits –half adder, full adder, half subtractor, full subtractor, parallel binary adder - subtractor, serial adder, multiplier and divider-encoder, decoder.

Unit IV **(15 hours)**

Introduction to sequential circuits-flipflops-SR,JK,D and T flipflops-master-slave flipflops-level and edge triggering-synchronous and asynchronous counters- up/down counters-modulo-n- counters- shift registers- serial in serial out-serial in parallel out,parallel in serial out and parallel in parallel out shift counters- ring counters.

Unit V **(15 hours)**

Read only memory- architecture of ROM, PROM, EPROM, EEPROM, ROM applications-RAM- RAM architecture-static and dynamic RAM.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Remember the basic structure of number system methods like binary, octal and hexadecimal

CO2: Apply the functions to simplify the logical expressions

CO3: Analyze the operations of various logical circuits
CO4: Evaluate the functions of the memory organization
CO5: Create the sequential and combinational logic circuits

Text Book:
1. S. Salivahanan And S. Arivazhagan, *Digital Circuits And Design*, Oxford University Press, 2018.

Reference Books:
1. M. Morris Mano and Michael D. Ciletti, *Digital Design*, Pearson Education, Fifth Edition, 2014.
2. A.Anand Kumar, *Fundamentals of Digital Circuits*, PHI Learning Private Limited, Fourth Edition, 2016.
3. Anil K.Maini, *Digital Electronics*, Wiley Publications, 2014.
4. Charles H.Roth, Fundamentals *of Logic Design*, Thomson Learning, Sixth Edition, 2013.

E-Resources:
1. https://nptel.ac.in/courses/108/105/108105113/
2.https://www.classcentral.com/course/swayam-digital-electronic-circuits-12953
3.https://onlinecourses.swayam2.ac.in/cec21_cs16/preview
4.https://tutorialsinhand.com/tutorials/digital-electronics-tutorial/digital-electronics-basics/digital- electronics-introduction.aspx
5.https://www.udemy.com/course/introduction-to-digital-electronics/
6.https://www.udemy.com/course/basics-of-digital-electronics/

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	3	3	1	9	9	9	43
CO2	9	3	3	1	9	3	9	37
CO3	9	3	3	1	9	3	9	37
CO4	9	3	3	1	9	3	9	37
CO5	9	3	3	1	9	3	9	37
Total	45	15	15	5	45	21	45	191

Low-1 Medium-3 High-9

SEC II - Linux and Shell Programming Lab

(For Students Admitted from 2022-23)

Semester: II **Hours/week:2**
Subject Code: IBCYS24P **Credit:2**

Course Objectives:
1. To understand and make effective use of Linux utilities and shell scripting language to solve problems
2. To develop the skills the necessary for systems programming including file system programming, processand signal management and interprocess communication

List of Programs

Built-in Commands

1. Write a shell program to use who commands
2. Write a shell program to use list commands
3. Write a shell program to use sort commands
4. Write a shell program to use wc commands
5. Write a shell program to use cat commands

Formula Substitution

6. Write a shell program to find odd or even number
7. Write a shell program to find smallest among three numbers
8. Write a shell program to find the factorial value
9. Write a shell program to display multiplication table

Switch case

10. Write a shell program to use case statement

Functions

11. To display username, pwd using function
12. Find age of a person using set date

Checking

13. To check the given file is a directory or not

String Manipulation

14. Convert lowercase to uppercase using tr statement

Note: Questions for the Internal/External examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Summarize shell commands, scripts, managing files, pipes and redirections

CO2: Apply appropriate Linux commands to make effective use of the environment to solve problems

CO3: Illustrate shell scripts to perform repetitive tasks using while and for loops

CO4: Evaluate shell functions

CO5: Derive command-line arguments

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	1	9	9	9	**49**
CO2	9	9	3	1	9	9	9	**49**
CO3	9	9	3	1	9	9	9	**49**
CO4	9	9	3	1	9	9	9	**49**
CO5	9	9	3	1	9	9	9	**49**
Total	**45**	**45**	**15**	**5**	**45**	**45**	**45**	**245**

Low-1 Medium-3 High-9

Extra Credit I - Corel Draw Lab

(For Students Admitted from 2022-23)

Semester: II
Subject Code:IBCYX2P **Credit: 2**

Course Objectives:

1. To understand various menu bars and graphic tools of Corel Draw
2. To make designs with very great accuracy

Corel Draw

1. Create a newspaper advertisement using CorelDraw's text formatting tools.
2. Create a Bitmap Image and apply the auto tracing technique to that image.
3. Create an object and apply transformation technique.
4. Create a Parachute using the given special fills methods such as
   a) Filling object using foundation fills b) Pattern Fill c) Interactive Fill Tool
5. Create a certificate template & merged with data files.
6. Create any kind of invitation.
7. Create a Mirror object using Mirror command.
8. Create any kind of LOGO using Fit Text to Path technique.
9. Create a Flyer design.
10. Design a magazine cover.

Note: Questions for the external examination will be based on concept learnt

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Describe the concepts of tools and techniques in CorelDraw
CO2: Apply the concept of Creation and modification of objects for graphic design purposes
CO3: Analyze various tools to design Flyers
CO4: Develop any kind of LOGO using techniques in CorelDraw
CO5: Build design magazine and presentations

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	9	1	1	**25**
CO2	9	3	3	1	9	1	3	**29**
CO3	9	3	3	3	9	3	3	**33**
CO4	9	3	3	3	9	3	3	**33**
CO5	9	3	9	3	9	3	9	**45**
Total	**45**	**15**	**19**	**11**	**45**	**11**	**19**	**165**

Low-1 Medium-3 High-9

Core V - Database Security

(For Students Admitted from 2022-23)

Semester: III **Hours/Week: 4**
Subject Code: IBCYC31 **Credit: 4**

Course Objectives:

1. To understand the fundamentals of security, and how it relates to information Systems
2. To provide an overview of database security concepts and techniques and describe new directions of databasesecurity in the context of information technology

Unit I **(12 hours)**

Security and Information Technology: Need of Database Security - A Secure Data Environment - Database Security Objectives - Who Are We Securing Ourselves Against - Hackers - Network and Database Administrators-E-Mails. **Malware**: Computer Viruses - Worms-Trojan Viruses-Bots. **Security Architecture:** Assessment and Analysis-Design and Modeling -Deployment-Management and Support.

Unit II **(12 hours)**

Global Policies for the Database Environment: Security Policies- Update and Upgrade Management- Backup Management Plan- The Disaster Plan. **Database Review**: Database Structure Components - Database Models-Database Types-Database Management Systems.

Unit III **(12 hours)**

Oracle Architecture: The Instance and the Database- The Physical Structure- The Memory Structure- The Processes. **Password, Profiles, Privileges, and Roles**: Authentication - Authorization. **Security Auditing**: Security Auditing - Audit Classification - The Goal of an Audit - The Auditing Process.

Unit IV **(12 hours)**

Database Auditing: Preparation and Planning for a Database Security Audit-The Database Audit-Reporting a Database Security Audit-Vendor-Specific Auditing Information.

Unit V **(12 hours)**

Security Testing: Security Testing Classification- The Goal of Security Testing. **Testing Methodology:** Planning and Preparation Phase- Execution Phase- Escalating Privileges-Reporting Phase.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe the concepts of Database security and access control
CO2: Demonstrate the database systems structure
CO3: Analyze security auditing and security testing
CO4: Determine Database issues in Trust Management
CO5: Build skill for solving complex problems in a team of database workers

Text Book:

1. Alfred Basta , Melissa Zgola, *Database Security*, Course Technology, Cengage Learning, 2012.

Reference Books:

1. Alan Williams , Angeline Janet Dhanarani , Ashok Swaminathan , Bettina Schäumer , Manish Choudhary , Michael Mesaros, *Securing the Oracle Database A technical Primer*,Oracle Press ,Fourth Edition,2021.
2. Michael Gertz, SushilJajodia George Mason, *Handbook of Database Security Applications*

and Trends, Springer Science Business Media, LLC, 2008.

E- Resources

1. NPTEL: https://nptel.ac.in/courses/106/104/106104135/
2. https://www.careers360.com/courses-certifications/swayam-database-management-courses-brp-org

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	3	9	1	3	**29**
CO2	9	3	1	1	9	1	1	**25**
CO3	9	3	3	3	9	3	3	**33**
CO4	9	3	1	1	9	3	3	**29**
CO5	9	3	9	3	9	9	3	**45**
Total	**45**	**15**	**15**	**11**	**45**	**17**	**13**	**161**

Low-1 Medium-3 High-9

Core VI – RDBMS Lab

(For Students Admitted from 2022-23)

Semester: III **Hours/Week:4**
Subject Code: IBCYC32P **Credit: 4**

Course Objectives:

1. To get practical knowledge on designing and creating Relational Database Management
2. To understand various advanced queries such as relational constraints, joins, set operations, aggregate functions, trigger, views and embedded SQL

SQL PROGRAMS

DDL

1. Create an address table with fields name , doorno , street & city
   - describe its structure
   - alter the table to include pincode
   - alter the table to modify street column
   - drop the table

DML

2. Create a student table with regno, name, age and dept.
   - insert records
   - delete the students with age above 20
   - truncate and drop the table

Functions

3. Create an employee table with fields eno , ename , sex ,age & years of experience
   - find out the no. of female employees
   - find out the employees with age ranging between 30 and 35
   - list out the employees who are working more than 5 years

4. Create a library file with fields accno,title,author,cost & no of copies
   - arrange the books according to accno
   - find out the TOTAL no. of books available in the library
   - find out the book of minimum cost
5. Create a player table with fields name,sports(cricket,hockey,etc.),age & country
   - find out the eldest and youngest player
   - group players according to sports
   - list out the Indian players
6. Write the SQL queries to illustrate all number functions
7. Write the SQL queries to illustrate date functions
8. Write the SQL queries to illustrate all string functions
9. Create an item table with field's itemno, itemname, quantity & price and insert records
10. Illustrate the comparison operators (between, like, in & isnull)
11. Create a table with the fields clientno , clientname & phoneno Illustrate the set operatorsunion ,unionall, minus & intersect
12. Create a student table with fields' regno, name, English, Tamil, Maths and TOTAL
    - insert records
    - arrange all records according to TOTAL
    - find the student who got first mark in Maths
    - list out the students whose name starts with 'S'
13. Create an inventory table with fields' itemno, itemname, qnty, price and reorder level
    - insert records
    - update the qnty when it goes less than reorderlevel
    - list the items with price less than 100
14. Create an employee table with fields ecode,ename,age & salary and create a department table with fields ecode, designation, deptcode & dept. Illustrate joins and sub queries using the above tables

Constraints

15. Create a vendormaster table with fields vencode, venname, place and phoneno
    Create an ordermaster table with fields item no, itemcode, vencode, qnty and orderdate
    Illustrate the following constraints using the above tables
    - vencode as primary key in vendormaster
    - vencode as foreign key in ordermaster
    - phoneno as unique
    - place as notnull &
    - qnty >100

TCL

15. SQL queries to illustrate TCL commands (savepoint, rollback andcommit)

PL / SQL PROGRAMS

Formula Substitution

1. PL / SQL block to find out the largest among three numbers
2. PL/SQL block to print the multiplication table for given multiplier

Functions

3. Write a PL/SQL block to find the sum of digits of a given number.Use function
4. Write a PL/SQL block to find the factorial of a given number using a function

Cursor

5. Create a library table with fields acc no, title author and price & insert records, write a PL/SQL block to illustrate implicit cursor

Procedure

6. Create a student table with fields regno, name, maths, physics & biology and insert records. write a PL/SQL block to find the TOTAL , average & grade using procedure
7. Create an electricity bill table with fields Custcode, custname, custtype, prevreading, currreading, UNITs, costperUNIT & TOTALamount. write a PL/SQL block to find the TOTAL amount for all customers using the following condition

Cust type	Cost per Unit
1. Domestic	Rs. 3 /-
2. Office	Rs. 4/-
3. Factory	Rs. 6/-

Exception Handling

8. Write a PL/SQL block to illustrate the following predefined exceptions
   a. too_many_rows b.no_data_found
9. Create a table with fields itemno, itemname, qntyordered & qntydelivered, write a PL/SQL block using user defined exception to indicate when more items have been delivered than ordered

Triggers

10. Creating and executing triggers

Note: Questions for Internal and External examination will be based on concept learnt

Course Outcomes:

After successful completion of this course, the students will be able to

CO 1: Build DDL, DML and TCL Commands
CO 2: Make use of implementing constraints in tables
CO 3: Apply to create block structure programming language
CO 4: Create the concepts of functions.
CO 5: Develop the procedures, exceptions, triggers in PL/SQL block

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	3	3	3	3	**25**
CO2	9	1	1	3	3	3	3	**23**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	1	9	3	9	9	9	**49**
CO5	9	3	9	3	9	9	9	**51**
Total	**45**	**9**	**25**	**15**	**33**	**33**	**33**	**193**

Low-1 Medium-3 High-9

SEC III - Web Designing Lab (HTML and Scripting Language)

(For Students Admitted from 2022-23)

Semester: III **Hours/week:2**
Subject Code: IBCYS34P **Credit:2**

Course Objectives:

1. To Design web pages using various HTML tags
2. To Write simple programs in Java Script

LIST OF PROGRAMS

HTML

1. Create a HTML page to illustrate all basic tags
2. Create a HTML page to display study time table for end semester examination
3. Create a HTML page to display a menu list for bakery
4. Create a HTML page to use all stylesheets
5. Create a HTML page to demonstrate frame
6. Create a HTML page to use hyperlink for both text and image
7. Create a HTML page to demonstrate forms

JAVA SCRIPT

1. Create a HTML page to check leap year
2. Create a HTML page to convert temperature from Fahrenheit to Celsius
3. Create a HTML page to create login form
4. Create a HTML page to demonstrate validation for gmail registration
5. Build college website
6. Build website for online shopping

Note: Questions for the Internal/External examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, the students will be able to

CO1: Explain the basics of all HTML tags to create the static web page
CO2: Apply the concepts of table and list in HTML
CO3: Examine the use of style sheets, frames and hyperlinks
CO4: Evaluate the concept of validation using Javascript
CO5: Create a dynamic website

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	1	9	9	9	**55**
CO2	9	9	9	1	9	9	9	**55**
CO3	9	9	9	1	9	9	9	**55**
CO4	9	9	9	1	9	9	9	**55**
CO5	9	9	9	1	9	9	9	**55**
Total	**45**	**45**	**45**	**5**	**45**	**45**	**45**	**275**

Low-1 Medium-3 High-9

Extra Credit II– Programming in Visual Basic Lab

(For Students Admitted from 2022-23)

Semester: III
Subject Code:IBCYX3P **Credit: 2**

Course Objectives:

1. To understand the concept of visual programming
2. To create projects using event driven programming

Program List

1. Find the simple and compound interest
2. Check whether the given number is perfect or not
3. Check given number is prime or not
4. Check given number is Armstrong or not
5. Implement all date & time functions
6. Calculate the age of a person using calendar control
7. Perform all string manipulations
8. Arrange the numbers in order
9. Implement menus

Note: Questions for the External examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, the students will be able to

CO1: Demonstrate the basics in visual basic programming in terms of control statements and functions
CO2: Apply the basic concept user defined function
CO3: Enhance problem solving, programming and debugging skills
CO4: Plan to implement the menu creation
CO5: Analyze and implement the various data control

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	1	9	9	3	**43**
CO2	9	3	9	3	9	9	9	**51**
CO3	3	9	1	1	3	1	9	**27**
CO4	9	3	9	1	9	9	3	**43**
CO5	9	1	9	3	9	9	3	**43**
Total	**39**	**25**	**31**	**9**	**39**	**37**	**27**	**207**

Low-1 Medium-3 High-9

Core VII - Principles of Cyber Security

(For Students Admitted from 2022-23)

Semester: IV **Hours/week: 4**
Subject Code: IBCYC41 **Credit: 4**

Course Objective:

1. To practice with an expertise in academics to design and implement security solutions in Organizations
2. To understand key terms and concepts in Cryptography, Rootkit, Cryptology

Unit I **(12 hours)**

Introduction to Cyber security: Computer security-threats-Harm-Vulnerabilities-Control-Authentication- Access Control-Cryptography-Malicious Code-Malware-Countermeasures-The web-User side-Browser Attacks-Email Attacks.

Unit II **(12 hours)**

Security In Operating System & Networks: Security in Operating Systems - Security in the Design of Operating Systems -Rootkit - Network security attack- Threats to Network Communications - Wireless Network Security -Denial of Service - Distributed Denial-of-Service.

Unit III **(12 hours)**

Database Security: Introduction of Databases-Security Requirements in Databases-Reliabilty and Integrity- Database Disclosure-Data Mining and Big Data-Cloud Compting: Cloud Computing Concepts-Cloud Securitytools and techniques-Securing Iaas.

Unit IV **(12 hours)**

Security Planning:Security Planning-Business Continuity Planning-Handling Incidents-Risk Analysis -Legal Issues and Ethics: Protecting Programs and Data-Information and the Law-Rights of Employees and Employers-Computer Crime-Ethical Issues in Computer Security.

Unit V **(12 hours)**

Cryptography: Cryptology-Symmetric Encryption Algorithms-Message Digests-Quantum Cryptography- Emerging Topics: The Internet of Things-Economics-E-Voting-Cyber Warfare.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Classify the concept of threat, risks and security planning
CO2: Apply theoretical concepts in different security phases
CO3: Analyze security concepts needs in cloud and database
CO4: Examine the concepts and do security in database and organization
CO5: Develop policies and procedures for database and cloud security and design security architecture for anorganization

Text Book:

1. Charles P. Pfleeger, Shari Lawrence Pfleeger, Jonathan Margulies, *Security in Computing,* Pearson Education, Fifth Edition, 2015.

Reference Books:

1. MarttiLehto, PekkaNeittaanmäki, *Cyber Security: Analytics, Technology and Automation,* Springer International Publishing, 2015.
2. Nelson Phillips , EnfingerSteuart, *Computer Forensics and Investigations,* Cengage

Learning, 2009.

E-Resources:

1. https://www.springboard.com/resources/learning-paths/cybersecurity-foundations/
2. https://www.edx.org/course/cyber-security-basics-a-hands-on-approach

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	9	9	3	9	**57**
CO2	9	3	9	9	3	9	9	**51**
CO3	9	1	3	9	9	9	9	**49**
CO4	9	3	3	9	9	9	9	**51**
CO5	9	9	3	9	9	9	9	**57**
Total	**45**	**25**	**27**	**45**	**39**	**39**	**45**	**265**

Low-1 Medium-3 High-9

Core VIII - .NET Programming Lab

(For Students Admitted from 2022-23)

Semester: IV **Hours/week: 5**
Subject Code: IBCYC42P **Credit: 4**

Course Objectives:

1. To introduce .Net IDE Component Framework
2. To create website using ASP .Net Controls

List of Programs

Console Application

1. Calculate the area of a floor given its length and width
2. Calculate the factorial of a number N, assuming the number is more than zero
3. Check a given numbers(prime,perfect,Armstrong etc)
4. Generate the numbers(prime,perfect,Armstrong etc)
5. Calculate age for a person using properties
6. Sort a given list of numbers and find out the average of a list of numbers
7. Display how many days are in a given month(check for leap years also)
8. Demonstrate Events, Delegates, and Interfaces

Windows Application

1. Build a simple calculator
2. Calculate the arithmetic operations using functions
3. Do String manipulation
4. Write a function that will return a approximate count of the number of words in a string
5. Create notepad

6. Create a greeting card generator

Web Application

1. Design an E-mail application form using standard controls and store these details in SQL tables
2. Create a login page and personal webpage. Enter the username and password in the login page. If the username and password are correct, the personal web page should be loaded otherwise the error page shouldbe loaded
3. Create a student details form and validate the details using validation controls
4. Display employee details using data grid control
5. Display an Electricity bill using data list control
6. Display employee details using repeater control

Note: Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Build console applications
CO2: Perform Windows and web Applications
CO3: Demonstrate validation controls in web form
CO4: Illustrate Data Grid control to database in Web application
CO5: Compose Data Repeater and Data list Controls

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	9	3	3	9	**39**
CO2	9	3	3	9	1	1	9	**35**
CO3	3	3	3	9	1	1	9	**29**
CO4	9	1	3	9	1	1	9	**33**
CO5	9	3	1	9	1	3	9	**35**
Total	**39**	**13**	**13**	**45**	**7**	**9**	**45**	**171**

Low-1 Medium-3 High-9

SEC IV –Graphics and Animation Lab (Flash)

(For Students Admitted from 2022-23)

Semester: IV **Hours/week:2**
Subject Code: IBCYS44P **Credit: 2**

Course Objectives:

1. To understand the basic concepts of animation
2. To gain knowledge about creating animated pictures

Lab Exercises

1. Create a ball bouncing animation
2. Create a melting candle animation
3. Animate a Doll

4. Draw a bird to lay an egg and to hatch it with animation
5. Animate the working of Solar System
6. Design a running clock with animation
7. Draw a natural scenery along with the movement of bird
8. Create a moving car animation
9. Animate the life cycle of a butterfly
10. Animate the scene "Tree growing from the seed"
11. Animate the scene "Leaves falling down from the tree"
12. Illustrate the text effect animation in flash
13. Draw the multicolored fishes and animate them to jump in and out of water in the tank
14. Create a kite flying animation
15. Animate the scene of transforming a circle into a square

Note: Questions for the External examination will be based on the concepts learnt

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Recognize the uses of various tools in macromedia flash
CO2: Predict the steps that are needed to create animation
CO3: Critically analyze the required options to create animation with respect to its nature
CO4: Evaluate the use of 'Insert Motion tween'
CO5: Create animated scenes, animated logos, animated cartoon characters etc

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	3	3	9	3	**31**
CO2	9	1	9	3	3	9	3	**37**
CO3	9	1	9	3	9	9	9	**49**
CO4	9	1	3	3	9	9	9	**43**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**13**	**33**	**21**	**33**	**45**	**33**	**223**

Low-1 Medium-3 High-9

Extra Credit III - R Tool Lab

(For Students Admitted from 2022-23)

Semester: IV
Subject Code: IBCYX4P **Credit: 2**

Course Objectives:
1. To understand the concept of R Tool
2. To implement statistics analysis

Program List
1. To implement correlation analysis
2. To implement regression analysis
3. To implement t-test

4. To implement z-test
5. To implement f-test
6. To implement chi-square test
7. To implement kruskal-wallis test
8. To implement likert scaling techniques
9. To implement analysis of variance (ANOVA)

Note: Questions for External examination will be based on concepts learnt

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Demonstrate the basics in R programming in terms of constructs, control statements and functions
CO2: Apply data analytics software
CO3: Enhance problem solving, programming and debugging skills
CO4: Plan the R programming from a statistical perspective
CO5: Analyze and implement the various data structures of R

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	1	9	9	3	**43**
CO2	9	3	9	3	9	9	9	**51**
CO3	3	9	1	1	3	1	9	**27**
CO4	9	3	9	1	9	9	3	**43**
CO5	9	1	9	3	9	9	3	**43**
Total	**39**	**25**	**31**	**9**	**39**	**37**	**27**	**207**

Low-1 Medium-3 High-9

Core IX - Programming in Java

(For Students Admitted from 2022-23)

Semester: V **Hours/week: 6**
Subject Code: IBCYC51 **Credit: 5**

Course Objectives:
1. To gain knowledge about basic Java language
2. To understand the fundamentals of object-oriented programming in Java, including defining classes,objects, invoking methods etc and exception handling mechanisms

Unit I **(18 hours)**

Fundamentals of Object Oriented Programming: Introduction, object oriented paradigm- basic concepts of oops - benefits of oops- applications of OOPs. **Java Evolution**: features- java Versus C and C++ - Java and internet- java and WWW- web browsers - **Overview of Java Language:** simple Java program - more of Java – application with two classes –Java program structure -tokens –statements-implementing a Java program - Java virtual machine - command line arguments.

Unit II **(18 hours)**

Constants, Variables, Data types: Declaration of variables- giving values to variables – scope of variables-symbolic constants- type casting -getting values of variables - standard default values-**Operators and Expressions**: Arithmetic operators-Relational operators-logical operators – assignment operators – increment and decrement operators –conditional operator- bitwise operator- special operators –arithmetic expressions--evaluation of expressions-precedence of arithmetic operators-type conversion in expression –operator precedence and associativity – mathematical functions.- **Decision making and Branching**: if statement –switch-? : Operator –Decision Making and Looping: while statement -do statement – for - jumps in loops-labeled loops.

Unit III **(18 hours)**

Classes, Objects and Methods: Introduction – defining a class, field declaration–methods declaration – creating objects – accessing class members – constructors – methods overloading – static members – nesting of methods-inheritance – overriding methods – final variables and methods – final classes –finalizer methods-abstract methods and classes –visibility control – **Arrays, Strings and Vectors:** one dimensional array – creating an array –two dimensional arrays –strings –vectors –wrapper classes – **Interfaces, Multiple Inheritance**: defining interfaces – extending interfaces –implementing interfaces – accessing interface variables.

Unit IV **(18 hours)**

Packages, Putting Classes together: Introduction - java **API packages**: using system packages – naming conventions –creating packages –accessing a package –using a package – adding a class to a package–hiding classes – **Multithreaded Programming**: creating threads – extending the thread class – stopping and blocking a thread - life cycle of a thread – using thread methods – thread exceptions –thread priority –synchronization–implementing the runnable interface.

Unit V **(18 hours)**

Managing Errors and Exception: Introduction-types of errors –exceptions -syntax of exception handling code-multiple catch statements –using finally statement –throwing our own exceptions –using exceptions for debugging- **Applet Programming**: introduction –how applets differ from applications-building applet code-applet life cycle – creating an executable applet –designing a web page- applet tag- adding applet to html file-–running the applet – more about applet tags –passing parameters to Applets –aligning the display.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Remember the importance of java with its data types, control statements and class fundamentals

CO2: Apply the concepts of inheritance, method overriding and implement packages and interfaces

CO3: Analyze the concept of exception handling and multithreading

CO4: Evaluate string buffer handling functions

CO5: Create applet programming through awt controls, layout managers and menus

Text Book:

1. E. Balaguruswamy, *Programming with JAVA - A Primer*, McGraw Hill Professional, 2015.

Reference Books:

1. Herbert Schildt, *Java: The Complete Reference*, McGraw Hill Professional, 2017.
2. Robert Sedgewick& Kevin Wayne, Introduction *to Programming in Java, Addison* Wesley Publishing, 2017.
3. Y. Daniel Liang, *Introduction to Java Programming*, Brief Version Pearson Education, 2017.

E-Resources:

1. https://spoken-tutorial.org/tutorial- search/?search_foss=Java&search_language=English
2.https://onlinecourses.swayam2.ac.in/aic20_sp13/preview
3. https://spoken-tutorial.org/watch/Java/First+Java+Program/English/
4. https://onlinecourses.nptel.ac.in/noc19_cs84/preview
5. https://spoken-tutorial.org/tutorial-search/?search_foss=Java&search_language=English

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	9	9	**43**
CO2	9	3	3	1	9	9	9	**43**
CO3	9	3	3	1	9	9	9	**43**
CO4	9	3	3	1	9	9	9	**43**
CO5	9	3	3	1	9	9	9	**43**
Total	**45**	**15**	**15**	**5**	**45**	**45**	**45**	**215**

Low-1 Medium-3 High-9

Core X - Programming in Java Lab

(For Students Admitted from 2022-23)

Semester: V **Hours/week:6**
Subject Code: IBCYC52P **Credit: 5**

Course Objectives:

1. To make the students to understand programming language Java
2. To able to create programs to solve simple calculations, check whether the given number is prime, perfect or armstrong, etc

Program List

Formula Substitution

1. Find the factorial and binomial coefficient
2. Calculate mean, variance and standard deviation
3. Develop the programs forNumber conversions

Checking

4. Develop the programs for Number checking (prime, perfect, etc.)

Generation

5. Develop the programs forNumber generation(prime, perfect, etc.)

Array

6. Arrange numbers and names in order
7. Develop the program for performing matrix addition, subtraction, multiplication & transpose

Searching

8. Develop the programs for implementing linear search and binary search

String

9. Develop the programs for doing String manipulation (case conversion, reversing, etc.)

OOP Concepts

10. Develop the programs for implementing inheritance concepts
11. Develop the programs for implementing exception handling
12. Develop the programs for implementing multithreading

Applet

13. Develop the programs to handle keyboard and mouse events
14. Develop the programs for handling window events
15. Simulate a calculator (arithmetic operations) using GUI components

Note: Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Outline Java programs that solve simple Mathematical problems, number checking and number generation

CO2: Demonstrate the concepts of String Manipulation, Linear Search and Binary Search.

CO3: Illustrate OOP concepts in Java programming like inheritance

CO4: Evaluate the multi-threaded programs

CO5: Develop Exception handling and GUI components

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	3	9	**39**
CO2	9	3	3	3	9	3	9	**39**
CO3	9	9	3	9	9	9	9	**57**
CO4	9	9	9	9	9	9	9	**63**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**33**	**27**	**33**	**45**	**33**	**45**	**261**

Low-1 Medium-3 High-9

Core XI - Ethical Hacking

(For Students Admitted from 2022-23)

Semester: V **Hours/week:6**

Subject Code: IBCYC53 **Credit: 5**

Course Objectives:

1. To understand the issues related to ethical Hacking
2. To understand foot Printing and Hacking Web Servers

Unit I **(18 hours)**

Ethical Hacking Overview: Introduction to Ethical Hacking-What you can do legally- What you cannot do legally -**TCP/IP Overview**: Overview of TCP/IP-Addressing-Overview of Numbering Systems - **Network and Computer Attacks**: Malicious Software-Intruder Attacks on Networks and Computers-Addressing physical security.

Unit II **(18 hours)**

Foot printing and Social Engineering: Using Web Tools for Foot printing-Conductive Competitive Intelligence-Using Domain Name System Zone Transfers-Introduction of Social Engineering. **Port Scanning**: Introduction to Port Scanning-Using Port Scanning Tools-Conducting Ping Sweeps-Understanding Scripting.

Unit III **(18 hours)**

Enumeration: Introduction to Enumeration-Enumerating Windows Operating System-Enumerating the unix Operating System. **Programming for Security Professionals**: Anatomy of a C Program-Understanding the HTML Basics-Understanding Perl.

Unit IV **(18 hours)**

Hacking Web Servers: Understanding Web Applications-Understanding web Application Vulnerabilities-Tools for Web Attackers and Security Testers. **Hacking Wireless Networks:** Wireless Technology-Wireless Network Standards-Understanding Authentication-Understanding War driving-Understanding Wireless Hacking.

Unit V **(18 hours)**

Cryptography: Cryptography Basics-Understanding Symmetric and Asymmetric Algorithms-Understanding Public Key Infrastructure. **Network Protection Systems**: Understanding Routers-Understanding Firewalls.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Summarize the concepts and terminologies used in ethical hacking and enumeration

CO2: Identify security threats and develop a security tools to prevent and find the hacking technology

CO3: Examine the programming languages and tools for security professionals

CO4: Importance of web servers and networks in hacking

CO5: Design and develop algorithms and firewall for hacking

Text Book:

1.Michael T. Simpson, Kent Backman, James E. Corley, *Hands-On Ethical Hacking and Network Defense*,Cengage Learning, 2013.

Reference Books:

1. Ec-Council, *Ethical Hacking and Countermeasures: Attack Phases*, Delmar Cengage Learning, 2009.
2. Kimberly Graves,*Certified Ethical HackerStudy Guide*, Wiley Publishing .

E-Resources:

1. https://www.udemy.com/topic/ethical-hacking/
2. https://www.coursera.org/courses?query=ethical%20hacking

3. https://www.hackerone.com/ethical-hacker/useful-online-resources-new-hackers
4. https://www.eccouncil.org/ethical-hacking/

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	3	3	9	3	9	9	45
CO2	9	3	3	3	9	9	9	45
CO3	9	3	9	9	3	9	9	51
CO4	9	3	9	3	9	9	9	51
CO5	9	3	9	9	9	9	9	57
Total	45	15	33	33	33	45	45	249

Low-1 Medium-3 High-9

DSE I - a) Mobile Computing

(For Students Admitted from 2022-23)

Semester: V **Hours/week: 4**
Subject Code: IBCYE5A **Credit: 4**

Course Objectives:

1. To define mobile technologies in terms of hardware, software, and communications
2. To evaluate the effectiveness of different mobile computing frameworks

Unit I **(12 hours)**

Introduction: Mobile Computing- Middleware and Gateways-Developing Mobile Computing Applications- Security in Mobile Computing – **Architecture of Mobile Computing**-Three-Tier Architecture-Design Consideration for Mobile Computing-Mobile Computing through Internet- Mobile Computing through Telephone-Developing an IVRApplications.

Unit II **(12 hours)**

Bluetooth and GSM: Bluetooth- Features and working of RFID -Wireless Broadband (WiMAX)- Mobile IP-IPV6- IPV4 Vs IPV6 –Global System for Mobile Communications – GSM Architecture – Call Routing in GSM – GSM Addresses and Identifiers – Network Aspects in GSM – GSM Frequency Allocation – Authentication and Security- Mobile Computing Over SMS – SMS- Value Added Services throughSMS.

Unit III **(12 hours)**

GPRS, 3G and 4G Networks: GPRS and Packet Data Network – GPRS Network Architecture – GPRS Network Operations – Data Services in GPRS- Applications for GPRS – Limitations of GPRS- Spread Spectrum Technology- CDMA Versus GSM – Features of 3G Networks –Architecture of 3G- Applications of 3G - Features of 4G- Architecture of 4G - Wireless Technologies Used in 4G- Merits and Demerits of 4G.

Unit IV **(12 hours)**

Mobile Ad-hoc Networks: MOBILE Ad-Hoc Basic Concepts – Characteristics – Applications – Design Issues-Routing – Essential of Traditional Routing Protocols –Popular Routing Protocols – Vehicular Ad HocNetworks (VANET) – MANET Vs VANET –

Security of VANET and MANET - **Open Source Tools for Mobile Testing**: Appium - Katalon Studio – Monkey Talk – IOS Driver – Robotium Calabash.

Unit V **(12 hours)**

Overview of Kotlin-Installation of Android Studio-Getting started with Hello World app-Creating a Registration form-Adding Radio Buttons-Adding spinner and Image-Creating a search App-URL Request- Display Search Result-Playing video using YouTube API.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the principles of mobile technologies like GPRS, GSM, CDMA and TDMA and the concepts of Bluetooth and GSM, Mobile Ad-hoc networks

CO2: Apply the features of Android programming for developing Android Applications

CO3: Analyze technology of 1G, 2G, 3G and 4G for gaining the working knowledge of four generation Wireless technologies and Analyze the architecture, merits and demerits of Wireless technologies like Infra-Red, blue tooth, Wi-Fi, RFID and Wi-Max

CO4: Compare the characteristics and techniques MANET with VANET

CO5: Derive wireless communication systems with 3G and 4G technologies

Text Books:

1. Asoke K. Talukder, Hasan Ahmed, Roopa R Yavagal, *and Mobile Computing: Technology, Applications, And Service Creation*, Tata McGraw Hill, 2017.
2. Stefano Basagni, Marco Conti , Silvia Giordano , Ivan IvanStojmenovic, *Mobile Ad Hoc Networking:Cutting Edge Directions*, Wiley-IEEE Press, 2015.

Reference Books:

1. Sunilkumar S. Manvi, Mahabaleshwar S. Kakkasageri, *Wireless and Mobile Networks Concepts and Protocols*, Wiley Publications, 2016.
2. James C. Sheusi, Android Application Development for Java Programmers, Cengage Learning, 2013.
3. Peter Spath , *Learn Kotlin for Android Development*, A Press Publications,2019.
4. Charles E.Perkins, *Ad Hoc Networking*, Addison-WesleyPublications, 2008.

E-Resources:

1.www.cse.iitk.ac.in/users/rkg/Talks/mobile_main.pdf
2.pl.cs.jhu.edu/oose/resources/android/Android-Tutorial.pdf
3.SWAYAM:https://swayam.gov.in/nd1_noc19_ee48/preview
4.SWAYAM:https://onlinecourses.swayam2.ac.in/aic20_sp02/preview
5.http://172.16.25.76/course/view.php?id=2224
6. https://spoken-tutorial.org/tutorial- search/?search_foss=Android+app+using+Kotlin &search_language=English

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	1	9	9	9	**55**

CO2	9	9	9	1	9	9	9	**55**
CO3	9	9	9	1	9	9	9	**55**
CO4	9	9	9	1	9	9	9	**55**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**45**	**45**	**13**	**45**	**45**	**45**	**283**

Low – 1 Medium – 3 High – 9

DSE I - b) Malware Analysis

(For Students Admitted from 2022-23)

Semester: V **Hours/week: 4**
Subject Code: IBCYE5B **Credit: 4**

Course Objectives:

1. To gain insight about the practical learning of malware analysis
2. To develop simple android based malware

Unit I **(12 hours)**

Introduction: Introduction to malware analysis, OS security concepts, malware threats, evolution of malware,malware types viruses, worms, rootkits, Trojans, bots, spyware, adware, logic bombs, malware analysis, staticmalware analysis, dynamic malware analysis**.**

Unit II **(12 hours)**

Static Analysis: Determining the file type- Fingerprinting the malware-Multiple Anti-virus scanning- Extracting strings-Determining file obfuscation- Inspecting PE header information-Comparing and Classifyingthe malware.

Unit III **(12 hours)**

Dynamic Analysis: Lab environment overview- System and network monitoring- Dynamic analysis tools- Dynamic analysis steps-Dynamic link library analysis- Debugging malicious binaries-General debugging concepts- Debugging a binary using x64dbg-Debugging a binary using IDA- Debugging a binary using .NETapplication.

Unit IV **(12 hours)**

Malware Functionality: Downloader, Dropper, Keylogger, Credential Stealers, Persistence Mechanisms, Privilege Escalation, Covert malware launching- Launchers, Process Injection, Process Replacement, Hook Injection, Detours, APC injection- **Malware Detection Techniques: Signature-based techniques:** malware signatures, packed malware signature, metamorphic and polymorphic malware signature - **Non-signature-based techniques**: similarity-based techniques, machine-learning methods, invariant inferences.

Unit V **(12 hours)**

Android Malware: Malware Characterization, Case Studies – Plankton, DroidKungFu, AnserverBot, Smartphone (Apps) Security- Introduction to the Android Operating System and Threats-Malware Threats, Hoaxes, and Taxonomy-Open Source Tools.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the skills necessary to carry out independent analysis of modern malware samples using bothstatic and dynamic analysis techniques
CO2: Illustrate the executable formats Windows and API, and analysis techniques
CO3: Analyze investigative leads from host and network based indicators associated with a maliciousprogram
CO4: Create malware detection techniques in future malware samples
CO5: Compose dynamic malware analysis

Text Books:
1. Monnappa K A, *Learning Malware Analysis*, Packt Publishing, 2018.
2. Michael Sikorski, *Practical Malware Analysis – The Hands–On Guide to Dissecting Malicious Software,* No Starch Press, First Edition, 2012.

Reference Books:
1. Victor Marak, *Windows Malware Analysis Essentials*, Packt Publishing, 2015.
2. KenDunham, *Android Malware and Analysis*, CRC Press, 2015.

E-Resources:
1.https://www.hackingtutorials.org/category/malware-analysis-tutorials/
2.https://ethicalhackingguru.com/the-complete-malware- analysis-tutorial/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	1	3	3	9	3	1	1	**21**
CO2	9	3	9	9	3	9	3	**45**
CO3	9	9	9	3	1	9	9	**49**
CO4	9	3	9	9	3	9	3	**45**
CO5	3	3	9	1	1	1	9	**27**
Total	**31**	**21**	**39**	**31**	**11**	**29**	**25**	**187**

Low-1 Medium-3 High-9

DSE II - a) Operating System Security

(For Students Admitted from 2022-23)

Semester: V **Hours/week: 4**
Subject Code: IBCYE5C **Credit: 4**

Course Objectives:
1.To gain insight about the architecture and enabling technologies of operating system
2.To develop simple OS applications for different domains

Unit I **(12 hours)**

Introduction to OS: Operating System Structure- Layered structure, System Components, Operating system functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems - Multiuser Systems - Multi process Systems, Multithreaded Systems, OperatingSystem services, Re-entrant Kernels, Monolithic

and Microkernel Systems.

Unit II **(12 hours)**

Concurrent Processes: Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation, Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem, Inter Process Communication models and Schemes, Process generation.

Unit III **(12 hours)**

CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. **Deadlock:** System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.

Unit IV **(12 hours)**

Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.

Unit V **(12 hours)**

Understanding OS Security: Threats and Security Controls – System and network threats-Intrusion Detection and prevention –Malwares and Related Threats – DOS Attacks Firewalls – Firewall Types-Configuration and Implementation - Firewall Forensics - Services and Limitations- Testing and validating operating system security – Improving operating system security - Implementing security defenses-Firewalling to protect systems and networks-Computer security classifications- Cryptography as a security tool

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain main components, services, types and structure of operating systems.

CO2: Perform the various algorithms and techniques to handle the various concurrency control issues.

CO3: Compare and contrast various CPU scheduling algorithms for process execution.

CO4: Select occurrence of deadlock and justify ways to handle it.

CO5: Derive network threats and its possible security measures are designed.

Text Books:

1.Abraham Silberschatz, Peter B. Galvin, Greg Gagne, *Operating Systems Concepts*,Wiley Publication, 2018

2.SibsankarHalder and Alex A Arvind, *Operating Systems*, Pearson Education ,2015

3.William Stallings, *Cryptography And Network Security* – Principles and Practices, Pearson Education, Sixth Edition,2013

Reference Books:

1.Keith Martin, *Everyday Cryptography: Fundamental Principles and Applications*, Second

Edition, Oxford, 2017
2.Joseph MiggaKizza, *Guide to Computer Network Security*, Second Edition, Springer, 2010

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	1	9	1	3	1	9	3	**27**
CO2	3	1	3	3	1	9	3	**23**
CO3	9	9	9	3	1	1	1	**33**
CO4	3	1	3	3	3	1	1	**15**
CO5	3	1	9	9	3	1	3	**29**
Total	**19**	**21**	**25**	**21**	**9**	**21**	**11**	**127**

Low-1 Medium-3 High-9

DSE II - b) Cyber Forensics

(For Students Admitted from 2022-23)

Semester:V **Hours/week: 4**
Subject Code: IBCYE5D **Credit: 4**

Course Objectives:

1. To understand the cyber forensics concepts
2. To gain knowledge in identifying digital evidence

Unit I **(12 hours)**

Understanding the Digital Forensics Profession and Investigations: An Overview of Digital Forensics- Preparing for Digital Investigations- Maintaining Professional Conduct- Preparing a Digital Forensics Investigation- Understanding Data Recovery Workstations and Software- Conducting an Investigation. **The Investigator's Office and Laboratory**: Understanding Forensics Lab Accreditation Requirements- Determining the Physical Requirements for a Digital Forensics Lab.

Unit II **(12 hours)**

Data Acquisition- Understanding Storage Formats for Digital Evidence- Determining the Best Acquisition Method- Contingency Planning for Image Acquisitions- Validating Data Acquisitions- Performing RAID DataAcquisitions- Using Other Forensics Acquisition Tools. **Processing Crime and Incident Scenes**: Identifying Digital Evidence- Collecting Evidence in Private-Sector Incident Scenes.

Unit III **(12 hours)**

Working with Windows and CLI Systems - Understanding File Systems- Exploring Microsoft File Structures- Examining NTFS Disks- Understanding the Windows Registry- Understanding Microsoft Startup Tasks. **Current Digital Forensics Tools**: Digital Forensics Software Tools- Digital Forensics Hardware Tools- Validating and Testing Forensics Software. **Linux and Macintosh File Systems:** Understanding Macintosh FileStructures.

Unit IV **(12 hours)**

Digital Forensics Analysis and Validation: Determining what data to collect and analyze- Validating Forensic data. **E-mail and Social Media Investigations**: Investigating E-mail

Crimes and Violations- Understanding E- mail Servers- Using Specialized E-mail Forensics Tools. **Mobile device Forensics and The Internet of Anything**: Understanding Mobile Device Forensics- Understanding Acquisition Procedures for Mobile Devices.

Unit V **(12 hours)**

Cloud Forensics: Legal Challenges in Cloud Forensics- Technical Challenges in Cloud Forensics- **Report Writing for High-Tech Investigations**: Understanding the Importance of Reports- Guidelines for Writing Reports - Generating Report Findings with Forensics Software Tools.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain investigation tools and techniques, analysis of data
CO2: Present evidence, Technical Aspects & Legal Aspects related to cyber crime.
CO3: Associate to maintain digital evidence
CO4: Support to solve social media and email crimes
CO5: Generate forensic reports with forensic software tools

Text Book:

1. Bill Nelson, Amelia Phillips, Chris Steuart, *Guide to Computer Forensics and Investigations,* Cengage Learning, Sixth Edition, 2019.

Reference Books:

1. John R.Vacca, *Computer Forensics: Computer Crime Scene Investigation,* Charles River Media, 2002.
2. Richard E.Smith, *Internet Cryptography* ,Pearson Education, Third Edition, 2008.
3. Kevin Mandia, Chris Prosise, *Incident Response and Computer Forensics*, Tata Mcgraw Hill Publishing, 2006.

E-Resources:

1. https://onlinecourses.swayam2.ac.in/cec22_ge09/preview
2. Https://Www.Coursera.Org/Lecture/Digital-Forensics-Concepts/Computer-Forensics-And-The- Role-Of-The- examiner-YlX8a
3. https://www.coursera.org/lecture/digital-forensics-concepts/collection-of-digital-evidence NuaX7
4. https://www.hackingarticles.in/best-of-computer-forensics-tutorials
5. https://www.tutorialspoint.com/python_digital_forensics/python_digital_forensics_tutorial.pdf

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	1	3	9	9	**49**
CO2	9	9	9	9	9	9	3	**57**
CO3	9	3	9	9	9	9	9	**57**
CO4	9	9	9	9	3	9	9	**57**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**39**	**45**	**37**	**33**	**45**	**39**	**283**

Low-1 Medium-3 High-9

SEC V – PHP Programming Lab

(For Students Admitted from 2022-23)

Semester: V **Hours/week: 2**
Subject Code: IBCYS54P **Credit: 2**

Course Objectives:

1. To understand the concepts of regular expressions including modifiers, operators and meta characters
2. To develop PHP programs that use various PHP library functions and that manipulate files and directories

List of Programs

1. Develop a PHP program to print Sum of digits.
2. Develop a PHP program to print factorial of a number.
3. Develop a PHP program to display count, from 10 to 20 using loop.
4. Develop a PHP program to print prime number.
5. Develop a PHP program to check Armstrong number.
6. Develop a PHP program to check Palindrome number.
7. Develop a PHP program to swap two numbers with and without using third variable.
8. Develop a PHP program to find if the given year is leap year or not.
9. Develop a PHP program to reverse the number with strrev ().
10. Develop a PHP program to show day of the week (for eg: Monday) based on numbers usingSwitch/case statements
11. Develop a PHP program to print number triangle
12. Develop a PHP program to print alphabet triangle
13. Develop a PHP program to check student grade based on the marks using if-else statement
14. Develop a PHP program Using nested for loop that creates a chess board

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe the fundamentals of PHP language in trivial problem solving
CO2: Determine solution to a problem and apply control structures
CO3: Simplify the use of strings and string handling functions
CO4: Justify real time applications using PHP language features
CO5: Build skill on problem solving by constructing algorithms

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	9	1	1	**25**
CO2	9	3	3	3	9	3	3	**33**
CO3	9	3	1	3	9	9	3	**37**
CO4	9	3	3	3	9	9	3	**39**

CO5	9	3	3	3	9	9	3	**39**
Total	**45**	**15**	**11**	**13**	**45**	**31**	**13**	**173**

Low-1 Medium-3 High-9

Core XII - Wireless Security

(For Students Admitted from 2022-23)

Semester: VI **Hours/week: 6**

Subject Code: IBCYC61 **Credit: 4**

Course Objectives:

1. To comprehend the fundamental concepts of mobile and wireless network security
2. To identify security threats in wireless networks and design strategies to manage network Security

Unit I **(18 hours)**

Security Issues in Mobile Communication: Mobile Communication History, Security- Wired Vs Wireless, Security Issues in Wireless and Mobile Communications, Security Requirements in Wireless and Mobile Communications, Security for Mobile Applications, Advantages and Disadvantages of Application –level Security- Importance of Authentication and Authorization- Challenges of Cybersecurity.

Unit II **(18 hours)**

Security of Device, Network, and Server Levels: Basic cyber security concepts- How to write a security policy- IT staff and end user education- Physical security implementation-Client traffic analytics-Perimeter security implementation-Password management-how to eliminate unnecessary services-Data in transit security-Data Backup solutions-Wireless technology fundamentals-Wireless security policy basics-How to create or refine wireless policies.

Unit III **(18 hours)**

Application Level Security in Cellular Networks: Generations of Cellular Networks, Security Issues and attacks in cellular networks, GSM Security for applications, GPRS Security for applications, UMTS security for applications, 3G security for applications, Some of Security and authentication Solutions. **802.11 dedicated architectures**: Introduction, Adhoc networks (hotspot), Wireless Intrusion Detection System (WIDS), Honeypots - Understanding 5G networks.

Unit IV **(18 hours)**

Application Level Security in MANETs: MANETs, Some applications of MANETs, MANET Features, Security Challenges in MANETs, Security Attacks on MANETs, External Threats for MANET applications, Internal threats for MANET Applications, Some of the Security Solutions. Ubiquitous Computing, Need for Novel Security Schemes for UC, SecurityChallenges for UC, and Security Attacks on UC networks, some of the security solutions for UC.

Unit V **(18 hours)**

Wireless Security: Wireless networks Attacks – Active, passive attacks, DoS attacks, TCP, Trojan and Dictionary Attacks, Security risks in IEEE 802.11 standards, Security in 802.1x, 802.11i- **WiMAX and LTE Security**: Introduction, WiMAX architecture and OFDM,

Security risks involved in 802.16-2004, Security risks involved in 802.16e Security in GSM, UMTS, GPRS, VoIP security, LTE security.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Illustrate with the issues and technologies involved in designing a wireless and mobile system that is robust against various attacks

CO2: Determine of the various ways in which wireless networks can be attacked and trade-offs in protecting networks

CO3: Simplify the state-of-the-art and open problems in wireless and mobile security, thus enhancing their potential to do research or pursue a career in this rapidly developing area.

CO4: Build various security issues related to GPRS, 3G and 5G

CO5: Invent various security issues involved in WiMAX and LTE

Text Books:

1. Hugo Hoffman, *Ethical Hacking Bible: Cybersecurity, Cryptography, Network Security, WirelessTechnology and Wireless Hacking with Kali Linux, 2020*.
2. M. Au, R. Choo and G. Kessler, *Mobile security and privacy*, Cambridge, MA: Syngress, 2017.

Reference Books:

1. PallapaVenkataram, SatishBabu, *Wireless and Mobile Network Security,* , Tata McGraw Hill Publishing Company , First Edition , 2010.
2. Frank Adelstein, K.S.Gupta, Fundamentals *of Mobile and Pervasive Computing*, TataMcGraw Hill Publishing Company, First Edition, 2005.
3. Randall k. Nichols, Panos C. Lekkas ,*Wireless Security Models, Threats and Solutions*, Tata McGraw Hill Publishing Company, First Edition, 2006.
4. Bruce Potter and Bob Fleck, 802.11 *Security*, O'REILLY Media, First Edition, 2005.
5. J. Joshi, *Network Security*. New York: Elsevier, 2009.
6. J. Harrington, *Network security*. Morgan Kaufmann Publishers, 2005.

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc21_cs16/preview
2. https://onlinecourses.nptel.ac.in/noc21_cs16/preview
3. https://blog.rsisecurity.com/what-is-the-mobile-security-framework/
4. https://wimaxforum.org/
5. https://www.coursera.org/lecture/security-awareness-training/mobile-devices-andsecurity-EMjmM
6. https://www.w3schools.in/cyber-security/wireless-security/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	9	9	3	9	**45**
CO2	3	3	3	9	1	3	3	**25**
CO3	3	1	9	9	3	1	3	**29**
CO4	9	3	9	3	3	3	3	**33**

CO5	9	3	9	3	3	3	3	**33**
Total	**33**	**13**	**33**	**33**	**19**	**13**	**21**	**165**

Low-1 Medium-3 High-9

Core XIII - Cyber Law

(For Students Admitted from 2022-23)

Semester: VI **Hours/Week: 5**
Subject Code: IBCYC62 **Credit: 4**

Course Objectives:

1. To understand the cyber world and cyber laws in general
2. To clarify the intellectual property issues in the cyber space and the growth and development of the law inthis regard

Unit I **(15 hours)**

Introduction: Basic Concepts– Internet and Advantages and Disadvantages of Internet Technology- Networkand Network Security-Cyber Space and Netizen.

Unit II **(15 hours)**

Cyber Law & Components of Cyber Law: Cyber Law in India - An Overview of Information Technology Act, 2000 - Cryptography, Encryption Technique & Algorithm and Digital Signature & Electronic Signature.

Unit III **(15 hours)**

E-Governance: E-Commerce- E-Governance- E-Record & E-Contract-Regulator Certifying Authority- Electronic Signature Certificates – Subscriber.

Unit IV **(15 hours)**

Cyber Crimes: Cyber Contraventions - Cyber Offences- Power of Investigation & Search - Power of Investigation & Search - E-Evidence and Computer Forensic - Grey Areas of Information Technology Act, 2000- Cyber Jurisdiction.

Unit V **(15 hours)**

Intellectual Property Rights (IPRs): Copyright Issues and Digital Medium- Patent Issues in Digital Medium- Domain Name Dispute & Resolution and Trademark Issues in Digital Medium- Spamming and Phishing.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Summarize the concepts of cyber security and cyberlaws
CO2: Demonstrate the strategies for cyber security
CO3: Analyze the problems arising out of online transactions and provoke them to find Solutions
CO4: Evaluate the intellectual property issues in the cyberspace and the growth and development of the laws
CO5: Analyze the problems arising out of online transactions and provoke them to find solutions

Text Book:

1. Justice Yatindra Singh , *Cyber Laws Paperback – 1* , Universal Law Publishing, 2016.

Reference Books:

1. Bhansali, *Information Technology Act, 2000*, University Book House, 2003.
2. Julie Yen, Summer Fellow, I*ntellectual Property And Cyberlaw* ,Cambridge, 2013.

E- Resources:

1. https://www.researchgate.net/publication/301894978_CYBER_LAW_AND_INFORMATION_SECURITY
2. https://taxguru.in/wp-content/uploads/2012/10/cyber-laws-overview.pdf
3. NPTEL: https://nptel.ac.in/courses/106/106/106106129/
4. NPTEL: https://nptel.ac.in/courses/110/105/110105139/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	9	1	3	**27**
CO2	9	3	1	1	9	1	1	**25**
CO3	9	1	3	3	9	3	3	**31**
CO4	9	3	3	3	9	3	3	**33**
CO5	9	3	3	3	9	9	3	**39**
Total	**45**	**13**	**11**	**11**	**45**	**17**	**13**	**155**

Low-1 Medium-3 High-9

Core XIV-Cryptography and Network Security

(For Students Admitted from 2022-23)

Semester: VI **Hours/week: 6**
Subject Code: IBCYC63 **Credit: 5**

Course Objectives:

1. To understand basics of cryptography and network security
2. To learn about how to maitain the confidentiality, integrity and availability of a data

Unit I **(18 hours)**

Computer and Network Security concept: Computer security concepts-The OSI security Architecture-Security Attacks- Security Services-Security Mechanisms. **Number Theory**: The Euclidean Algorithm-Modular Arithmetic-Prime Numbers- Fermat's Euler's Theorem-Discrete Logarithms.

Unit II **(18 hours)**

Symmetric Ciphers: Classical Encryption Techniques: Symmetric Chippers Model-Substitution Techniques- Transposition Techniques-Traditional Block Cipher Structure-Block Cipher Design Principles. **Finite Fields**: Groups-Rings-Fields-Finite Fields of the FormGF(p).

Unit III **(18 hours)**

Advanced Encryption Standard: Finite Field Arithmetic-AES Structure-AES Tranformation Functions-AES Key Expansion. **Asymmetric Ciphers** : Principles of public – key cryptosystems-The RSA Algorithm.

Unit IV **(18 hours)**

Other Public-Key Cryptosystem: Diffie-Hellman Key Exchange-Elgmal cryptographic system-Elliptic curve arithmetic- Elliptic curve Crptography. **Digital Signature**:Digital signature-Elgmal Digital Signature Scheme- Schnorr Digital Scheme-NIST Digital signature algorithm.

Unit V **(18 hours)**

Wireless Network Security: Wireless Security-Mobile Device Security-IEEE802.11 Wireless LAN Overview- IEEE802.11 Wireless LAN Security. **Electronic Mail Security**: Internet Mail Architecture-Email Formats- Email Threats and compressive Email Security-S/MIME – DNSSEC-Sender policy Framework-Domain KeysIdentify Mail.

Text Book:

1.William Stallings, *Cryptography and Network Security Principles and Practice*, Pearson Education ,Seventh Edition, 2017.

Reference Books:

1. Wade Trappe, Lawrence C Washington, *Introduction to Cryptography with coding theory*, Pearson Education, Second Edition, 2007.
2. William Stallings, *Cryptography and Network security Principles and Practice*, Pearson Education, Fourth Edition,2006.
3.W. Mao, *Modern Cryptography – Theory and Practice*, Pearson Education, Second Edition, 2007.

E- Resource:

1.NPTEL: https://nptel.ac.in/courses/106/105/106105162/

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Compare various cryptographic techniques
CO2: Apply various data encryption techniques
CO3: Classify the encryption standard and asymmetric ciphers
CO4: Implement hashing and digital signature techniques
CO5: Explain the various security application

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	3	9	3	9	**45**
CO2	9	9	3	9	9	3	9	**51**
CO3	3	9	3	9	9	3	9	**45**
CO4	9	9	3	3	9	3	9	**45**
CO5	9	9	3	9	9	3	9	**51**
Total	**39**	**45**	**15**	**33**	**45**	**15**	**45**	**237**

Low-1 Medium-3 High-9

Core XV – Project

(For Students Admitted from 2022-23)

Semester: VI **Hours/Week: 6**
Subject Code: IBCYC64PW **Credit: 5**

Course Objectives:

1. To impart the students to implement project by collecting the data and selecting the software tool
2. To enhance the students to select the programming language for implementing the project

Project shall be a group project (group consisting of maximum of two members)

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Identify goals, constraints, deliverables, performance criteria and resource requirements in consultationwith stakeholders
CO2: Apply the plan by executing the code
CO3: Illustrate the various aspects of software development for the total project
CO4: Evaluate the entire software project according to the specific problem
CO5: Develop the software project by executing with the various data

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	9	9	3	9	**57**
CO2	9	3	9	3	9	9	9	**51**
CO3	9	3	9	9	9	9	9	**57**
CO4	9	3	9	9	9	9	9	**57**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**27**	**45**	**39**	**45**	**39**	**45**	**285**

Low-1 Medium-3 High-9

DSE III - a) Cloud Computing and Security

(For Students Admitted from 2022-23)

Semester: VI **Hours/week: 4**
Subject Code: IBCYE6A **Credit: 4**

Course Objectives:

1. To identify the technical foundations of cloud systems architectures
2. To apply principles of best practice in cloud application design and management

Unit I **(12 hours)**

Cloud Computing Essentials - Introduction to cloud computing -Characteristics of Cloud computing - Cloud computing models - Cloud services and technologies. Overview of Cloud Computing – Introduction - Cloud computing elements - Essential characteristics - Cloud

services - Cloud deployment models - Nist cloud computing reference architecture - ITU-T Cloud computing reference architecture - **Network requirements for cloud computing**. Cloud Security Baselines - Introduction - An overview of computer security - Vulnerabilities and attacks - Privacy and security in cloud storage services - Privacy and security in multiclouds - Cloud accountability.

Unit II **(12 hours)**

Cloud Security, Privacy, and Trust Baselines – Introduction - Understanding the threats - Classification and countermeasures - Threats assessment - Trusting the cloud Infrastructure as a Service (IaaS) - Contextual considerations - Components of a cloud infrastructure. **Risk and Trust Assessment** – Introduction - risk analysis, assessment, and management - Top threats for the cloud - Cloud risk assessment - Risk and trust models for the cloud.

Unit III **(12 hours)**

Managing Risk in the Cloud – Introduction - The risk management framework - Cloud provider's risk management process - Cloud consumer's risk management process. **Cloud Security Risk Management** – Introduction – Introduction of risk - Definitions of risk - Risk and cloud - Cloud computing risk assessment and management.

Unit IV **(12 hours)**

Secure Cloud Risk Management – Introduction - What are my risks? - Cloud acronyms - What makes cloud risks more or less risky? - What are the rewards? **Cryptographic Key Management for Data Protection** – Introduction – Background - Key management lifecycle - Key management system design choices - Drivers for cloud key management design - Cloud key management challenges - Cloud key management strategies.

Unit V **(12 hours)**

Cloud Security Access Control – Introduction - Layers of security needs - Improvement at all levels – Multilevel authentication – Encryption - Password management - Distributed servers. **Advanced Security Architectures for Cloud Computing** – Introduction - Public cloud security - Public cloud architecture - Advanced security architectures.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Recall the components of cloud computing showing how business agility in an organization can becreated

CO2: Determine the deployment of web services from cloud architecture

CO3: Categorize the consistency of services deployed from a cloud architecture

CO4: Compare and contrast the economic benefits delivered by various cloud models based on applicationrequirements, economic constraints and business requirements

CO5: Generate case studies to derive the best practice model to apply when developing and deploying cloudbased applications

Text Book:

1. John R Vacca, *Cloud computing security: foundations and challenges,* CRC Press, Second Edition, 2021.

Reference Books:

1.Gautam Shroff, *Enterprise Cloud Computing Technology Architecture Applications,*

CambridgeUniversity Press,First Edition, 2010.
2. TobyVelte, Anthony Velte, Robert Elsenpeter, Cloud Computing, A Practical Approach, McGraw-Hill Publishing Company, First Edition, 2009.
3. Dimitris N. Chorafas, *Cloud Computing Strategies*, CRC Press, 2010.

E-Resources:

1. https://spoken-tutorial.org/tutorial-search/?search_foss=Java&search_language=English
2.NPTEL: https://nptel.ac.in/courses/106/105/106105167/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	3	9	3	9	**45**
CO2	9	9	3	9	9	3	9	**51**
CO3	3	9	3	9	9	3	9	**45**
CO4	9	9	3	3	9	3	9	**45**
CO5	9	9	3	9	9	3	9	**51**
Total	**39**	**45**	**15**	**33**	**45**	**1**	**45**	**237**

Low-1 Medium-3 High-9

DSE III - b) Intellectual Property Rights

(For Students Admitted from 2022-23)

Semester: VI **Hours/week: 4**
Subject Code: IBCYE6B **Credit: 4**

Course Objectives

1. To recognize the importance of IP and to educate the pupils on basic concepts of Intellectual Property Rights
2. To identify the significance of practice and procedure of patents and to make the students to understand the statutory provisions of different forms of IPRs in simple forms

Unit I **(12 hours)**

Overview of Intellectual Property : Introduction and the need for intellectual property right (IPR)-Kinds of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varieties and Layout Design-Genetic Resources and Traditional Knowledge-Trade Secret - **IPR in India** : Genesis and development – IPR in abroad-Major International Instruments concerning Intellectual Property Rights: Paris Convention, 1883, the Berne Convention, 1886, the Universal Copyright Convention, 1952, the WIPO Convention, 1967,the Patent Co-operation Treaty, 1970, the TRIPS Agreement, 1994.

Unit II **(12 hours)**

Patents : Elements of Patentability: Novelty , Non Obviousness (Inventive Steps), Industrial Application – Non Patentable Subject Matter - Registration Procedure, Rights and Duties of Patentee, Assignment and licence ,Restoration of lapsed Patents, Surrender and Revocation

of Patents, Infringement, Remedies & Penalties - Patent office and Appellate Board.

Unit III **(12 hours)**

Copyrights: Nature of Copyright - Subject matter of copyright: original literary, dramatic, musical, artistic works; cinematograph films and sound recordings - Registration Procedure, Term of protection, Ownership of copyright, Assignment and licence of copyright - Infringement, Remedies & Penalties – Related Rights - Distinction between related rights and copyrights.

Unit IV **(12 hours)**

Trademarks: Concept of Trademarks - Different kinds of marks (brand names, logos, signatures, symbols, well known marks, certification marks and service marks) - Non Registrable Trademarks - Registration of Trademarks - Rights of holder and assignment and licensing of marks - Infringement, Remedies & Penalties -Trademarks registry and appellate board. **Current Contour :** India`s New National IP Policy, 2016 – Govt. of India step towards promoting IPR – Govt. Schemes in IPR – Career Opportunities in IP - IPR in current scenariowith case studies.

Unit V **(12 hours)**

Other forms of IP: Design- meaning and concept of novel and original - Procedure for registration, effect of registration and term of protection Geographical Indication (GI) Geographical indication: meaning, and difference between GI and trademarks - Procedure for registration, effect of registration and term of protection.**Plant variety protection**: meaning and benefit sharing and farmers' rights – Procedure for registration, effect of registration and term of protection. **Layout Design protection**: meaning – Procedure for registration, effect of registration and term of protection.

Course Outcomes:

After suceesful completion of this course, student will be able to

CO1: To introduce fundamental aspects of Intellectual property rights to students who are going to play a major role in development and management of innovative projects in industries

CO2: To disseminate knowledge on patents, patent regime, registration aspects in India & abroad

CO3: To disseminate knowledge on copyrights and its related rights and registration aspects

CO4: To disseminate knowledge on trademarks and registration aspects

CO5: To disseminate knowledge on Design, Geographical Indication (GI), Plant Variety and Layout Design Protection and their registration aspects

Text Book:

1. Nithyananda K V, Intellectual Property Rights :Protection and Management, Cengage Learning Private Limited,2019.

Reference Books:

1. Neeraj.P, Khusdeep.D, *Intellectual Property Rights*, PHI Learning Private Limited, 2014.
2. Virendra Kumar Ahuja, *Law relating to Intellectual Property Rights*, Lexis Nexis Butterworths, 2017.

E-Resources:

1. https://www.tutorialspoint.com/information_security_cyber_law/intellectual_property_right.htm
2. https://www.icsi.edu/media/website/IntellectualPropertyRightLaws&Practice.pdf
3. https://nptel.ac.in/courses/110/105/110105139/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	1	9	9	3	**43**
CO2	9	3	9	3	9	9	9	**51**
CO3	3	9	1	1	3	1	9	**27**
CO4	9	3	9	1	9	9	3	**43**
CO5	9	1	9	3	9	9	3	**43**
Total	**39**	**25**	**31**	**9**	**39**	**37**	**27**	**207**

Low -1 Medium – 3 High - 9

SEC VI – Cryptography and Network Security Lab

(For Students Admitted from 2022-23)

Semester: VI **Hours/week: 2**
Subject Code: IBCYS65P **Credits: 2**

Course Objectives

1. To learn the fundamental principles and theories underlying cryptographic algorithms, including themathematical foundations of cryptography
2. To apply cryptography to solving data security problems and introduce the concepts how cryptographic algorithms and protocols work and how to use them provides a broad view of security with practical applications of cryptography to data security

List of Programs

1. Write a program that contains a string (char pointer) with a value ‘Hello world’. The program shouldXOR each character in this string with 0 and displays the result.
2. Write a program that contains a string (char pointer) with a value ‘Hello world’. The program should AND or and XOR each character in this string with 127 and display the result
3. Perform encryption and decryption using the following algorithms:
   a. Ceaser cipher b. Substitution cipher c. Hill Cipher
4. Implement the DES algorithm logic
5. Implement the Blowfish algorithm logic
6. Encrypt the text “Hello world”using Blowfish
7. Implement RSA algorithm
8. Calculate the message digest of a text using the SHA-1 algorithm
9. Calculate the message digest of a text using the MD5 algorithm
10. Encrypt and Decrypt the password in Shell Script
11. Encrypt and Decrypt file using RIJNDAEL-128

12.Encrypt Password file and Decrypt in a shell Script
13.Shell Script to cipher a Text file (Caesar Method)

Note: Questions for the external examination will be based on the concepts learnt

Course Outcomes

After suceesful completion of this course, student will be able to

CO1: Apply encryption and decryption algorithms i.e., AES, MD5 and RSA algorithms
CO2: Analyze basic security attacks and services
CO3: Illustrate symmetric and asymmetric key algorithms for cryptography
CO4: Demonstrate authentication functions
CO5: Explain classical encryption techniques and block ciphers.

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	9	1	3	9	3	9	**37**
CO2	9	9	3	3	3	9	1	**37**
CO3	9	9	9	3	9	3	3	**45**
CO4	9	1	3	9	3	9	1	**35**
CO5	3	9	3	9	9	3	3	**39**
Total	**33**	**37**	**19**	**27**	**33**	**27**	**17**	**193**

Low-1 Medium – 3 High – 9

Extra Credit V-Data Mining Lab

(For Students Admitted from 2022-23)

Semester: VI
Subject Code: IBCYX6P **Credit: 2**

Course Objectives:

1. To understand the concept of data mining tool
2. To implement various data mining algorithm

Program List

1. Create data-set in .arff file format. Demonstration of preprocessing on WEKA data-set
2. Demonstration of Association rule process on data-set contact lenses.arff /supermarket using apriori algorithm
3. Demonstration of classification rule process on WEKA data-set using j48 algorithm
4. Demonstration of classification rule process on WEKA data-set using Naive Bayes algorithm
5. Demonstration of clustering rule process on data-set iris.arff using simple k-means

Note: Questions for External examination will be based on concepts learnt

Course Outcomes

After suceesful completion of this course, student will be able to

CO1: Describe Data mining concept
CO2: Apply the knowledge of data mining techniques
CO3: Adapt to new data mining tools.
CO4: Explore recent trends in data mining such as web mining, spatial-temporal mining
CO5: Build different types of algorithm

Course	Programme Outcomes

Outcomes								
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	9	1	1	**25**
CO2	9	3	3	1	9	1	3	**29**
CO3	9	3	3	3	9	3	3	**33**
CO4	9	3	3	3	9	3	3	**33**
CO5	3	3	9	3	9	3	9	**39**
Total	**39**	**15**	**19**	**11**	**45**	**11**	**19**	**159**

Low-1 Medium-3 High-9

Bachelor of Computer Applications

(Three Year Regular Programme)
(For Students Admitted from 2022-23)

Programme Specific Outcomes:
On completion of this programme, student will be able to gain

PSO1: To impart knowledge about various sub domains related to the field of Accounting, Mathematics andComputer applications
PSO2: The graduate will equip themselves to pursue higher studies, entrepreneurship, and apply newideas and technologies in the evolving field
PSO3: To produce students who can analyze a problem and apply the innovation ideas
PSO4: The graduates will become a successful employer as an outcome of Industry-Academia collaboration
PSO5: To produce professionals who show their readiness to work in a team and find solutions to theneeds of the society with the help of upcoming technologies
PSO6: An ability to apply mathematical methodologies to solve computation task, model real worldproblem using appropriate data structure and suitable algorithm
PSO7: Familiarity with a programming language and open-source platforms

PREAMBLE
The Board of Studies of Computer Science revamped the curriculum with the following changes

Core Papers

- New syllabus has been framed for Programming in c, Programming in C lab, DBMS, DBMS Lab
- Office Automation Lab converted as Core paper
- Object Oriented Programming in C++ syllabus has been changed and list of programs updated in Object Oriented Programming in C++ Lab
- RDBMS renamed as DBMS and new syllabus has been framed
- RDBMS has been shifted from V Semester to IV Semester
- Programming in Java Lab syllabus has been updated
- Computer Organization renamed as Computer Organization and Architecture has been shifted from III Semester to IV Semester, new syllabus has been framed and converted as Allied paper

- Internet of things syllabus has been changed
- Software Engineering, Computer Network new syllabus has been changed
- Computer Graphics syllabus has been updated

Ability Enhancement Compulsory Course (AECC)

- New syllabus reframed Digital Electronics Lab list

Discipline Specific Elective (DSE)

- Software Development Framework has been removed and Block chain Technology has been introduced
- Cloud Computing has been renamed as Cloud and Distributed Computing
- Software testing, cloud and Distributed computing ,mobile application and complier design syllabus has been changed
- Theory of computation syllabus has been updated

Skill Enhancement Course (SEC)

- Multimedia Lab II (Photoshop) renamed as Multimedia Lab I
- Multimedia Lab I (Flash) renamed as Multimedia Lab II
- web designing lab(HTML, VBScript and JavaScript) renamed as web designing Lab(HTML and JavaScript) and New syllabus has been framed for this Lab
- PHP Lab has been renamed as PHP Programming Lab and program list has been changed

PROGRAMME STRUCTURE - PROGRAM CODE : UCP

Sem	Subject Code	Course	Subject Title	Hours / week	Credit	CIA	ESE	Total Marks
I	IBLT11/ IBLA11/ IBLH11	Language I	Tamil I / Arabic I / Hindi I	5	3	40	60	100
	IBLEI12/ IBLEII12	Language II	English I a (or) b	5	3	40	60	100
	IBCPC11	Core I	○ Programming in C	4	3	40	60	100
	IBCPC12P	Core II	Programming in C Lab	4	3	40	60	100
	IBCPC13P	Core III	Office Automation Lab	3	3	40	60	100
	IBCPA13	AECC I	Numerical Methods	5	4	40	60	100
	IBCPS14P	SEC I	Python Lab	2	2	-	50	50
			Library/Browsing	1	-	-	-	-
			Remedial/Games	1	-	-	-	-
			Total	**30**	**21**	**240**	**410**	**650**
II	IBLT21/	Language	Tamil II / Arabic II / Hindi					

	IBLA21/ IBLH21	I	II	5	3	40	60	100
	IBLEI22/ IBLEII22	Language II	English II a or b	5	3	40	60	100
	IBCPC21	Core IV	○ Object oriented Programmingin C++	5	5	40	60	100
	IBCPC22P	Core V	Object Oriented Programmingin C++ Lab	4	4	40	60	100
	IBCPA23	AECC II	Digital Electronics	3	2	40	60	100
	IBCPA24P	AECC III	Digital Electronics Lab	2	2	40	60	100
	IBCPS25P	SEC II	Multimedia Lab I (Photoshop)	2	2	-	50	50
	IBES2	GIC I	Environmental Science	2	2	-	50	50
			Library/Browsing	1	-	-	-	-
			Remedial/Games	1	-	-	-	-
	IBCPX2P/ IBCPX2O	Extra Credit	Coral Draw Lab/ * Online Course	-	2	-	100	100
			Total	**30**	**23+2**	**240**	**460+ 100**	**700+100**
III	IBLT31/ IBLA31/ IBLH31	Language I	Tamil III / Arabic III / Hindi III	5	3	40	60	100
	IBLEI32/ IBLEII32	Language II	English III a or b	5	3	40	60	100
	IBCPC31	Core VI	Data Base Management System	4	4	40	60	100
	IBCPC32P	Core VII	Data Base Management System Lab	4	4	40	60	100
	IBCPA33	AECC IV	Accounting Principles & Package	4	4	40	60	100
	IBCPS34P	SEC III	Web Designing Lab(HTML and Java Scripting Language)	2	2	-	50	50
		OEC		2	2	-	50	50
	IBHR3	GIC II	Human Rights	2	2	-	50	50
	IBXTN3	Extension Activities	NSS/CSS	2	2	100	-	100
	IBCPX3P/ IBCPX3O	Extra Credit	Programming in Visual Basic Lab/ * Online Course	-	2	-	100	100
			Total	**30**	**26+2**	**300**	**450+ 100**	**750+100**
IV	IBLT41/ IBLA41/	Language I	Tamil IV /Arabic IV / Hindi IV	5	3	40	60	100

	IBLH41							
	IBLEI42/ IBLEII42	Language II	English IV a or b	5	3	40	60	100
	IBCPC41	Core VIII	Data Structures and Algorithms	4	4	40	60	100
	IBCPC42	Core IX	Operating System	5	4	40	60	100
	IBCPA43	AECC V	Computer Organization and Architecture	5	4	40	60	100
	IBCPS44P	SEC IV	Linux and Shell ProgrammingLab	2	2	-	50	50
		OEC		2	2	-	50	50
	IBLEV4	GIC III	Life Skills and Value Education	2	2	-	50	50
	IBCPX4P/ IBCPX4O	Extra Credit	R Tool Lab/ # Internship	-	2	-	100	100
			Total	**30**	**24+2**	**200**	**450+ 100**	**650+100**
V	IBCPC51	Core X	Programming in Java	6	5	40	60	100
	IBCPC52P	Core XI	Programming in Java Lab	6	5	40	60	100
	IBCPC53	Core XII	Internet of Things	6	5	40	60	100
	IBCPE5A/ IBCPE5B	DSE I	a. Software Testing b. Cloud and Distributed Computing	4	4	40	60	100
	IBCPE5C/ IBCPE5D	DSE II	a. Block Chain Technology b.Theory of Computation	4	4	40	60	100
	IBCPS54P	SEC V	PHP Programming Lab	2	2	-	50	50
	IBWE5	GIC IV	Women Entrepreneurship	2	2	-	50	50
	IBCPX5/ IBCPX5O	Extra Credit	Employability Skills/ * Online Course	-	2	100	-	100
			Total	**30**	**27+2**	**200+ 100**	**400**	**600 +100**
VI	IBCPC61	Core XIII	Software Engineering	6	5	40	60	100
	IBCPC62	Core XIV	Computer Networks	6	4	40	60	100
	IBCPC63	Core XV	Computer Graphics	5	4	40	60	100
	IBCPC64PW	Core XVI	Project	6	5	40	60	100
	IBCPE6A/ IBCPE6B	DSE III	a.Mobile Application Development b.Compiler Design	4	4	40	60	100
	IBCPS65P	SEC VI	Multimedia Lab II (Flash)	2	2	-	50	50
			Library	1		-	-	-

	IBCPX6P/ IBCPX6O	Extra Credit	Data Mining Lab/ * Online Course	-	2	-	100	100
			Total	**30**	**24+2**	**200**	**350+ 100**	**550+100**
			Grand Total	**180**	**145+10**	**1380+ 100**	**2520 +400**	**3900+500**

*****For Online Course credit alone will be assigned on submission of certificate obtained by appearing for online examination from EdX, Spoken Tutorial, NPTEL or Coursera etc.

For internship course, refer www.internshala.com

o For online course integration, syllabus will be taken from spoken tutorial.

AECC - Ability Enhancement Compulsory Course
SEC - Skill Enhancement Course
DSE - Discipline Specific Elective
OEC-Open Elective Course
GIC – General Interest Course

Core I - Programming in C

(For Students Admitted from 2022-23)

Semester: I **Hours/week: 4**
Subject Code: IBCPC11 **Credit: 3**

Course Objectives:

1. To understand the main features of operators, input/ output statements, control statements andprogram structure
2. To understand the significance of functions, arrays, strings, pointers and structures

Unit I **(12 hours)**

Introduction to C Programming: C Character Set – Writing first program of C – Identifiers and Keywords -A more useful C Program – Entering the program into the computer – Data types – Constants – Variables and Arrays – Declarations – Expressions – Statements – Symbolic constants **Operators and Expressions**: Arithmetic Operators – Unary Operators – Relational and logical Operators – Assignment Operators – Theconditional Operators – Library functions.

Unit II **(12 hours)**

Data Input and Output: Preliminaries – The getchar function – The putchar function – The scanf function The printf function – gets and puts function – Interactive programming **Control Statements:** Preliminaries – Branching: The If-else Statement - Looping – while statement – do- while statement – for statement – nested control structures – switch statement – break statement – continuestatement – coma operator – goto statement .**Functions:** A brief overview – Defining a function – Accessing a function - Function prototypes – Passing arguments to a function – Recursion.

Unit III **(12 hours)**

Program Structure: Storage classes – Automatic variables – External variables – Static variables – Multi File programs – More about library functions. **Arrays:** Defining an Array – Processing an Array – Passing arrays to Functions – Multidimensional arrays.

Unit IV **(12 hours)**

Strings: Defining a String – NULL Character – Initialization of Strings – Reading and writing a string – Processing strings – Character arithmetic – Searching and sorting of strings – Some more library Functions for strings. **Pointers:** Fundamentals – Pointer Declarations – Passing pointers to a function – Pointers and one dimensional arrays – Dynamic memory allocation – Operations on pointers - Pointers and multidimensional arrays – Arrays of Pointers - Passing functions to other functions – More about pointer declarations.

Unit V **(12 hours)**

Structures and Unions: Defining a Structure – Processing a Structure – User defined data types – Structures and pointers – Passing structures to functions – Self Referential structures – Unions. **File Handling:** Why Files - Opening and closing a Data file – Reading and writing a data file – Processing a data file – Unformatted data files – Concept of binary files – Accessing the file randomly.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe the basic programming knowledge of C, operators and expressions
CO2: Demonstrate data input and output, control statements & functions
CO3: Analyse program structure and arrays
CO4: Evaluate strings and pointers
CO5: Formulate structures, unions and file handling

Text Book:

1. Byron Gottfried, *Programming with C*, Tata McGraw Hill Education, Fourth Edition, 2018.

Reference Books:

1. Balagurusamy E, *Programming in ANSI C*, Tata McGraw-Hill Publishing Company, Sixth Edition, 2012.
2. Venugopal K R , Sudeep R Prasad, *Programming with C*, Tata McGraw-Hill Publishing Company, 2008.
3. Mullish, Henry Cooper, Herbert, *The Spirit of C - An introduction to modern programming*, JaicoPublishing House, Third Edition, 2006.

E - Resources:

1. NPTEL: https://onlinecourses.nptel.ac.in/noc19_cs42/preview
2. NPTEL:https://nptel.ac.in/courses/106/105/106105171/
3. NPTEL:https://onlinecourses.nptel.ac.in/noc21_cs01/preview
4. SpokenTutorial:https://spokentutorial.org/tutorialsearch/?search_foss=C+and+Cpp&search_language=English

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total

CO1	9	3	3	9	9	3	9	**45**
CO2	9	3	3	3	9	3	9	**39**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	3	3	3	9	3	9	**39**
CO5	9	9	9	3	9	9	9	**57**
Total	**45**	**21**	**21**	**21**	**45**	**27**	**45**	**225**

Low-1 Medium-3 High-9

Core II - Programming in C Lab

(For Students Admitted from 2022-23)

Semester: I **Hours/week: 4**
Subject Code: IBCPC12P **Credit: 3**

Course Objectives:

1. To introduce the field of programming using C language
2. To enhance the analyzing and problem solving skills and use the same for writing programs in C

Program List

Formula substitution

1. Write a C Program to check whether the given number is odd or even
2. Write a C Program to find sum of the digits and reverse the digits
3. Write a C Program to generate the Fibonacci series
4. Write a C Program to generate Prime number within range
5. Write a C Program to find whether a given number is Armstrong or not
6. Write a C Program to count the number of positive, negative and zero in the list
7. Write a C Program to solve the Quadratic Equation
8. Write a C Program to find the area of various shapes using switch case

Array

9. Write a C Program to Find Matrix Addition , Subtraction, Multiplication and Transpose of a matrix using switchcase
10. Write a C Program to Check whether the element is present in the given list or not
11. Write a C Program to sort numbers in ascending and descending order
12. Write a C Program to sort names in Alphabetical order

Functions & Structures

13. Write a C Program to find the factorial of a given number using function declaration
14. Write a C Program to find the factorial of a given number using recursion function
15. Write a C Program to Prepare student mark list using structure
16. Write a C Program to Prepare electricity bill using structure

String Manipulation

17. Write a C Program to count the vowels in the given string
18. Write a C Program to convert the case of given string from upper case to lower case and vice versa

Pointers

19. Write a C Program to sort numbers in ascending order using pointers
20. Write a C Program to find average of two numbers using pointers

Note:-Questions for Internal and External examination will be based on concept learnt

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Remember the control structures and loops
CO2: Apply the concepts of functions and pointers
CO3: Analyze the concepts of Structures and arrays
CO4: Evaluate string handling functions
CO5: Create programs with pointers, arrays, structures

E-Resource:
1. SpokenTuroial:https://spokentutorial.org/tutorialsearch/?search_foss=C+and+Cpp&search_language=English

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	9	9	**43**
CO2	9	3	3	1	9	9	9	**43**
CO3	9	3	3	1	9	9	9	**43**
CO4	9	3	3	1	9	9	9	**43**
CO5	9	3	3	1	9	9	9	**43**
Total	**45**	**15**	**15**	**5**	**45**	**45**	**45**	**215**

Low-1 Medium-3 High-9

Core III - Office Automation Lab

(For Students Admitted from 2022-23)

Semester: I **Hours/week: 3**
Subject Code: IBCPC13P **Credit: 3**

Course Objectives:
1. To acquire knowledge about word processing, spread sheet, Data base creation and slide preparation
2. To improve creative thinking in presentations

Program List

Word Processing
1. Create a word processing document consists two pages in a Book named "XX" and then do the following:
   a. Formatting Text, Alignment and Font Style
   b. Perform Find and Replace
   c. Add Header and Footer option to specify name of the Book ChapterHeading and Page number of total pages.
2. Create a word processing document having details of our College courses using bulleted and numberlists. Type the title using Word Art
3. Design a Letter to felicitate Farewell Address to our seniors with Font Setting/Page Borders/Word Art/Clip Art/Symbols
4. Create a Newsletter Article (using Columns, Drop cap)
5. Create a time table for your Internal Exam Schedule (using Table)

6. Type Business letter and send it to more using Mail Merge.
7. Create your own Resume
8. Create an spreadsheet consists of Student details and then do the following:
   a. Calculate student wise total and subject wise total.
   b. Find the Maximum and Minimum marks of the subject.
   c. Grade is calculated as
      i. if %>=90, then grade A
      ii. if %>=80 and <90, then grade B
      iii. if %>=70 and <80, then grade C
      iv. if %>=60 and <70, then grade D
      v. If %<60, then grade F
9. Create a spreadsheet having Employee details suitably and then do the following
   a. Use functions to calculate Net Pay and Gross Pay
   b. Perform conditional formatting and validation
10. Create a purchase order list for a company
   a. prepare a purchased item list with price
   b. prepare a flowchart for the price wise item
11. Create a macro

Presentation

1. Create a presentation showing your various activities of the department a Perform slide translationand Setting background designs
2. Create a presentation showing various aspect of your college and perform custom animation and import sound
3. Create a presentation using design templates and then perform thefollowing one:
   a. Include Table and chart from file
   b. Include Picture and run the presentation using auto play
4. Perform Hyperlink within slides and link other documents

Database

1. Crate a Student Database having Name, Regno, Tamil, English, Maths, Total, and Average. Perform tofind total and average and check data entered
2. Create an Inventory database having Item Name, Item no. Quantity and Price. Perform query operationto retrieve data
3. Create a form to enter the details of the Book database
4. Create a report for the Book database

Note:- Questions for Internal and External examination will be based on concept learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Illustrate various options of Office Application
CO2: Demonstrate different types of formats, formulas and transition in office application
CO3: Develop reports to solve the problems of manual report handling
CO4: Compare the options of different Microsoft Office Applications to use appropriately
CO5: Build a Presentation, Advertisement, Reports etc for enterprises

Course Outcomes	Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	9	3	3	9	3	9	45
CO2	9	9	3	9	9	9	9	57
CO3	9	9	3	9	9	9	9	57
CO4	9	3	3	3	9	3	9	39
CO5	9	9	3	3	9	3	9	45
Total	45	39	15	27	45	27	45	243

Low-1 Medium-3 High-9

SEC I- Python Lab

(For Students Admitted from 2022-23)

Semester: I **Hours/week: 2**
Subject Code:IBCPS14P **Credit: 2**

Course Objectives:

1. To acquire programming skills in Core Python
2. To develop the web designing in Python

List of Programs

Display Text

1. Write a python program to display any given text message

Formula Substitution

2. Write a python program to display Fibonacci series

Array

3. Write a python program to count the number of vowel in the string

Function

4. Write a python program to convert a date read from the user, given in DD/MM/YYYY format into written format.
5. Write a python program to print the contents of a file in uppercase using function
6. Write a python program to sort the contents of a file using function Operator Overloading
7. Write a python program to implement Operator Overloading Script
8. Write a python script that implements the Arithmetic Quiz
9. Write a python script to create a button with the text, "HelloWorld"
10. Write a python script that creates a combo box with three elements. When the selection is changedthe selected item is to be printed
11. Write a python script that creates a simple application window with menus andsubmenus
12. Write a python script that creates a simple application window with displaying lines
13. Write a python program to create your own web site for displaying message
14. Write a python program to create a simple blog using models

Note:-Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Acquiring the basic knowledge of functions

CO 2: Examine test and debug simple Python programs
CO 3: Implement Python programs with conditionals and loops
CO 4: Develop Python programs step-wise by defining functions
CO5: Develop the webpage

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	3	3	3	9	**39**
CO2	9	9	9	9	3	9	9	**57**
CO3	9	9	9	3	3	9	9	**51**
CO4	9	3	9	3	3	3	9	**39**
CO5	3	9	3	3	3	3	9	**33**
Total	**39**	**39**	**33**	**21**	**15**	**27**	**45**	**219**

Low-1 Medium-3 High-9

Core IV - Object Oriented Programming in C++

(For Students Admitted from 2022-23)

Semester: II **Hours/Week: 5**
Subject Code: IBCPC21 **Credit: 5**

Course Objectives:

1. To enhance the knowledge of complete understanding of Programming language C++
2. To understand the significance of functions, operator overloading and inheritance concepts

Unit I **(15 hours)**

Principles of Object-Oriented Programming Paradigm: Basic Concepts of Object Oriented Programming- Benefits of OOP - Object Oriented languages - Application of OOP

Beginning with C++: What is C++ - Applications of C++ - A Simple C++ program – More C++ statements -An example with Class – Structure of C++ program- Creating the source file – Compilingand Linking

Tokens, Expressions and Control Structure: Introduction -Tokens-Keywords – Identifiers and Constants- Data types – Operators in C++ - Operator Overloading- Operator Precedence – Controlstructures.

Unit II **(15 hours)**

Functions in C++: Introduction- The main function- Function prototyping- Call by Reference- Return by Reference- Inline Functions- Default Arguments- Const Arguments- Function Overloading- Function and Virtual Functions- Math Library Functions.

Classes and Objects: Introduction , Specifying a Class, Defining Member Functions, A C++ Program with Class, Making an Outside Function Inline, Nesting of Member Functions, Private Member Functions, Array within a Class, Memory Allocation for Objects, Static Data Members, Static Member Functions, Array of Objects, Objects as Function Arguments, Friendly Functions, Returning Objects, Const Member Functions.

Unit III **(15 hours)**

Operator Overloading and Type Conversions: Introduction, Defining Operator Overloading – OverloadingUnary, Binary Operators – Overloading Binary Operators using Friends – Manipulation of Strings using Operators - Rules for Overloading Operators.

Inheritance: Extending Classes: Introduction, Defining Derived Class, Single Inheritance, Making Private Member Inheritable, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Virtual Base Class, Abstract Classes, Constructors in Derived Classes, Member Classes: Nestingof Classes.

Unit IV **(15 hours)**

Pointers, Virtual Functions and Polymorphism: Introduction, Pointers, Pointers to Objects, this Pointer,Pointer to Derived Classes, Virtual Functions, pure Virtual functions

Managing Console I/O Operations: Introduction, C++ Streams, C++ Stream classes, Unformatted I/O Operations, Formatted Console I/O Operations, Managing Output with Manipulators.

Unit V **(15 hours)**

Working with files: Introduction – classes for file stream operations- opening and closing a file – DetectingEnd of file – more about open - File modes

Templates: introduction – class Templates – class templates – class templates with multiple parameters-function templates – function templates with multiple parameters

Exception Handling: Introduction- Basics of Exception Handling – Exception Handling Mechanism-throwing Mechanism-catching mechanism.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Outline principles of object oriented programming paradigm, tokens, expressions and control structure

CO2: Illustrate functions in C++, the concept of classes and objects

CO3: Analyse operator overloading, type conversions and inheritance extending classes

CO4: Relate pointers, virtual functions, polymorphism and managing console I/O Operations

CO5: Formulate working with files, templates and exception handling

Text Book:

1. E. Balagurusamy, *Object - Oriented Programming with C++*, Tata McGraw- Hill Publishing Company Limited, Eighth Edition, 2020.

Reference Books:

1. Ivor Horton, *Beginning C++ The Complete Language*, Shroff Publishers and Distributors Private Limited,2007.
2. Venugopal K R, Rajkumar B, and RaviShankar T, *Mastering C++*, Tata McGraw Hill, Fifth Reprint, 2006.

E - Resources:

1. NPTEL: https://onlinecourses.nptel.ac.in/noc21_cs02/preview
2. NPTEL: https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-cs38/
3. NPTEL: https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs17/

4. NPTEL: https://nptel.ac.in/courses/106/101/106101208/
5. NPTEL: https://nptel.ac.in/noc/courses/noc22/SEM1/noc22-cs43/
6. SpokenTutroail:https://spokentutorial.org/tutorialsearch/?search_foss=C+and+Cpp&search_language= English

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	3	3	9	9	3	9	45
CO2	9	3	3	3	9	3	9	39
CO3	9	3	3	3	9	9	9	45
CO4	9	3	3	3	9	3	9	39
CO5	9	9	9	3	9	9	9	57
Total	45	21	21	21	45	27	45	225

Low-1 Medium-3 High-9

Core V - Object Oriented Programming in C++ Lab

(For Students Admitted from 2022-23)

Semester: II **Hours/Week: 4**
Subject Code: IBCPC22P **Credit: 4**

Course Objectives:

1. To familiarize the students with language environment and to develop the programs for solving the problemsusing function overloading, constructors and object
2. To introduce the concepts that includes various steps involved in developing software including requirement elicitation, systemdesign, object design and testing

Program List

Formula Substitution

1. To check a given number is odd or even
2. To check a given number is palindrome or not using class
3. To sort the list of numbers using class

Functions

4. To check a given number is positive or negative using function
5. To find sum of digit using nesting of member function
6. To demonstrate unary operator using friend function

Constructors

7. To find reverse of digit using constructor

Overloading

8. To find area of shapes using function overloading
9. To add two complex numbers using binary operator overloading

Inheritance

10. To perform student mark list using single inheritance
11. To prepare electricity bill using multilevel inheritance

Pointer

12. To searching an element in the list using pointer
13. To checking a given number is prime or not using pointer to object

File Handling

14.To create a new files to store content and display number of words in the files

Exception Handling

15.To demonstrate user defined exception

Note: - Questions for Internal and External examination will be based on concept learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Remember the different programming paradigm such as procedure oriented and object orientedprogramming methodology and conceptualize elements of OO methodology

CO2: Apply the concepts of object oriented programming

CO3: Analyze the usage of pointers and exception handling

CO4: Evaluate the concepts of inheritance and overloading features.

CO5: Create programs with the usage of Files, templates and exception Handling

E-Resource:

1.https://spokentutorial.org/tutorialsearch/?search_foss=C+and+Cpp&search_language=English

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	9	9	**43**
CO2	9	3	3	1	9	9	9	**43**
CO3	9	3	3	1	9	9	9	**43**
CO4	9	3	3	1	9	9	9	**43**
CO5	9	3	3	1	9	9	9	**43**
Total	**45**	**15**	**15**	**5**	**45**	**45**	**45**	**215**

Low-1 Medium-3 High-9

AECC II - Digital Electronics

(For Students Admitted from 2022-23)

Semester: II **Hours/week: 3**

Subject Code: IBCPA23 **Credit: 2**

Course Objectives:

1. To know the concepts of Combinational circuits.
2. To understand the concepts of flip flops, registers and counters

Unit I **(9 hours)**

Number Systems and Codes: Introduction- binary, octal, decimal, and hexadecimal number system- decimal to binary, octal to binary, hexadecimal to binary – hexadecimal to octal conversions and vice versa - binary arithmetic-1s and 2s complement representations-BCD addition and subtraction - weighted and un-weighted codes- alphanumeric codes.

Unit II **(9 hours)**

Basic Boolean functions: AND,OR,NOT Functions- Boolean theorems and laws-use of Boolean algebra for simplification of logical expressions- minterm and maxterm- canonical sum of products and product of sum simplifications- minimization of logical expressions using K-map-logic gates- AND,OR,NOT,EX- OR,NAND,NOR gates.

Unit III **(9 hours)**

Introduction to combinational logic circuits: arithmetic circuits –half adder, full adder, half subtractor, full subtractor, parallel binary adder - subtractor, serial adder, multiplier and divider - encoder, decoder.

Unit IV **(9 hours)**

Introduction to sequential circuits-flipflops-SR,JK,D and T flipflops-master-slave flipflops-level and edge triggering- synchronous and asynchronous counters- up/down counters-modulo-n- counters- shift registers- serial in serial out- serial in parallel out, parallel in serial out and parallel in parallel out shift counters- ring counters.

Unit V **(9 hours)**

Read only memory- architecture of ROM, PROM, EPROM, EEPROM, ROM applications-RAM- RAM architecture- static and dynamic RAM.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Remember the basic structure of number system methods like binary, octal and hexadecimal
CO2: Apply the functions to simplify the logical expressions
CO3: Analyze the operations of various logical circuits
CO4: Evaluate the functions of the memory organization
CO5: Create the sequential and combinational logic circuits

Text Book:

1. S. Salivahanan, S. Arivazhagan, *Digital Circuits And Design*, Oxford University Press, 2018.

Reference Books:

1. M. Morris Mano and Michael D. Ciletti, *Digital Design*, Pearson Education, Fifth Edition, 2014.
2. A.Anand Kumar, Fundamentals *of Digital Circuits*, PHI Learning Private Limited, Fourth Edition, 2016.
3. Anil K.Maini ,*Digital Electronics*, Wiley Publications, 2014.
4. Charles H.Roth, *Fundamentals of Logic Design*, Thomson Learning, Sixth Edition, 2013.

E-Resources:

1. **NPTEL:** https://nptel.ac.in/courses/108/105/108105113/
2. **Swayam:** https://www.classcentral.com/course/swayam-digital-electronic-circuits-12953
3. **Swayam:** https://onlinecourses.swayam2.ac.in/cec21_cs16/preview
4. https://tutorialsinhand.com/tutorials/digital-electronics-tutorial/digital-electronics-basics/digital- electronics-introduction.aspx
5. https://www.udemy.com/course/introduction-to-digital-electronics/

6.https://www.udemy.com/course/basics-of-digital-electronics/

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	3	3	1	9	9	9	43
CO2	9	3	3	1	9	3	9	37
CO3	9	3	3	1	9	3	9	37
CO4	9	3	3	1	9	3	9	37
CO5	9	3	3	1	9	3	9	37
Total	45	15	15	5	45	21	45	191

Low-1 Medium-3 High-9

AECC III – Digital Electronics Lab

(For Students Admitted from 2022-23)

Semester: II **Hours/Week: 2**
Subject Code:IBCPA24P **Credit: 2**

Course Objectives:

1. To know the concepts of Combinational circuits.
2. To understand the concepts of flipflops, registers and counters

Program List

Logic Gates

1. Verification of AND Gate using ICs
2. Verification of OR Gate using ICs
3. Verification of NOT Gate using ICs
4. Verification of NAND Gate using ICs
5. Verification of NOR Gate using ICs
6. Verification of EX-OR Gate using ICs

Universal Gates

7. Universality of NAND gates using IC 7400
8. Universality of NOR gates using IC 7402

Boolean algebra and Theorem

9. Verification of Boolean Expression using ICs
10. Verification of Demorgan's theorems using ICs

Combinational Logic Circuits

11. Binary half and full adder using ICs
12. Binary half and full subtractor using ICs

Note: - Questions for Internal and External examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to
CO1: Recognize logic functions
CO2: Identify the steps for truth tables, and Boolean algebra expressions

CO3: Simplify the process of the laws of Boolean algebra to simplify circuits and Boolean algebra expressions
CO4: Support combinational logic circuits
CO5: Build the Diodes Characteristics

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	9	3	3	9	**39**
CO2	9	3	3	9	1	1	9	**35**
CO3	3	3	3	9	1	1	9	**29**
CO4	9	1	3	9	1	1	9	**33**
CO5	9	3	1	9	1	3	9	**35**
Total	**39**	**13**	**13**	**45**	**7**	**9**	**45**	**171**

Low-1 Medium-3 High-9

SEC II - Multimedia Lab-I (Photoshop)

(For Students Admitted from 2022-23)

Semester: II **Hours/week :2**
Subject Code: IBCPS25P **Credit: 2**

Course Objectives:

1. To understand the basic concepts of GIMP
2. To gain knowledge about various tools of GIMP

GIMP
Program List

1. Design a Business card
2. Create a logo
3. Convert an image into pencil drawing
4. Design a scenery using various brushes
5. Design a greeting card
6. Create clipping mask – place an image inside text
7. Create passport size photo
8. Animate a still photo
9. Create a shadow effect for an object
10. Create a mirror effect for an image
11. Apply the following tools in an image: i)Smudge ii)Blur/Sharpen iii)Dodge/Burn
12. Create a mosaic photo collage

Note: Questions For the External Examinations shall be based on the concepts learnt

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Recognize the uses of various tools and effects in GIMP
CO2: Identify the steps to start designing with images
CO3: Simplify the process of designing, editing and masking to solve the difficulties of designers

CO4: Support studios to create passport size photo
CO5: Design Visiting card, ID card, Birthday card and logo

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	9	9	1	**43**
CO2	9	1	9	9	3	9	3	**43**
CO3	9	3	9	9	3	9	9	**51**
CO4	9	1	3	9	3	9	3	**37**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**17**	**39**	**39**	**27**	**45**	**25**	**237**

Low-1 Medium-3 High-9

Core VI – Data Base Management System

(For Students Admitted from 2022-23)

Semester: III **Hours/week: 4**
Subject Code: IBCPC31 **Credit: 4**

Course Objectives:

1. To understand the basic concepts, applications of database systems, relational database design principlesand SQL queries
2. To understand the different issues involved in the design and implementation of a database system,security, integrity and concurrency

Unit I **(12 hours)**

Introduction: Database System Applications-Purpose of Database System-View of Data-Database Design- **Data Storage and Quering**-Transaction Management-Database Architechture .**Relational Databases :** Introduction to the Relational Model-Introduction to SQL-Intermediate SQL:Join Expressions-Views- Transactions-Integrity constraints-Schemas-Authorization.

Unit II **(12 hours)**

Database Design: Database design and E-R Model: overview -ER-Model-Constraints- ER-Diagrams- Reduction to Relational Schemas – Design Issues-.Relational database model: Logical view of data- keys- integrity rules. **Relational Database design:** Features of good relational database design- Atomic domain and Normalization (1NF- 2NF- 3NF-BCNF).Database-Design Process-Modeling Temporal Data.

Unit III **(12 hours)**

Data Storage and Querying: Storage and File Structure: Overview of Physical Storage-Magnetic Disk and Floppy Disk-RAID- Organization of Records in Files-**Indexing and Hashing:** Basic Concepts-Ordered Indices-Multiple Key Access-Static Hashing-Dynamic Hashing-Bit Map Indices. **Query Processing**: Overview-Selection Operation-Sorting- Join Operation.

Unit IV **(12 hours)**

Transaction Management: Transaction: Transaction Concept-Simple Transaction Model-Storage Structure-Transaction Atomicity and Durability-Transaction Isolation-Serializablity-**Concurrency Control:** Lock- Based Protocols-Deadlock Handling-Multiple Granularity-Time Stamp Protocols-Valuation Based Protocols. **Recovery System:** Failure Classification-Recovery and Atomicity-Recovery Algorithm-Failure Management.

Unit V **(12 hours)**

System Architecture Text: Database –System Architecture Centralised and Client-Server Architecture- Server System Architecture-Parallel System-Distributed System-Network Types-**ObjectBased Databases:** Complex Data Types –Table Inheritance-Implementing O-R Features-**Advanced Topics, Advanced Application Development:** Performance Tuning-Performance Benchmarks-Standardization.

Course Outcomes:

After successful completion of the course, the students will be able to

CO1: Explore about DBMS architecture, database designs, database modeling
CO2: Extend about ER-Diagram and UML, Relational Algebra and Relational Calculus
CO3: Distinguish the normalization theory
CO4: Apply Structured query language (SQL) and Constraints
CO5: Evaluate various transaction processing, concurrency control mechanisms and database protection mechanisms

Text Book:

1. A Silberschatz, H Korth, S Sudarshan, *Database System and Concepts*, McGraw- Hill, Sixth Edition, 2019.

Reference Books:

1. Raghu Ramakrishnan and Johannes Gehrke, *Database Management Systems (3/e*), McGraw Hill, 2003.
2. Atul Kahate, *Introduction to Database Management Systems*, Pearson Education, Tenth impression, 2012.
3. C J Date , *An Introduction to Database System* , Addison- Wesley Publishing Company, Third Edition, 1998.

E-Resources:

1. https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm
2. https://www.coursera.org/projects/introduction-to-relational-database-and-sql
3. NPTEL: https://onlinecourses.nptel.ac.in/noc21_cs04/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	3	3	3	3	**25**
CO2	9	1	1	3	3	3	3	**23**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	1	9	3	9	9	9	**49**
CO5	9	3	9	3	9	9	9	**51**
Total	**45**	**9**	**25**	**15**	**33**	**33**	**33**	**193**

Low-1 Medium-3 High-9

Core VII – Data Base Management System Lab

(For Students Admitted from 2022-23)

Semester: III **Hours/week: 4**
Subject Code:IBCPC32P **Credit: 4**

Course Objectives:

1. The Students get practical knowledge on designing and creating Relational Database Management
2. To understand various advanced queries such as relational constraints, joins, set operations, aggregatefunctions, trigger, views and embedded SQL

SQL PROGRAMS

DDL

1. Create an address table with fields name , doorno , street & city
   - describe its structure
   - alter the table to include pincode
   - alter the table to modify street column
   - drop the table

DML

2. Create a student table with regno, name, age and dept.
   - insert records
   - delete the students with age above 20
   - truncate and drop the table

Functions

3. Create an employee table with fields eno , ename , sex ,age & years of experience
   - find out the no. of female employees
   - find out the employees with age ranging between 30 and 35
   - list out the employees who are working more than 5years
4. Create a library file with fields accno,title,author,cost & no of copies
   - Arrange the books according to accno
   - Find out the total no. of books available in the library
   - Find out the book of minimum cost
5. Create a player table with fields name,sports(cricket,hockey,etc.),age & country
   - find out the eldest and youngest player
   - group players according to sports
   - list out the Indian players
6. Write the SQL queries to illustrate all number functions
7. Write the SQL queries to illustrate date functions
8. Write the SQL queries to illustrate all string functions
9. Create an item table with field's itemno, itemname, quantity & price and insertrecords.
10. Illustrate the comparison operators (between, like, in & isnull)
11. Create a table with the fields clientno , clientname & phoneno Illustrate the set operatorsunion , unionall, minus & intersect

12. Create a student table with fields' regno, name, English, Tamil, Maths and total & insert records
- Arrange all records according to total
- Find the student who got first mark in Maths
- List out the students whose name starts with 'S'

13. Create an inventory table with fields' itemno, itemname, qnty, price andreorderlevel insert records
- update the qnty when it goes less than reorderlevel
- list the items with price less than 100

14. Create an employee table with fields ecode,ename,age & salary and create a department tablewith fields ecode, designation, deptcode & dept. Illustrate joins and sub queries using the above tables.

Constraints

15. Create a vendormaster table with fields vencode, venname, place and phoneno. Create an **ordermaster table** with fields item no, itemcode, vencode, qnty and orderdate. Illustrate the following constraints using the above tables
- vencode as primary key in vendormaster
- vencode as foreign key in ordermaster
- phoneno as unique
- place as notnull &
- qnty > 100

TCL

16. SQL queries to illustrate TCL commands (savepoint, rollback andcommit)

Triggers

17. Creating and executing triggers

Note: - Questions for Internal and External examination will be based on concept learnt

Course Outcomes:

After successful completion of the course, the students will be able to

CO1: Build DDL, DML and TCL Commands
CO2: Make use of implementing constraints in tables
CO3: Apply to create block structure programming language
CO4: Create the concepts of functions.
CO5: Develop the procedures, exceptions, triggers in PL/SQL block

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	3	3	3	3	**25**
CO2	9	1	1	3	3	3	3	**23**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	1	9	3	9	9	9	**49**
CO5	9	3	9	3	9	9	9	**51**
Total	**45**	**9**	**25**	**15**	**33**	**33**	**33**	**193**

Low-1 Medium-3 High-9

SEC III – Web Designing Lab (HTML and Java Script Language)

(For Students Admitted from 2022-23)

Semester: III **Hours/week: 2**
Subject Code:IBCPS34P **Credit: 2**

Course Objectives:

1. To analyze a web page and identify its elements and attributes
2. To build dynamic web pages by using Java script

Program List

1. Create a HTML page for displaying the personal information by using various tags such as backgroundcolor, heading tag, font tag
2. Create a HTML page, which includes images and audio for any application.
3. Create a HTML page for displaying the Tender notice which is given to you.
4. To create a Time Table of your class using HTML.
5. Create mark sheet preparation using table
6. Creation of Lists in HTML
7. Create web site for your company product advertisement in HTML
8. Create your own website for your personal information

Frames

9. To create a simple website for our college
10. To create a dictionary using frames. The words are displayed in one frame and when you click the word,the meaning will be displayed on the other frame.

Java Script:

11. Write a JavaScript program to display the current day and time in the following format
    Today is: Tuesday. Current time is: 10 AM: 30: 38
12. Write a JavaScript program to check whether a string starts with 'Java'
13. Write a JavaScript program to find the largest of three given integers
14. Write a JavaScript program to reverse a given string
15. Write a JavaScript program to create a simple Calculator
16. Write a JavaScript Program to Count the Number of Vowels in a String

Note: Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand the basic tags in HTML and create the programs in that tags
CO2: Create a web page by applying frames and own personal web pages
CO3: Develop a web page for advertising purposes
CO4: Design web pages for own company and institution
CO5: Create interactive web page using Script

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	9	9	**45**
CO2	3	3	9	9	3	9	9	**45**
CO3	3	3	9	9	1	9	9	**43**

CO4	3	3	9	9	3	3	3	**33**
CO5	3	3	3	9	1	9	3	**31**
Total	**21**	**15**	**33**	**39**	**17**	**39**	**33**	**197**

Low-1 Medium-3 High-9

Core VIII -Data Structures and Algorithms

(For Students Admitted from 2022-23)

Semester: IV **Hours/week: 4**
Subject Code: IBCPC41 **Credit: 4**

Course Objectives:

1. To understand the fundamental design, analysis, implementation of basic data structures, specification and analysis of programs
2. To understand about Significance of algorithms in the computer field and various aspects of Algorithm Development

Unit I **(12 hours)**

Introduction: History of Algorithms - Data structures and Algorithms - Data structure - Definition and Classification. Stacks: Introduction - stack Operation - Application. **Queues:** Introduction - Operation - circularQueues - Other Types of Queues - Application.

Unit II **(12 hours)**

Linked Lists: Introduction - Singly Linked Lists - Circularly Linked List - Doubly Linked List - Multiply Linked List- Application. **Trees and Binary Trees:** Introduction -Trees: Definition and Basic Terminologies - Representation of Trees -Binary Tree Traversals - Threaded Binary Trees - Applications.

Unit III **(12 hours)**

Graphs: Introduction-Definitions and Basic Terminologies - Representations of Graphs - Graph Traversals - Single- source & All pairs shortest paths problem - Minimum cost spanning trees. Bi**nary Search Trees and AVL Trees**: Introduction - Binary Search Trees: Definition and Operations - AVL Trees: Definition and Operations - Applications.

Unit IV **(12 hours)**

Red-Black Trees and Splay Trees: Red-Black Trees - Applications. Hash Tables: Introduction-Hash Table Structure- Hash Functions - Linear Open Addressing - Chaining - Applications. **Searching:**Introduction - Linear Search - Transpose Sequential Search - Interpolation Search - Binary Search- Fibonacci Search - Other Search Techniques.

Unit V **(12 hours)**

Internal Sorting: Introduction - Bubble Sort - Insertion Sort - Selection Sort - Merge Sort - Shell Sort - Quick Sort - Heap Sort - Radix Sort.Algorithms: Algorithm Specification - Performance analysis - Asymptotic notation.

Course Outcomes:

After successful completion of the course, the students will be able to

CO1: Explain the basics concept of data structures and Algorithm stacks, queues and lists

CO2: Distinguish about knowledge of tree and graphs concepts

CO3: Analyze the concepts about searching and sorting techniques
CO4: Demonstrate the types of Trees
CO5: Evaluate about Algorithm and step by step approach in solving problems with the help offundamental data structure

Text Books:
1. Vijayalakshmi Pai G A, *Data structures and Algorithms, Concepts, Techniques and Application,* Tata McGraw-Hill Education, 2008.
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, *Fundamentals of Computer Algorithms,* Universities Press, Second Edition, 2008.

Reference Books:
1. Alfred V Aho,John E Hopcroft,Jeffrey D Ullman, data Structures and Algorithms,Dorling Kindersley,2013.
2. Patel R B, *Expert Data Structures with C*, Khanna Book Publishing, Third Edition, 2000.

E-Resources:
1. http://www.dave-reed.com/csc427.F04/
2. http://www.math.tau.ac.il/~matias/ds03.html
3. NPTEL: https://onlinecourses.nptel.ac.in/noc22_cs26/preview
4. NPTEL: https://nptel.ac.in/courses/106/106/106106127/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	3	1	1	**19**
CO2	9	3	9	1	9	1	3	**35**
CO3	9	1	9	9	1	1	3	**33**
CO4	9	3	3	3	3	3	3	**27**
CO5	9	1	1	9	9	9	3	**41**
Total	**45**	**11**	**23**	**23**	**25**	**15**	**13**	**155**

Low-1 Medium-3 High-9

Core IX - Operating Systems

(For Students Admitted from 2022-23)

Semester: IV **Hours/week: 5**
Subject Code: IBCPC42 **Credit: 4**

Course Objectives:
1. To understand the services provided by and the design of an operating system
2. To understand what a process is and how processes are synchronized and scheduled

Unit I **(15 hours)**

Introduction: What is an Operating System -Mainframe systems- desktop systems-MultiprocessorSystems - Distributed systems - Clustered Systems - Real time systems - Hand held systems **Operating System Structure:** System components - Operating System services

- System calls- System structure

Unit II **(15 hours)**

Processes: Process concept- process scheduling- operations on processes- Inter process Communication **CPU Scheduling**: Basic Concepts- Scheduling Criteria- Scheduling algorithms **Process Synchronization**: Background- The critical section problem- Mutex Locks- semaphores- Monitors.

Unit III **(15 hours)**

Deadlock: System Model-Deadlock Characterization- Methods of Handling Deadlock- Deadlock Prevention-Deadlock Avoidance- Deadlock Detection- Recovery from Deadlock.**Memory management**: Background- Contiguous memory allocation- Swapping.

Unit IV **(15 hours)**

Virtual memory: Background- Demand paging- Copy-on-Develop -Page replacement- Thrashing. **File system interface**: File concepts- access methods- Directory structure. **Mass storage structure**: Overview of mass storage structure-HDD Scheduling-NVM Scheduling.

Unit V **(15 hours)**

Protection: Goals of protection- domain of protection- Access matrix- Implementation of Access matrix- revocation of access rights.**Security:** The security problem- User authentication- Program threats- System threats- securing systems and facilities- Intrusion detection- Cryptography.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Remember the structure of operating system and scheduling algorithms
CO2: Apply the concept of process scheduling, deadlocks and its recovery
CO3: Analyze the background of memory with segmentation and paging
CO4: Evaluate file management with file organization, and disk scheduling
CO5: Create Securing systems and facilitites

Text Book:

1. Abraham G Silberschatz, *Operating System*, Wiley Publisher, Tenth Edition, 2017.

Reference Books:

1. Milan Milenkovic, *Operating System Concepts & Design***,** Tata McGraw Hill Publishing Limited, Second Edition, 1997.
2. Peter Baer Galvin, Robert Neilson Boyd, *Applied Operating System Concepts*, John Wiley & Sons Publisher, First Edition, 2000.
3. Dhananjay M. Dhamdhere, *Operating System A Concept-Based Approach*, Tata McGraw Hill Publishing Limited, Third Edition, 2012.
4. W. Stallings, *Operating Systems, Internals & Design Principles*, Prentice Hall of India, Fifth Edition, 2008.

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105214/
2. https://nptel.ac.in/courses/106/106/106106144/
3. https://onlinecourses.nptel.ac.in/noc21_cs44/preview

4. https://www.udacity.com/course/introduction-to-operating-systems--ud923

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	3	3	9	3	9	9	45
CO2	9	3	3	3	9	9	9	45
CO3	9	3	9	9	3	9	9	51
CO4	9	3	9	3	9	9	9	51
CO5	9	3	9	9	9	9	9	57
Total	45	15	33	33	33	45	45	249

Low-1 Medium-3 High-9

AECC V – Computer Organization and Architecture

(For Students Admitted from 2022-23)

Semester: IV **Hours/week: 5**
Subject Code: IBCPA43 **Credit: 4**

Course Objectives:

1. To understand the structure, function and characteristics of computer systems and understand the design of the various functional units and components of computers
2. To identify the elements of modern instructions sets and their impact on processor design, explain thefunction of each element of a memory hierarchy

Unit I **(15 hours)**

Basic Computer Organization and Design: Instruction Codes- Computer Registers- Computer Instructions-Timing and Control-Instruction Cycle-Memory Reference Instructions- Input-Output and Interrupts.

Unit II **(15 hours)**

Micro programmed Control: Control Memory- Address Sequencing-Micro program Examples –Design of Control Unit.

Unit III **(15 hours)**

Central Processing Unit: Introduction- General Register Organization- Instruction Formats – Addressing Modes- Data Transfer and Manipulation-Program Control-RISC **Pipeline and Vector Processing:** Parallel Processing-Pipeline- Arithmetic Pipeline-Instruction Pipeline-Vector Processing.

Unit IV **(15 hours)**

Input-Output Organization: Peripheral Devices-I/O interface- Asynchronous Data Transfer – Modes of Transfer - Direct Memory Access - Input Output Processor (Excluding IBM and Intel IOPs).

Unit V **(15 hours)**

Memory Organization: Memory-Main Memory – Auxiliary Memory - Associative Memory - Cache Memory-Virtual Memory-Memory Management Hardware.

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Define the fundamental organization of a computer system
CO2: Explain the concept of sequencing, designing, pipeline and vector processing methods
CO3: Examine the function of input-output organization
CO4: Compare various pipeline concepts
CO5: Distinguish the organization of various parts of a system memory hierarchy

Text Book:
1. Morris Mano M, *Computer System Architecture*, Prentice Hall of India Private Limited, 2011.

Reference Books:
1. William Stallings. *Computer Organization and Architecture*. Pearson publication, Eighth Edition, 2010.
2. Morris Mano. *Digital Login and Computer Design*, Prentice Hall of India Private Limited, 2001.

E-Resources:
1.NPTEL: https://nptel.ac.in/courses/106/105/106105163/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	1	3	3	3	**31**
CO2	9	3	3	3	9	9	3	**39**
CO3	3	9	3	3	3	3	3	**27**
CO4	9	3	9	3	3	3	3	**33**
CO5	3	9	3	3	9	3	3	**33**
Total	**33**	**33**	**21**	**13**	**27**	**21**	**15**	**163**

Low-1 Medium-3 High-9

SEC IV - Linux and Shell Programming Lab

(For Students Admitted from 2022-23)

Semester: IV **Hours/week: 2**
Subject Code: IBCPS44P **Credit: 2**

Course Objectives:
1. To understand and make effective use of linux utilities and shell scripting language to solve problems
2. To develop the skills the necessary for systems programming including file system programming, process and signal management and inter process communication

Program List
Built-in Commands
1. Write a shell program to use who commands

2. Write a shell program to use list commands
3. Write a shell program to use sort commands
4. Write a shell program to use wc commands
5. Write a shell program to use cat commands

Formula Substitution

6. Write a shell program to find odd or even number
7. Write a shell program to find smallest among three numbers
8. Write a shell program to find the factorial value
9. Write a shell program to display multiplication table

Switch case

10. Write a shell program to use case statement

Functions

11. Write a shell program to display username, pwd using function
12. Find age of a person using set date

Checking

13. To check the given file is a directory or not

String Manipulation

14. Convert lowercase to uppercase using tr statement

Note: - Questions for the Internal/External examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Summarize shell commands, scripts, managing files, pipes and redirections

CO2: Apply appropriate Linux commands to make effective use of the environment to solve problems

CO3: Illustrate shell scripts to perform repetitive tasks using while and for loops

CO4: Evaluate shell functions

CO5: Derive command-line arguments

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	1	9	9	9	**49**
CO2	9	9	3	1	9	9	9	**49**
CO3	9	9	3	1	9	9	9	**49**
CO4	9	9	3	1	9	9	9	**49**
CO5	9	9	3	1	9	9	9	**49**
Total	**45**	**45**	**15**	**5**	**45**	**45**	**45**	**245**

Low-1 Medium-3 High-9

Core X - Programming in Java

(For Students Admitted from 2022-23)

Semester: V **Hours/week: 6**

Subject Code: IBCPC51 **Credit: 5**

Course Objectives:

1. To gain knowledge about basic Java language syntax and semantics to develop Java programs and useconcepts such as variables,conditional and iterative execution methods
2. To understand the fundamentals of object-oriented programming in Java, including defining classes, objects,invoking methods etc and exception handling mechanisms

Unit I **(18 hours)**

Fundamentals of Object Oriented Programming: Introduction, object oriented paradigm – basic concepts of oops – benefits of oops – applications of OOPs**. Java Evolution:** java features –java Versus C and C++ -java and internet – java and WWW – web browsers **Overview of Java Language**: simple java program - more of java – application with two classes –java program structure – java tokens – java statements-implementing a java program - java virtual machine - command line arguments.

Unit II **(18 hours)**

Constants, Variables, data types: Declaration of variables- giving values to variables – scope of variables – symbolic constants – type casting – getting values of variables – standard default values – **Operators and Expressions**: Arithmetic operators –Relational operators- logical operators – assignment operators – increment and decrement operators – conditional operator – bitwise operator – special operators –arithmetic expressions – evaluation of expressions–precedence of arithmetic operators-type conversion in expression –operator precedence and associativity – mathematical functions.- **Decision making and Branching:** if statement – switch - ? : operator –**Decision Making and Looping:** while statement – do statement – for statement – jumpsin loops - labeled loops.

Unit III **(18 hours)**

Classes, Objects and Methods: Introduction – defining a class, field declaration – methods declaration – creating objects– accessing class members – constructors – methods overloading – static members – nestingof methods – inheritance – overriding methods – final variables and methods – final classes–finalizer methods – abstract methods and classes – visibility control - **Arrays Strings and Vectors** : one dimensional array – creating an array –two dimensional arrays – strings –vectors –wrapper classes. **Interfaces, Multiple Inheritance**: defining interfaces – extending interfaces – implementing interfaces accessing interface variables.

Unit IV **(18 hours)**

Packages, Putting classes together : Introduction - java API packages : using system packages–naming conventions–creating packages –accessing a package –using a package – adding a class to a package–hiding classes – **Multi-threaded Programming** : creating threads – extending the thread class – stoppingand blocking a thread - life cycle of a thread – using thread methods – thread exceptions –thread priority–synchronization –implementing the runnable interface.

Unit V **(18 hours)**

Managing Errors and Exception: Introduction – types of errors –exceptions -syntax of exception handling code – multiple catch statements –using finally statement –throwing our own exceptions –using exceptions fordebugging- **Applet Programming:** introduction –how applets differ from applications –building applet code–applet life cycle – creating an executable applet –designing a web page - applet tag – adding applet to html file –running the applet – more about applet tags –passing parameters to Applets –aligning the display.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Remember the importance of java with its data types, control statements and class fundamentals

CO2: Apply the concepts of inheritance, method overriding and implement packages and interfaces

CO3: Analyze the concept of exception handling and multithreading

CO4: Evaluate string buffer handling functions

CO5: Create applet programming through awt controls, layout managers and menus

Text Book:

1. E. Balaguruswamy, *Programming with JAVA - A Primer*, McGraw Hill, 2015.

Reference Books:

1. Herbert Schildt, *Java: The Complete Reference*, McGraw Hill, 2017.
2. Robert Sedgewick, Kevin Wayne, *Introduction to Programming in Java*, Addison Wesley, 2017.
3. Y. Daniel Liang, *Introduction to Java Programming*, Brief Version Pearson Education, 2017.

E-Resources:

1. https://spoken-tutorial.org/tutorial-search/?search_foss=Java&search_language=English
2. https://onlinecourses.swayam2.ac.in/aic20_sp13/preview
3. https://spoken-tutorial.org/watch/Java/First+Java+Program/English/
4. https://onlinecourses.nptel.ac.in/noc19_cs84/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	1	9	9	9	**49**
CO2	9	9	3	1	9	9	9	**49**
CO3	9	9	3	1	9	9	9	**49**
CO4	9	9	3	1	9	9	9	**49**
CO5	9	9	3	1	9	9	9	**49**
Total	**45**	**45**	**15**	**5**	**45**	**45**	**45**	**245**

Low-1 Medium-3 High-9

Core XI - Programming in Java Lab

(For Students Admitted from 2022-23)

Semester: V **Hours/week: 6**

Subject Code: IBCPC52P **Credit: 5**

Course Objectives:

1. To make the students to understand Programming language Java
2. To implement sorting and searching programs

Program List

Formula Substitution

1. Find the factorial and binomial coefficient
2. Calculate mean, variance and standard deviation
3. Develop the programs for Number conversions

Checking

4. Develop the programs for Number checking (prime, perfect, etc.)

Generation

5. Develop the programs for Number generation (prime, perfect, etc.)

Array

6. Arrange numbers and names in order
7. Develop the program for performing matrix addition, subtraction, multiplication & transpose

Searching

8. Develop the programs for implementing linear search and binary search

String

9. Develop the programs for doing String manipulation (case conversion, reversing, etc.)

OOP Concepts

10. Develop the programs for implementing inheritance concepts
11. Develop the programs for implementing exceptionhandling
12. Develop the programs for implementing multithreading

Applet

13. Develop the programs to handle Keyboard events
14. Simulate a calculator (arithmetic operations) using GUI components

Note: - Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Outline Java programs that solve simple Mathematical problems, number checking and number generation

CO2: Demonstrate the concepts of String Manipulation, Linear Search and Binary Search

CO3: Illustrate OOP in Java programming like inheritance

CO4: Evaluate the multi-threaded programs

CO5: Develop Exception handling and GUI components

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	3	9	**39**
CO2	9	3	3	3	9	3	9	**39**
CO3	9	9	3	9	9	9	9	**57**
CO4	9	9	9	9	9	9	9	**63**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**33**	**27**	**33**	**45**	**33**	**45**	**261**

Low-1 Medium-3 High-9

Core XII - Internet of Things

(For Students Admitted from 2022-23)

Semester: V **Hours/week: 6**
Subject Code: IBCPC53 **Credit: 5**

Course Objectives:

1. To understand the fundamentals of Internet of Things and its building blocks
2. To understand the recent application domains of IoT in everyday life and the protocols with standards designed for IoT and the current research on it

Unit I **(18 hours)**

Introduction to IoT: Introduction to IoT- Enabling technologies of IoT - AI and Machine Learning - Physical and logical design of IoT - IoT Reference Architecture - IoT Functional Architecture - IoT levels and deployment templates– **Application domains of IoT:** Home automation – Cities – Environment – Energy – Industry – Agriculture – Transportation - Health care & Lifestyle.

Unit II **(18 hours)**

IoT and M2M: Introduction to M2M – Difference between IoT and M2M- SDN and NFV for IoT- IoT System Management with NETCONF-YANG- Need for IoT Systems Management- SNMP- Network Operator Requirements- NETCONF- YANG- IoT Systems Management with NETCONF- YANG.

Unit III **(18 hours)**

IoT Platforms Design Methodology: Step 1 to Step 10- Case Study on IoT System for Weather Monitoring- Motivation for Using Python- IoT Systems Logical Design using Python- Introduction-Installing Python- Python Data Types and Data Structures-Control Flow-Functions-Modules- Packages-File Handling-Date/Time-Operations- Classes- Python Packages of Internet for IoT.

Unit IV **(18 hours)**

IoT Physical Devices and Endpoints: What is an IoT Device- Exemplary Device: Raspberry Pi- About the board- Linux and Raspberry Pi- Raspberry Pi Interfaces- Programming Raspberry Pi with Python- Other IoTDevices.

Unit V **(18 hours)**

IOT Physical Servers and Cloud Offerings: Introduction to Cloud Storage Models and Communication API-WAMP- AutoBahn for IoT-Xively Cloud for IoT-Python Web Application Framework-Django-Designing a RESTful Web API- Amazon Web Services for IoT-Case Studies Illustrating IoT Design- Home Automation- Cities-Environment-Agriculture-Productivity Applications.

Course Outcomes:

After successful completion of this course, student will be able to
CO1: Recall the importance of smart objects and smart environment
CO2: Define IoT and M2M
CO3: Create IoT platforms using design methodology
CO4: Perform WiFi data communications, remote data storage in cloud, and handle the data

using web applications

CO5: Develop potential problems and solutions using IoT

Text Book:

1. Arshdeep Bahga, Vijay Madisetti, *Internet of Things: A Hands-On Approach*, Universities Press, 2015.

Reference Books:

1. Charles Platt, *Make Electronics – Learning by discovery*, O'Reilly Media, 2015.
2. Michael Miller, *The Internet of Things*, Pearson Education, 2015.

E-Resources:

1. NPTEL:https://nptel.ac.in/courses/106/105/106105166/

2.Classcentral:https://www.classcentral.com/course/swayam-introduction-to-internet-of-things-10093

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	9	3	1	3	**25**
CO2	1	3	9	9	3	1	9	**35**
CO3	3	3	3	1	1	9	9	**29**
CO4	1	3	9	1	3	3	9	**29**
CO5	3	3	3	3	1	3	9	**25**
Total	**11**	**15**	**27**	**23**	**11**	**17**	**39**	**143**

Low-1 Medium-3 High-9

DSE I - a) Software Testing

(For Students Admitted from 2022-23)

Semester: V **Hours/week: 4**

Subject Code: IBCPE5A **Credit: 4**

Course Objectives:

1. To explore the effective testing techniques (both black-box and white box) for ensuring high quality software
2. To understand software test automation problems and solutions

Unit I **(12 hours)**

Software Testing Importance: Importance of Software Testing – Challenges and limitations of testing-Depth of Testing-Software Testing Quality-Importance of testing knowledge to software professional- The Psychology of Testing.

Unit II **(12 hours)**

Testing Fundamentals: Software testing Fundamentals – Test case Design – Software testing vs other product testing- Software Development Life Cycle Phases- SDLC-V Model- Seven testing Principle (ISTQB)-Maintenance testing.

Unit III **(12 hours)**

Static techniques: Reviews and the test process-Review process-static analysis by tools - **Test Design techniques:** Identifying test conditions and design techniques- Categories of test design techniques-Specification based or blackbox testing- Structure based or white box testing-Experience based techniques- Choosing a test technique.

Unit IV **(12 hours)**

Test Management: Test Organization – Test Plans, estimates, and strategies – Test progress monitoring and control – Configuration management – Risk and testing – Incident management – Testing Metrics and Complexity.

Unit V **(12 hours)**

Types of Testing: Testing GUIs – Testing Client – Server Architecture – Testing for Real-time System – A Strategic Approach to Software testing – issues – unit testing – Integration Testing – Validation testing – System testing – The art of Debugging. **Tool Support for Testing**: Types of test tool- Effective use of tools- Introducing a tool into an organization.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Recall the fundamentals of software testing

CO2: Illustrate software testing experience by applying software testing knowledge and methods topractice-oriented software testing projects

CO3: Classify specification and structure based testing concept

CO4: Analyze test management process

CO5: Derive programs and test data in client-server architecture

Text Books:

1. Nitin Shah, *Software Quality Assurance and Testing for Beginners*, 2019.
2. Dorothy Graham, Rex Black, Erik Van Veenendaal, *Foundations of Software Testing - ISTQB Certification*, Cengage Learning India, Fourth Edition, 2018.

Reference Books:

1. Roger. S. Pressman, *Software Engineering – A Practitioner's Approach*, McGraw Hill, 5th Edition, 2001.
2. Marnie.L. Hutcheson, *Software Testing Fundamentals*, Wiley-India, 2007.
3. Boris Beizer, *Software testing techniques*, DreamTech Press, Second Edition, 2003.

E- Resources:

1. https://www.tutorialspoint.com/software_testing/index.htm
2. https://www.guru99.com/software-testing-introduction-importance.html
3. https://nptel.ac.in/courses/106/105/106105150/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	1	1	3	9	1	3	3	**21**
CO2	9	3	9	3	1	9	9	**43**
CO3	9	9	9	3	1	9	9	**49**

CO4	9	9	9	3	1	9	9	**49**
CO5	9	1	3	9	3	3	9	**37**
Total	**37**	**23**	**33**	**27**	**7**	**33**	**39**	**199**

Low-1 Medium-3 High-9

DSE I - b) Cloud and Distributed Computing

(For Students Admitted from 2022-23)

Semester: V **Hours/week: 4**
Subject Code: IBCPE5B **Credit: 4**

Course Objectives:

1. To impart the complete understanding of cloud, virtualization and distributed clouds and able to understand the leader election in cloud and distributed systems
2. To enhance the students to understand the significance of classical distributed algorithms, give the clear idea about recovery in clouds and cloud storage and enable the students to understand cloud applications,cloud native computing

Unit I ` **(12 hours)**

Introduction to Cloud, Virtualization, and Virtual Machine: Introduction to Cloud Computing - Features of Today's Cloud - Introduction to Virtualization - Mitigation Techniques for VM Migration Network Virtualization and Geo- Distributed Clouds: Introduction - Cloud Computing and Server Virtualization - Networking of Virtual Machines Inside the Hypervisor – Docker – Software - Defined Network

Unit II **(12 hours)**

Leader Election in Cloud, Distributed Systems, and Industry Systems: Introduction – Leader Election in Rings(Classical Distributed Algorithms) - Ring Leader Election and Bully Leader Election Algorithms - Classical Algorithm: Ring Election Algorithm - Classical Algorithm: Bully Election - Algorithms for Recording Global State and Snapshot - Mutual Exclusion Algorithms for Distributed Systems.

Unit III **(12 hours)**

Consensus, Paxos, and Recovery in Clouds: Introduction – Consensus – Byzantine Agreement – Failures andRecovery approaches in Distributed systems **Cloud Storage:** Key-Value Stores/NoSQL Stores and HBase: Design of Key-Value Stores - Design of HBase.

Unit IV **(12 hours)**

P2P Systems and Their applications in Industry systems: Introduction – Bitcoin crypto currency system –Blockchain technology and its applications beyond bitcoin solutions
Cloud Applications: MapReduce, Spark, and Apache Kafka – MapReduce – Spark – Kafka.

Unit V **(12 hours)**

Cloud-Native Computing: Introduction – Micro services – Docker – Kubernetes-Introduction to Edge Computing - Classification of Edge Computing - **Software-Defined Networking and Network Function Virtualization:** Introduction - Software-Defined Networking - Applications and Use Cases-Software - Defined NFV – Network Slicing - Ongoing Research Opportunities.

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Identify the features of cloud computing and virtualization
CO2: Demonstrate the leader election and classical distributed algorithms
CO3: Classify types of consensus, paxos, recovery in clouds and cloud storage
CO4: Justify P2P systems and cloud applications
CO5: Formulate the cloud native computing, software-defined networking and network function virtualization

Text Book:
1. Rajiv Misra, Yashwant Singh Patel, *Cloud and Distributed Computing: Algorithms and Systems***,** Wiley Emerging Technology Series, 2020.

Reference Books:
1. Chris Dotson, *Practical Cloud Security: A Guide for Secure Design and Deployment*, OReilly Media, First Edition, 2019.
2. Rajkumar Buyya, Christian Vecchiola, Thamarai Selvi, *Mastering Cloud Computing*, Tata McGraw Hill, 2017.
3. Rajkumar Buyya, James Broberg, Andrzej Goscinski, *Cloud Computing Principles and Paradigms*,John Wiley & Sons Publishing, 2011.
4. Toby Velte, Anthony Velte, Robert Elsenpeter, *Cloud Computing-A Practical Approach*, Tata McGraw Hill Publishing, 2010.

E- References:
1. https://nptel.ac.in/courses/106/104/106104182/
2. www.amazon.in/Cloud-Distributed-Computing-Algorithms-Systems/dp/8126520272?asin=B086V7Q2KW&revisionId=&format=4&depth=1

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	9	3	1	9	**35**
CO2	9	1	9	9	3	1	3	**35**
CO3	9	3	3	9	3	1	9	**37**
CO4	3	9	9	9	9	3	9	**51**
CO5	3	9	9	9	9	3	9	**51**
Total	**33**	**23**	**33**	**45**	**27**	**9**	**39**	**209**

Low-1 Medium-3 High-9

DSE II - a) Blockchain Technology

(For Students Admitted from 2022-23)

Semester: V **Hours/week: 4**
Subject Code: IBCPE5C **Credit: 4**

Course Objectives:
1. To understand how block chain system (Bitcoin and Ethereum) work

2. To integrate Ideas from block chain technology into their own projects

Unit I **(12 hours)**

Introduction of Block chain: Block 101-Distributed Systems-Consensus-The history of block chain- Introduction of block chain-Features of block chain-Applications of block chain technology-Tiers of Block chain technology-Consensus in block chain-CAP theorem and block chain-Benefits and limitations of Block chain.

Unit II **(12 hours)**

Cryptography and technical Foundations: Introduction-Mathematics-Cryptography-Confidentiality- Integrity- Authentication-Non repudiation-Accountability-Block Ciphers-DES-AES-Public and Private keys- RSA-hash Functions-Secure hash algorithms-Merkle trees-Patricia trees-DHT-ECDSA-Financial markets andtrading-Trading- Exchanging.

Unit III **(12 hours)**

Bitcoin: Bitcoin definitions-transactions-types of transactions-What is UTXO-Block chain-The genesis of Block-The bitcoin network-wallets-**Alternative coins**: Theoretical Foundations-Alternatives of Proof of Work-Proof of stake-Name coin-Litecoin.

Unit IV **(12 hours)**

Ethereum101: Introduction-Ethereum block chain-The consensus mechanism-The world state-the account state- Transactions-Contract creation transaction-Message call transaction-Elements of ethereum block chain- EVM-Execution Environment-Opcodes and their meaning-Accounts-Block-Block header.

UNIT-V **(12 hours)**

BlockChain–Outside of Currencies: Internet of things-IoT Block chain experiment-Government- Health-Finance- **Emerging Trends**: ABC's-Enterprise-grade block chains-PrivateBlockchains-startups- standardization-Enhancements- Real world Implementations-Consortia-Education in block chain technologies-Employment-Crypto Economics.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the fundamental concept of block chain and consensus algorithm
CO2: Apply cryptography algorithms in protecting the block chain
CO3: How transactions held in bitcoins
CO4: Develop an application in ethereum framework
CO5: Design block chain technology in popular fields

Text Book:

1. Imran Bashir, *Mastering Block chain: Deeper insights into decentralization, Cryptography, Bitcoin and Popular block chain frameworks***,** Packt Publishing, 2017.

Reference Books:

1. Andreas Antonopoulos, Satoshi Nakamoto, *Mastering Bitcoin***,** O'Reilly, 2014.
2. Roger Wattenhofer**,** *The Science of the Block chain*, Create Space Independent Publishing, 2016.
3. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, *Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction***,** Princeton University Press, 2016.

E-Resources:

1. https://nptel.ac.in/courses/106/104/106104220/#
2. https://www.udemy.com/course/build-your-blockchain-az/
3. https://www.mygreatlearning.com/academy/learn-for-free/courses/blockchain-basics

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	3	3	9	9	**51**
CO2	9	3	9	9	9	9	9	**57**
CO3	9	3	9	3	9	9	9	**51**
CO4	9	3	9	3	9	9	9	**51**
CO5	9	3	9	3	9	3	9	**45**
Total	**45**	**21**	**45**	**21**	**39**	**39**	**45**	**255**

Low-1 Medium-3 High-9

DSE II - b) Theory of Computation

(For Students Admitted from 2022-23)

Semester: V **Hours/week: 4**
Subject Code: IBCPE5D **Credit: 4**

Course Objectives:

1. To give an overview of the theoretical foundations of computer science from the perspective of formal languages and regular grammars, context free grammar
2. To illustrate finite state machines to solve problems in computing and explain the hierarchy ofproblems arising in the computer sciences

Unit I **(12 hours)**

Automata Fundamentals: Introduction to formal proof – Additional forms of Proof – Inductive Proofs – Finite Automata – Deterministic Finite Automata – Non-deterministic Finite Automata – Finite Automata withEpsilon Transitions.

Unit II **(12 hours)**

Regular expressions and languages: Regular Expressions – FA and Regular Expressions – ProvingLanguages notto be regular – Closure Properties of Regular Languages – Equivalence and Minimization of Automata.

Unit III **(12 hours)**

Context Free Grammar and Languages: CFG – Parse Trees – Ambiguity in Grammars and Languages – Definition of the Pushdown Automata – Languages of a Pushdown Automata – Equivalence of Pushdown Automata and CFG, Deterministic Pushdown Automata.

Unit IV **(12 hours)**

Properties of Context Free Languages : Normal Forms for CFG – Pumping Lemma for CFL – ClosureProperties of CFL – Turing Machines – Programming Techniques for TM.

Unit V **(12 hours)**

Undecidability: Non Recursive Enumerable (RE) Language – Undecidable Problem with RE – Undecidable Problems about TM – Post's Correspondence Problem, The Class P and NP.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the language hierarchy, Turing machines and their capability and undecidable problems and NP class problems

CO2: Apply the theoretical foundations of computer science from the perspective of formal languages

CO3: Illustrate finite state machines to solve problems in computing and various problems of applying normal form techniques push down automata and Turing Machines

CO4: Evaluate automata for any given pattern and find its equivalent regular expressions and construct context free grammar for various languages

CO5: Design a context free grammar for any given language and design Finite Automatas for different regular expressions and languages

Text Book:

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, *Introduction to Automata Theory Languages and Computation*, Pearson Education, Third Edition, 2007.

Reference Books:

1. K. L. P Mishra, N. Chandrashekaran, *Theory of Computer Science - Automata Languages and Computation*, Second edition, 2003.
2. H.R.Lewis and C.H.Papadimitriou, *Elements of the theory of Computation*, Prentice Hall of India, Second Edition, 2003.
3. J.Martin, *Introduction to Languages and the Theory of Computation*, Tata McGraw Hill, Third Edition, 2003.
4. Micheal Sipser, *Introduction of the Theory and Computation*, Thomson Brokecole, 1997.

E-Resources:

1. https://nptel.ac.in/courses/106/104/106104148/
2. https://nptel.ac.in/courses/106/104/106104028/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	1	9	9	9	**49**
CO2	9	9	3	1	9	9	9	**49**
CO3	9	9	3	1	9	9	9	**49**
CO4	9	3	3	1	9	9	9	**43**
CO5	9	9	3	1	9	9	9	**49**
Total	**45**	**39**	**15**	**5**	**45**	**45**	**45**	**239**

Low-1 Medium-3 High-9

SEC V - PHP Programming Lab

(For Students Admitted from 2022-23)

Semester: V **Hours/week: 2**
Subject Code: IBCPS54P **Credit: 2**

Course Objectives:

1. To understand the concepts of regular expressions including modifiers, operators and meta characters
2. To develop PHP programs that use various PHP library functions and that manipulate files and directories

Program List:

1. Develop a PHP program to print Sum of digits
2. Develop a PHP program to print factorial of a number
3. Develop a PHP program to display count, from 10 to 20 using loop
4. Develop a PHP program to print prime number
5. Develop a PHP program to check Armstrong number
6. Develop a PHP program to check Palindrome number
7. Develop a PHP program to swap two numbers with and without using third variable
8. Develop a PHP program to find if the given year is leap year or not
9. Develop a PHP program to reverse the number with strrev ()
10. Develop a PHP program to show day of the week (for eg: Monday) based on numbers using Switch/case statements
11. Develop a PHP program to print number triangle
12. Develop a PHP program to print alphabet triangle
13. Develop a PHP program to check student grade based on the marks using if-else statement
14. Develop a PHP program Using nested for loop that creates a chessboard

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe the fundamentals of PHP Language in trivial problem solving.
CO2: Determine solution to a problem and apply control structures.
CO3: Simplify the use of Strings and string handling functions.
CO4: Justify real time applications using PHP language features.
CO5: Build skill on problem solving by constructing algorithms

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	9	1	1	**25**
CO2	9	3	3	3	9	3	3	**33**
CO3	9	3	1	3	9	9	3	**37**
CO4	9	3	3	3	9	9	3	**39**
CO5	9	3	3	3	9	9	3	**39**
Total	**45**	**15**	**11**	**13**	**45**	**31**	**13**	**173**

Low-1 Medium-3 High-9

Core XIII - Software Engineering
(For Students Admitted from 2022-23)

Semester: VI **Hours/week: 6**
Subject Code: IBCPC61 **Credit: 5**

Course Objectives:

1. To provide the idea of decomposing the given problem into analysis, design, implementation, testing and maintenance phases and provide an idea of using various process models in the software industry according to given circumstances
2. To gain knowledge of how analysis, design, implementation, testing and maintenance processes are conducted in a software project

Unit I **(18 hours)**

Introduction: The Nature of Software – Changing nature of software – **Software Engineering:** The Software Process - Software Engineering Practice - Software Development Myths - **Software Process Structure:** A Generic Process Model - Defining a Framework Activity - Identifying a Task set -Process Patterns – **Process Models:** - Prescriptive Process Models – Specialized Process Models.

Unit II **(18 hours)**

Understanding Requirements: Requirements Engineering - Eliciting requirements- Developing Use Cases- Building the Analysis Model- Negotiating Requirements- Requirements Monitoring - Validating Requirements **- Requirements Modeling:** Scenario Based Modeling.**Design Engineering:** Design within the context of software engineering – Design Process – Design Concepts Design Model – **Architectural Design: -** Architectural Styles **-** Architectural Design.

Unit III (**18 hours)**

Software Testing Strategies: A strategic approach to software testing – strategic issues – test strategies for conventional software – test strategies for object- oriented software – validation testing – system testing – the art of debugging.**Testing Conventional Applications:** Software Testing Fundamentals –White-Box testing – Basis Path Testing – Control Structure Testing – Black-Box Testing – Model-Based Testing - Testing for Real-Time Systems - Patterns for Software Testing.

Unit IV **(18 hours)**

Risk Management: Reactive Versus Proactive Risk Strategies – Software Risks - Risk Identification – Risk Projection – Risk Refinement – Risk Mitigation, Monitoring and Management – RMMM Plan **Quality concepts**: – Software Quality – Achieving Software Quality – **Review Techniques:** – Review Metrics and Their Use – Informal Reviews - Formal Technical Reviews – **Software Quality Assurance**: - Elements of Software Quality Assurance – SQA Processes and Product Characteristics - SQA Tasks, Goals, and Metrics Formal Approaches to SQA – Statistical Software Quality Assurance - Software Reliability – The ISO 9000 quality standards – SQA plan.

Unit V **(18 hours)**

Agile Development: - Agility and the Cost of Change- Agile Process - Extreme Programming- Other Agile Process Models - A Tool Set for the Agile Process. **Human Aspects of Software Engineering:** - Characteristics of a Software Engineer - The Software Team - Team Structures - Agile Teams - Software Engineering Using the Cloud -

Collaboration Tools - Global Teams.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain a process model for a software project Development

CO2: Apply Project Management and Requirement analysis, Principles to software project development

CO3: Analyze the cost estimate and problem complexity using various estimation techniques

CO4: Compare the SRS, Design document, Project plan of given software system.

CO5: Generate test cases using the techniques involved in selecting: (a) White Box testing (b) Block Boxtesting

Text Book:

1. Roger S. Pressman, *Software Engineering A Practitioner's Approach*, Tata McGraw Hill, Eigth Edition, 2015.

Reference Books:

1. Ian Sommerville, *Software Engineering*, Pearson Education, Seventh Edition, 2004.
2. Samarjeet kaur, Sandhir Sharma , P.P Singh, *Software Engineering – Complete Course Book*, Deep &Deep Publications, 2006.
3. Waman S Jawadekar, *Software Engineering – Principles and Practice*, Tata McGraw Hill Education Private Limited, 2004.

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105182/

2. https://www.coursera.org/courses?query=software%20engineering

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	3	9	9	3	**45**
CO2	9	9	9	3	9	9	9	**57**
CO3	9	9	9	3	9	9	9	**57**
CO4	9	9	3	3	9	9	9	**51**
CO5	9	9	9	3	9	9	9	**57**
Total	**45**	**45**	**33**	**15**	**45**	**45**	**39**	**267**

Low-1 Medium-3 High-9

Core XIV - Computer Networks

(For Students Admitted from 2022-23)

Semester: VI **Hours/week: 6**

Subject Code: IBCPC62 **Credit: 4**

Course Objectives:

1. To build an understanding of the fundamental concepts of computer networking
2. To identify the different types of network topologies and protocols and enumerate the layers of the OSI and TCP/IP Model, Explain the function of each layers

Unit I **(18 hours)**

Introduction: Uses of Computer Networks-Network Hardware-Network Software- Reference Models-Example Networks-Network Standardization

Physical Layer: Guided Transmission Media-Wireless transmission.

Unit II **(18 hours)**

Data Link Layer: Data Link Layer Design Issues-Error Detection and Correction-Elementary Data linkProtocols- Sliding Window Protocols-Example Data Link Protocols

Medium Access Control Sublayer: Channel Allocation Problem-Multiple Access Protocols-Ethernet-Wireless LANs- Data Link Layer Switching.

Unit III **(18 hours)**

Network Layer: Network layer Design Issues-Routing Algorithms-Congestion Control Algorithms-Qualityof Service- Internetworking-Network Layer in the Internet.

Unit IV **(18 hours)**

Transport Layer: Transport Service-Elements of Transport Protocols-Congestion Control-InternetTransport Protocols: UDP –TCP.

Unit V **(18 hours)**

Application Layer: Domain Name System-Electronic Mail-World Wide Web: HTTP - Streaming Audio and Video.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the concepts of computer networks

CO2: Apply the protocols of computer networks in network design and implementation

CO3: Analyse functions of each layer in the OSI and TCP/IP reference model

CO4: Compare the working principle of various layer protocols

CO5: Design networks by using protocols of computer networks

Text Book:

1. Andrew S Tanenbaum, David. J. Wetherall, *Computer Networks***,** Pearson Education, Fifth Edition, 2021.

Reference Books:

1. Behrouz A Forouzan, *Data Communications & Networking*, Tata McGraw Hill, Fourth Edition, 2003.
2. Douglas E Comer, *Computer Networks and Internets*, Pearson Education, Fourth Edition, 2004.

E-Resources:

1. https://onlinecourses.swayam2.ac.in/ugc19_cs10/preview
2. https://onlinecourses.swayam2.ac.in/cec19_cs07/preview
3. https://nptel.ac.in/courses/106/105/106105081/

Course	Programme Outcomes

Outcomes								
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	1	3	9	**31**
CO2	9	1	3	3	1	3	9	**29**
CO3	9	1	3	3	1	9	9	**35**
CO4	9	1	3	3	1	9	9	**35**
CO5	9	3	3	3	1	9	9	**37**
Total	**45**	**9**	**15**	**15**	**5**	**33**	**45**	**167**

Low-1 Medium-3 High-9

Core XV - Computer Graphics

(For Students Admitted from 2022-23)

Semester: VI **Hours/Week: 5**
Subject Code: IBCPC63 **Credit: 4**

Course Objectives:

1. To acquire the fundamental concept and theory of computer graphics
2. To learn the important concept of drawing algorithm, clipping ,Color illumination , 2D & 3D transformation

Unit I **(15 hours)**

Introduction to Computer Graphics: Introduction-Non Interactive/Interactive Computer Graphics-Uses of Computer Graphics-Classification of Applications-Programming Language, Graphics and Operating Software.

Unit II **(15 hours)**

Output Primitives: Representing Image-Straight Line-Line Drawing Algorithms-DDA Algorithm- Breshenhams Line Algorithm-Circle Generating Algorithm-Midpoint Circle Algorithm-Ellipse Generating Algorithm-Midpoint Ellipse Generating Algorithm-Polygon Filling Algorithms-**Two Dimensional Transformations**: Basic Transformation-Matrix Representation of Homogenous Coordinates-Composite transformation-Other transformation.

Unit III **(15 hours)**

Windowing and Clipping: Viewing Transformation-Window to Viewport-Clipping-point Clipping-Line Clipping- Cohen Sutherland Line Clipping Algorithm -Liang Barsky Line Clipping Algorithm-Polygon Clipping-Sutherland Hodgeman Clipping Algorithm-Curve Clipping-Text Clipping.

Unit IV **(15 hours)**

3D Concepts and Techniques: Introduction-3D Transformation-3D Modeling Schemes-Projection- Ortho Graphic Projection-Isometric Projection-Oblique Projection-Perspective Projection-One Two Three point Perspective-Viewing Parameter-Object-3D Clipping.

Unit V **(15 hours)**

Surface Generation: Introduction-Quadric surface-Bezier Surface - B-Spline Surface. **Color**

and IlluminationModel: Introduction-Colors-Illumination Model and Light Sources-Specular Reflection-Intensity Attenuation- Shadow- Reflectivity and Refractivity-Radiosity Model**. Animation:**Devices for Producing Animation- Computer Assisted Animation-Video Formats - Frame-by-frame Animation Techniques - Real-Time Animation Techniques - Animation Software.

Course Outcomes:

After successful completion of this course, student will beable to

CO1: List out the computer graphics devices
CO2: Demonstrate different graphical objects like rescale, transmit, skew and rotate
CO3: Apply various transformations to 2D and 3D graphics objects
CO4: Analyze algorithms for clipping
CO5: Elaborate various projections of 3D objects, know the method of color illumination and animationin graphics model

Text Book:

1. Amarendra N Sinha Arun D Udai, *Computer Graphics*, Tata Mc Graw Hill Publishing, 2008.

Reference Books:

1. Donald Hearn, M.Pauline Bsker, *Computer Graphics*, Prentice Hall of India, Second Edition, 2001.
2. William M.Newman, Robert F.Sproull, *Principles of Interactive Computer graphics*, Tata McGraw Hill, 1997.
3. Foley, Van Dam, Feiner, Hughen, *Computer graphics Principles and Practice*, Addision-Wesley Publishing Company, Second Edition,1990.

E- Resource:

1. https://www.geeksforgeeks.org/computer-graphics-2/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	3	9	3	9	**45**
CO2	9	3	3	3	3	3	3	**27**
CO3	9	9	3	9	3	1	9	**43**
CO4	9	3	3	3	3	3	3	**27**
CO5	9	3	3	3	3	3	9	**33**
Total	**45**	**27**	**15**	**21**	**21**	**13**	**33**	**175**

Low-1 Medium-3 High-9

Core XVI- Project

(For Students Admitted from 2022-23)

Semester: VI **Hours/Week: 6**
Subject Code: IBCPC64PW **Credit: 5**

Course Objectives:

1. To impart the students to implement project by data collection and selecting the software tool
2. To enhance the students to select the programming language for implementing the project

Project shall be a group project (group consisting of maximum of two members)

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Identify goals, constraints, deliverables, performance criteria and resource requirements inconsultation with stakeholders
CO2: Apply the plan by executing the code
CO3: Illustrate the various aspects of software development for the total project
CO4: Evaluate the entire software project according to the specific problem
CO5: Develop the software project by executing with the various data.

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	9	9	3	9	**57**
CO2	9	3	9	3	9	9	9	**51**
CO3	9	3	9	9	9	9	9	**57**
CO4	9	3	9	9	9	9	9	**57**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**27**	**45**	**39**	**45**	**39**	**45**	**285**

Low-1 Medium-3 High-9

DSE III - a) Mobile Application Development

(For Students Admitted from 2022-23)

Semester: VI **Hours/Week: 4**
Subject Code: IBCPE6A **Credit: 4**

Course Objectives:
1. To facilitate students to understand android SDK and to help students to gain a basic understandingof Android application development
2. To inculcate working knowledge of Android Studio development tool

Unit I **(12 hours)**
Introduction-Important of Mobile strategies, Mobile development today, Mobile myths, Mobile web vs Mobile App, benefits of mobile app, creating consumable web services for mobile devices- What is a web service, Web services languages. **Mobile user interface design**-understanding mobile platforms, using the toolsof mobile interface design.

Unit II **(12 hours)**
Introduction to Android-Android Features-Android Operating system-Downloading apps from Google play- Packages- Android Software Development Kit-Test Driving the Tip Calculator App in an Android Virtual Device-Building Great Android Apps-Android

Development Resources.

Unit III **(12 hours)**

Android Studio – Introduction - Technologies overview - Creating an App - Android Studio window - Building the Apps GUI with the Layout Editor-Adding an Image to the project, adding an app icon, changing RelativeLayout to a Linear Layout, orientation,Configuring the Textview's id, textsize property, Setting the Textview's textcolor, gravity, weight property, Adding an Image view to display the image, Previewing the Design.

Unit IV **(12 hours)**

Tip Calculator App-Introduction, Test-driving the Tip Calculator App-Technologies overview-Class activity, Activity lifecycle methods, arranging views with a GridLayout, Creating and Customizing the GUI with the Layout editor, Implementing interface TextWatcher for Handling EditText text changes, Building the GUI, Default Theme and customizing theme colors.

Unit V **(12 hours)**

Overview of Kotlin-Installation of Android Studio-Getting started with Hello World app-Creating a Registration form-Adding Radio Buttons-Adding spinner and Image-Creating a search App-URL Request- Display Search Result-Playing video using YouTube API.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the principles of Mobile strategies
CO2: Demonstrate the Android installing and configuring supporttools
CO3: Build and publishing Android app
CO4: Apply the knowledge of Android user interface
CO5: Develop Mobile application using Android and IOS

Text Book:

1.Paul Deitel, Harvey Deitel, Alexander Wald, *Android 6 for Programmers – An App driven Approach*, Pearson Education, Third Edition, 2016.

Reference Books:

1. Jeff McWherter, Scott GoWell, *Professional Mobile Application Development*, John Wiley & Sons Publication, 2012.
2. DonnFelker with Joshua Dobbs, *Android Application Development for Dummies*, John Wiley & Sons Publication, 2011.
3. Jerome (J. F) DiMarzio, *Android – A Prograammer's Guide*, Tata McGraw Hill, Eigth reprint, 2015.

E-Resources:

1. https://developer.android.com/
2. https://www.openxcell.com/mobile-app-development/
3. https://www.zoho.com/creator/application-development/mobile.html
4. https://spoken-tutorial.org/tutorial-search/?search_foss=Android+app+using+Kotlin&search language=English

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	9	3	3	9	3	9	45
CO2	9	9	3	9	9	9	9	57
CO3	9	9	3	9	9	9	9	57
CO4	9	3	3	3	9	3	9	39
CO5	9	9	3	3	9	3	9	45
Total	45	39	15	27	45	27	45	243

Low-1 Medium-3 High-9

DSE III - b) Compiler Design

(For Students Admitted from 2022-23)

Semester: VI **Hours/week: 4**

Subject Code: IBCPE6B **Credits: 4**

Course Objectives:

1. To understand the basic principles of compiler design
2. To acquire knowledge of various constituent parts, algorithms and data structures required to beused in the compiler

Unit I **(12 hours)**

Introduction- The structure of a compiler –Evolution of programming languages-Applications of compiler technology-**A Simple Syntax Directed Translator**: Syntax definition-syntax-directed translation.

Unit II **(12 hours)**

Parsing-Lexical Analysis-Symbol Tables-**Lexical Analysis**: The role of the lexical analyser-Input Buffering- Specification of Tokens-Recognition of tokens-The lexical analyser generator Lex-Finite Automata.

Unit III **(12 hours)**

Design of lexical analyser generator: DFA for lexical analyser-Important states of an NFA, Converting a regular expression directly to a DFA-Minimizing the number of states of a DFA-**Syntax Analysis**: Syntax errorhandling-error recovery strategies-Contex free grammers-Top down parsing: FIRST and FOLLOW –LL (1) Grammars-Bottom Up Parsing.

Unit IV **(12 hours)**

LR Parsing, More Powerful LR Parsers-Using Ambiguous Grammars-Parser Generators-Syntax-Directed Translation: Evaluation orders for SDD's –application of SDT-Syntax Directed Translation Schemes- **Intermediate Code Generation**: Variants of Syntax Trees-Three address code.

Unit V **(12 hours)**

Run time environment: Heap Management- Code Generation: The target language-Address in the Target Code-A Simple code generator - Peephole Optimization - Optimal Code generation for Expression - Dynamic Programming code- Generation - **Machine-Independent**

Optimization: Semantics preserving Transformations- CopyPropagation-Dead-Code Elimination-Code Motion.

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Define common forms of parsers
CO2: Illustrate compiler construction tools and describes the Functionality of each stage of compilationprocess
CO3: Construct the grammar for Natural Languages and find the Syntactical Errors/Semantic errors during the compilations using parsing techniques
CO4: Analyze different representations of intermediate code
CO5: Design to construct compiler for new languages

Text Book:
1.Alfred V Aho, Monica S Lam, Ravi Sethi, Jeffrey D Ullman, *Compiler Principles, Techniques & Tools*, Pearson Education, Second Edition, 2007.

Reference Books:
1. Alfred V. Aho, Jeffrey D. Ullman, *Principles of compiler design*, PearsonEducation, 2001.
2. Kenneth C. Louden, *Compiler Construction– Principles and Practice*, PWS Publishing, First Edition, 1997.
3. K. L. P Mishra, N. Chandrashekaran. *Theory of Computer Science - Automata Languages and Computation*, Prentice Hall of India, Second Edition, 2003.
4. Andrew W. Appel, *Modern Compiler Implementation C*, Cambridge University Press, 2004.

E- Resources:
1. https://www.geeksforgeeks.org/compiler-design-tutorials/
2. **NPTEL**:https://nptel.ac.in/courses/106/108/106108113/

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	9	9	9	9	**57**
CO2	9	3	3	3	3	3	3	**27**
CO3	9	9	3	3	3	9	3	**39**
CO4	9	3	3	3	3	9	3	**33**
CO5	3	3	3	3	3	3	3	**21**
Total	**39**	**27**	**15**	**21**	**21**	**33**	**21**	**177**

Low-1 Medium-3 High-9

SEC VI - Multimedia Lab II (Flash)

(For Students Admitted from 2022-23)

Semester: VI **Hours/week: 2**
Subject Code:IBCPS65P **Credit: 2**

Course Objectives:
1. To understand the basic concepts of animation

2. To gain knowledge about creating animated pictures using Blender

Program List
Blender
1. Create a coffee cup
2. Create a dinner table fork
3. Create a cup with wooden texture
4. Create a wooden table
5. Model a leather couch
6. Create a teddy bear
7. Create a photo realistic ring
8. Create a simple character
9. Create a stylized number animation
10. Animate a bouncing ball
11. Animate a shape of an object into another shape

Note: Questions for the external examination will be based on the concepts learnt

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Recognize the uses of various tools in Blender
CO2: Predict the steps that are needed to create animation
CO3: Critically analyze the required options to create animation with respect to its nature
CO4: Evaluate the use of 'Motion tween' in the givenconcept
CO5: Create animated scenes, animated logos, animated cartoon characters

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	3	3	9	3	**31**
CO2	9	1	9	3	3	9	3	**37**
CO3	9	1	9	3	9	9	9	**49**
CO4	9	1	3	3	9	9	9	**43**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**13**	**33**	**21**	**33**	**45**	**33**	**223**

Low-1 Medium-3 High-9

Extra Credit I- Corel Draw Lab

Semester: II
Subject Code: IBCPX2P **Credit: 2**

Course Objectives:
1. To understand various menu bars and graphic tools of Corel Draw
2. To make designs with very great accuracy

Program List
Corel Draw

1. Create a newspaper advertisement using CorelDraw's text formatting tools
2. Create a Bitmap Image and apply the auto tracing technique to that image
3. Create an object and apply transformation technique
4. Create a Parachute using the given special fills methods such as
   a) Filling object using foundation fills b) Pattern Fill c) Interactive Fill Tool
5. Create a certificate template & merged with data files
6. Create any kind of invitation
7. Create a Mirror object using Mirror command
8. Create any kind of LOGO using Fit Text to Path technique
9. Create a Flyer design.
10. Design a magazine cover.

Note: Questions for the external examination will be based on concept learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe the concepts of tools and techniques in CorelDraw
CO2: Apply the concept of Creation and modification of objects for graphic design purposes
CO3: Analyze various tools to design Flyers
CO4: Develop any kind of LOGO using techniques in CorelDraw
CO5: Build design magazine and presentations

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	9	1	1	**25**
CO2	9	3	3	1	9	1	3	**29**
CO3	9	3	3	3	9	3	3	**33**
CO4	9	3	3	3	9	3	3	**33**
CO5	9	3	9	3	9	3	9	**45**
Total	**45**	**15**	**19**	**11**	**45**	**11**	**19**	**165**

Low-1 Medium-3 High-9

Extra Credit II – Programming in Visual Basic Lab

Semester: III
Subject Code: IBCPX3P **Credit: 2**

Course Objectives:

1. To understand the concept of visual programming
2. To make designs with GUI

Program List

1. Write a Visual basic program to find the simple and compound interest
2. Write a Visual Basic program to check whether the given number is perfect or not
3. Write a Visual Basic program to check given number is prime or not
4. Write a Visual Basic program to check given number is Armstrong or not
5. Write a Visual basic program to implement all date & time functions and menus
6. Write a Visual basic program to calculate the age of a person using calendar control
7. Write a Visual basic program to perform all string manipulations

8. Write a Visual basic program to arrange the numbers in order

Note: - Questions for the External examination will be based on the concepts learnt

Course Outcomes

After successful completion of this course, student will be able to

CO1: Demonstrate the basics in visual basic programming in terms of control statements and functions

CO2: Apply the basic concept user defined function

CO3: Enhance problem solving, programming and debugging skills

CO4: Plan to implement the menu creation

CO5: Analyze and implement the various data control

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	1	9	9	3	**43**
CO2	9	3	9	3	9	9	9	**51**
CO3	3	9	1	1	3	1	9	**27**
CO4	9	3	9	1	9	9	3	**43**
CO5	9	1	9	3	9	9	3	**43**
Total	**39**	**25**	**31**	**9**	**39**	**37**	**27**	**207**

Low-1 Medium-3 High-9

Extra Credit III- R Tool Lab

Semester: IV

Subject Code: IBCPX4P **Credits: 2**

Course Objectives:

1. To understand the concept of R Tool
2. To implement statistics analysis

Program List

1. Write a Program to implementing correlation analysis
2. Write a Program to implementing regression analysis
3. Write a Program to implementing t-test
4. Write a Program to implementing z-test
5. Write a Program to implementing f-test
6. Write a Program to implementing chi-square test
7. Write a Program to implementing kruskal-wallis test
8. Write a Program to implementing likert scaling techniques
9. Write a Program to implementing analysis of variance (ANOVA)

Note: - Questions for External examination will be based on concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Demonstrate the basics in R programming in terms of constructs, control statements

and functions

CO2: Apply data analytics software
CO3: Enhance problem solving, programming and debugging skills
CO4: Plan the R programming from a statistical perspective
CO5: Analyze and implement the various data structures of R

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	1	9	9	3	**43**
CO2	9	3	9	3	9	9	9	**51**
CO3	3	9	1	1	3	1	9	**27**
CO4	9	3	9	1	9	9	3	**43**
CO5	9	1	9	3	9	9	3	**43**
Total	**39**	**25**	**31**	**9**	**39**	**37**	**27**	**207**

Low-1 Medium-3 High-9

Extra Credit V-Data Mining Lab

Semester: VI
Subject Code: IBCPX6P **Credit: 2**

Course Objectives:

1. To understand the concept of data mining tool
2. To implement various data mining algorithm

Program List

1. Create data-set in .arff file format. Demonstration of preprocessing on WEKA data-set.
2. Demonstration of Association rule process on data-set contact lenses.arff /supermarket using apriori algorithm
3. Demonstration of classification rule process on WEKA data-set using j48 algorithm
4. Demonstration of classification rule process on WEKA data-set using Naive Bayes algorithm
5. Demonstration of clustering rule process on data-set iris.arff using simple k-means

Note: - Questions for External examination will be based on concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to
CO1: Describe Data mining concept.
CO2: Apply the knowledge of data mining techniques
CO3: Adapt to new data mining tools.
CO4: Explore recent trends in data mining such as web mining, spatial-temporal mining
CO5: Build different types of algorithm

Course	Programme Outcomes

Outcomes								
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	9	1	1	**25**
CO2	9	3	3	1	9	1	3	**29**
CO3	9	3	3	3	9	3	3	**33**
CO4	9	3	3	3	9	3	3	**33**
CO5	3	3	9	3	9	3	9	**39**
Total	**39**	**15**	**19**	**11**	**45**	**11**	**19**	**159**

Low-1 Medium-3 High-9

B Com with Computer Applications

Three Years Regular Programme

(For Students Admitted From 2022 – 2023)

Program Specific Outcomes: (PSOs)

On completion of this programme, student will be able to gain

PSO1: Disciplinary Knowledge in the concepts of commerce and its application.

PSO2: Effective Communication skills to lead the group and organization in the attainment of overall objective

PSO3: Research Skills and Critical Thinking to identify, understand, analyse and assess the business problems and to suggest solutions

PSO4: Moral, Ethical Awareness/ Reasoning to run the business with Corporate Social Responsibility

PSO5: Professional skills to be placed in ever changing challenging situations.

PSO6: Entrepreneurial Skills to explore, innovate, plan, execute, start and run business as job providers

PSO7: Life long Learning Skills to be self-directed for independent thinking and action to tackle day today problems.

PREAMBLE

The Board of Studies of Computer Science revamped the curriculum with the following changes

Core Papers

- Course content for "Principles of Information Technology" has been changed
- "Web Designing Lab" in Semester V has been changed as core subject and credits for this course is updated
- Course content for "Web Designing" in Semester V is changed

Ability Enhancement Compulsory Course

- All Allied courses are renamed as "Ability Enhancement Compulsory Course" (AECC)
- Hours/Week and credits for the course "Programming in C" has been changed
- New course content for "Programming in C" is framed
- Lab list for "Programming in C lab" is modified
- The course "Database Query Language" is renamed as "Database Management

System" and it incorporates new course content. Hours/Week and Credit for this course is also changed

- The course "RDBMS lab" is changed as "DBMS Lab" and its lab list is also modified
- The course "Visual Programming" is replaced with "PHP Lab" and its credits and Hours/week is changed
- The course "Graphics and Animation" is replaced with "Programming in Java" and its credit and Hours/Week is changed
- The course "Programming in Java Lab" is also introduced

Skill Enhancement Course

- All 'Skill Based Elective' courses are renamed as 'Skill Enhancement Course'
- New course content for 'PC Package Lab' is framed
- The course 'Designing Lab(Photoshop)' is renamed as 'Designing Lab I' and few modifications are done in its lab list
- The allied course 'Graphics and Animation Lab' is changed as 'Skill Enhancement Course'
- The course 'Designing Lab –II (Corel Draw)' is renamed as 'Designing Lab II'

Discipline Specific Elective

- All 'Core Elective' courses are renamed as 'Discipline Specific Elective'

Others

- 'Program Outcomes' are included
- 'Program Specific Outcomes' are modified
- Course Objectives' and 'CO-PO Mapping' are included in all the courses

PROGRAMME STRUCTURE - PROGRAMME CODE: UCC

Sem	Subject code	Part	Course	Subject Title	Hours/ Week	Credits	CIA	ESE	TOTAL
I		I	Language I	Tamil I / Arabic I / Hindi I	5	3	40	60	100
		II	Language II	English I a (or) b	5	3	40	60	100
		III	Core I	○ Financial Accounting- I	6	5	40	60	100
	IBCCC12	III	Core II	**Principles of Information Technology**	5	4	40	60	100
	IBCCA13	III	AECC I	**Programming in C**	3	2	40	60	100
	IBCCA14P	III	AECC II	**Programming in C Lab**	2	2	40	60	100
	IBCCS15P	IV	SEC I	**PC Package Lab**	2	2	-	50	50
				Library / Browsing	1	-	-	-	-
				Remedial/ Games	1	-	-	-	-
				TOTAL	**30**	**21**	**240**	**410**	**650**

II		I	Language I	Tamil II / Arabic II / Hindi II	5	3	40	60	100
		II	Language II	English II a (or) b	5	3	40	60	100
		III	Core III	Financial Accounting-II	5	5	40	60	100
		III	Core IV	Business Statistics	4	4	40	60	100
	IBCCA23	III	AECC III	**Data Base Management System**	3	2	40	60	100
	IBCCA24P	III	AECC IV	**DBMS Lab**	2	2	40	60	100
	IBCCS25P	IV	SEC II	**Designing Lab I**	2	2	-	50	50
		IV	GIC I	Environmental Science	2	2	-	50	50
				Library / Browsing / Lectures	1	-	-	-	-
				Remedial	1	-	-	-	-
			Extra Credit	Business Communication / * Online Course	-	2	-	100	100
				TOTAL	**30**	**23+2**	**240**	**460+ 100**	**700+ 100**
III		I	Language I	Tamil III / Arabic / Hindi III	5	3	40	60	100
		II	Language II	English III a (or) b	5	3	40	60	100
		III	Core V	E-Commerce	4	4	40	60	100
		III	Core VI	Partnership Accounting	4	4	40	60	100
	IBCCA33P	III	AECC V	**PHP Lab**	4	4	40	60	100
		IV	SEC III	Digital Marketing	2	2	-	50	50
		IV	OEC		2	2	-	50	50
		IV	GIC II	Human Rights	2	2	-	50	50
		V	Extension	NSS/CSS	2	2	100	-	100
			Extra Credit	Marketing/ *Online Course	-	2	-	100	100
				TOTAL	**30**	**26+2**	**300**	**450+ 100**	**750+ 100**
IV		I	Language I	Tamil IV / Arabic IV / Hindi	5	3	40	60	100
		II	Language II	English IV a (or) b	5	3	40	60	100
		III	Core VII	Banking Law and Practice	5	4	40	60	100
		III	Core VIII	Financial Markets & Services	4	4	40	60	100
	IBCCA43	**III**	**AECC VI**	**Programming in Java**	3	2	40	60	100
	IBCCA44P	**III**	**AECC VII**	**# Programming in Java Lab**	2	2	40	60	100
		IV	SEC IV	Business Research	2	2	-	50	50

				Methods					
		IV	GIC III	Life Skills and Value Education	2	2	-	50	50
		IV	OEC		2	2	-	50	50
			Extra Credit	Business Environment/ *Online Course	-	2	-	100	100
				TOTAL	**30**	**24+2**	**240**	**510+ 100**	**750+ 100**
V		III	Core IX	○ Income Tax Law & Practices –I	6	6	40	60	100
		III	Core X	Accounting Package Lab(Tally)	5	3	40	60	100
	IBCCC53	III	Core XI	**Web Designing**	4	3	40	60	100
	IBCCC54P	III	Core XII	**Web Designing Lab**	3	3	40	60	100
		III	DSE I	Corporate Accounting /Corporate Law	4	4	40	60	100
		III	DSE II	Management Accounting / Corporate Finance	4	4	40	60	100
	IBCCS55P	IV	SEC V	**Graphics and Animation Lab**	2	2	-	50	50
		IV	GIC IV	Women Entrepreneurship	2	2	-	50	50
			Extra Credit	Employability Skills/ *Online Course	-	2	100	-	100
				TOTAL	**30**	**27+2**	**240+ 100**	**460**	**700+ 100**
VI		III	Core XIII	Accounting for Public Utility	6	5	40	60	100
		III	Core XIV	Income Tax Theory Law and Practice -II	6 (T-4 P-2)	5	40 (T-20 P-20)	60	100
		III	Core XV	Project	6	4	40	60	100
		III	Core XVI	Practical Auditing	5	4	40	60	100
		III	DSE III	Human Resource Management / Services Marketing	4	4	40	60	100
	IBCCS65P	IV	SEC VI	**Designing Lab II**	2	2	-	50	50
				Library/Browsing	1	-			
			Extra Credit	Total Quality Management / *Online Course	-	2	-	100	100
				TOTAL	**30**	**24+2**	**200**	**350 +100**	**550+ 100**
				GRAND TOTAL	**180**	**145+10**	**1460+ 100**	**2640 +400**	**4100+ 500**

*For Online Course credit alone will be assigned on submission of certificate obtained by appearing for online examination from EdX, Spoken Tutorial, NPTEL or Coursera etc.
#For internship course, refer www.internshala.com
- For online course integration, syllabus will be taken from spoken tutorial

AECC-Ability Enhancement Compulsory Course
SEC-Skill Enhancement Course
DSE-Discipline Specific Elective
OEC-Open Elective Course

Core II – Principles of Information Technology

(For Students Admitted From 2022 – 23)

Semester: I **Hours/Week: 5**
Subject Code: IBCCC12 **Credit: 4**

Course Objectives:

1. To know the generation of computers and various I/O devices
2. To understand about new developments in the digital communication and Networks

Unit I **(15 hours)**

Computer System: Algorithms-Simple model of Computer - Characteristics of a Computer - Problem solving of a computer. **Data Representation:** Representation of a computer-Integer-Fractions-Hexadecimal- Decimal to Binary Conversion-Error Detecting Code. **Input/output Units:** Traditional Computer Input/output units-other Input Technologies-Computer Output Devices.

Unit II **(15 hours)**

Computer Memory: Memory Cell-Memory Organization-ROM-Serial Access Memory-Physical Devices Used to Construct Memories-Magnetic Hard Disk-CDROM-Magnetic Tape Drive-Memory Hierarchy. **Computer Generation:** First Generation-second Generation-Third Generation-Fourth Generation-Fifth Generation-Moore Law-Classification of Computers.

Unit III **(15 hours)**

Computer Architecture: Interconnection of Units-Processor to Memory Communication-I/O Devices to processor Communication-Interrupt Structures-Multiprogramming. **Operating systems:** Batch Operating System-Multiprogramming Operating system-Time sharing Operating System-On-Line and Real Time systems-UNIX Operating Systems.

Unit IV **(15 hours)**

Computer Network: Communication Protocols-LAN-Using Public switched Telephone Network to Connect Computers-Interconnecting Networks-Internet and WWW-Internet Security. **Voice and Data Communications:** Communication Channels-Allocation of Communication Channel- Physical Communication Media-Public Switched Telephone Networks-Cable Modems-Cellular Communication Systems-Spread Spectrum Technology-Wireless LAN-WiMAX.

Unit V **(15 hours)**

Multimedia Data Acquisition: Image Acquisition-Storage formats for pictures-Compression of Video Data- MPEG Compression Standard-Acquiring and Storing Audio Signals-Compression of Audio Signals-Audio Signal Processing. **Emerging Computing Environments:** Current Computing Scenario-Peer to peer computing-Grid computing-Cloud Computing.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Summarize the concept of Computer System, Architecture, Network and Memory

CO2: Explain how computers are networked and how an operating system interacts with hardware

CO3: Illustrate the working of Voice and Data Communication Systems and Networks

CO4: Evaluate and Measure the performance of Computer security and Virus

CO5: Develop the applications in Multimedia and Cloud Computing

Text Book:

1. V Raja Raman, Neeharika Adabala, *Fundamentals of Computers***,** PHI Learning Private Limited,2018.

Reference Books:

1. Alex Leon, Mathews Leon, *Fundamentals of Information Technology***,** Tata McGraw Hill Education, Fourth Edition, 2007.
2. Bethesda MD, *Planning for Integrated Academic Information Management Systems,* Proceedings of a symposium sponsored by the National Library of Medicine, 1984.

E-Resources:

1. https://www.coursera.org/courses?query=computer%20fundamentals
2. https://www.classcentral.com/course/swayam-computer-fundamentals-13950

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	3	9	3	9	**37**
CO2	9	3	3	3	3	9	9	**39**
CO3	9	1	9	9	3	3	9	**43**
CO4	3	1	3	9	9	3	3	**31**
CO5	9	1	9	3	3	9	9	**43**
Total	**39**	**9**	**25**	**27**	**27**	**27**	**39**	**193**

Low-1 Medium-3 High-9

AECC I - Programming in C

(For Students Admitted From 2022-23)

Semester: I **Hours/week: 3**

Subject Code: IBCCA13 **Credit: 2**

Course Objectives:

1. To improve the knowledge of complete understanding of Programming language C
2. To Enhance the students to understand the significance of functions, arrays, strings, pointers and structures

Unit I **(9 hours)**

Introduction to C Programming: C Character Set–Writing first program of C-Identifiers and Keywords- A more useful C Program- Entering the program into the computer - Data types- Constants-Variables and Arrays-Declarations-Expressions- Statements **Operators and Expressions:** Arithmetic Operators – Unary Operators-Relational and logical - Assignment Operators- The conditional Operators.

Unit II **(9 hours)**

Data Input and Output: Preliminaries – The getchar function – The putchar function – The scanf function – The printf function – gets and puts function **Control Statements:** Preliminaries – **Branching:** The If-else Statement - Looping – while statement –do-while statement –for statement – nested control structures – switch statement.

Unit III **(9 hours)**

Functions: A brief overview-Defining function-Accessing a function - Function prototypes-Passing argument to a function -Recursion. **Program Structure:** Storage classes-Automatic variables -External variables -Static variables -Multi File programs.

Unit IV **(9 hours)**

Arrays: Defining an Array –Processing an Array –Passing arrays to Functions–Multidimensional arrays. **Strings:** Defining a String – NULL Character – Initialization of Strings – Reading and writing a string – Processing strings – Character arithmetic – Searching and sorting of strings.

Unit V **(9 hours)**

Pointers: Fundamentals – Pointer Declarations – Passing pointers to a function – Pointers and one dimensional arrays – Dynamic memory allocation – Operations on pointers - Pointers and multidimensional arrays–Arrays of Pointers. **Structures and Unions:** Defining a Structure – Processing a Structure – User defined data types – Structures and pointers – Unions.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe the basic programming knowledge of C, operators and expressions
CO2: Demonstrate data input, output, control statements & functions
CO3: Analyze program structure and arrays
CO4: Evaluate strings and pointers
CO5: Formulate structures, unions and file handling

Text Book:

1. Byron Gottfried, *Programming with C*, Tata McGraw Hill, Fourth Edition, 2018.

Reference Books:

1 . Balagurusamy E, *Programming in ANSI C*, Tata McGraw-Hill Publishing Company, Sixth Edition, 2012.

2. Venugopal K R, Sudeep R Prasad, *Programming with C*, Tata McGraw-Hill, 2008.
3. Mullish, Hentry Cooper, Herbert, *The Spirit of C - An Introduction to Modern Programming*, Jaico Publishing House, Third Edition, 2006.

E - Resources:

1. https://onlinecourses.nptel.ac.in/noc19_cs42/preview
2. https://nptel.ac.in/courses/106/105/106105171/
3. https://onlinecourses.nptel.ac.in/noc21_cs01/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	9	9	3	9	**45**
CO2	9	3	3	3	9	3	9	**39**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	3	3	3	9	3	9	**39**
CO5	9	9	9	3	9	9	9	**57**
Total	**45**	**21**	**21**	**21**	**45**	**27**	**45**	**225**

Low-1 Medium-3 High-9

AECC II – Programming in C Lab

(For Students Admitted From 2022 – 23)

Semester: I **Hours/week: 2**
Subject Code: IBCCA14P **Credit: 2**

Course Objectives:

1. To introduce the field of programming using C language
2. To enhance the analyzing and problem solving skills and use the same for writing programs in C

List of Programs

Formula Substitution

1. Develop a C program to find largest number among three numbers
2. Develop a C program to find the sum of the digits of a given Integer.
3. Develop a C program to generate the Fibonacci series
4. Develop a C program to check whether a given number is Armstrong or not
5. Develop a C Program to find the area of shapes using switch case
6. Develop a C program to check whether the given number is palindrome or not

Arrays

7. Develop a C program to check whether the element is present in the given list or not
8. Develop a C program to sort the numbers in ascending order
9. Develop a C program to perform matrix addition

Conversion

10. Develop a C program to convert the case of given string from upper case to lower case
11. Develop a C program to convert a binary number to its decimal equivalent

Function

12. Develop a C program to find the factorial of a given number using recursive and non-recursive function

Structure

13. Develop a C program to prepare student mark list using structure
14. Develop a C program to find average of 10 numbers using pointers

Note:-Questions for Internal and External examination will be based on concept learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Remember the control structures and loops
CO2: Apply the concepts of functions and pointers
CO3: Analyze the concepts of Structures and arrays
CO4: Evaluate string handling functions
CO5: Create programs with pointers, arrays, structures

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	9	9	**37**
CO2	9	3	3	1	9	9	9	**46**
CO3	9	3	3	1	9	9	9	**37**
CO4	9	3	3	1	9	9	9	**37**
CO5	9	3	3	1	9	9	9	**37**
Total	**45**	**15**	**15**	**5**	**45**	**45**	**45**	**185**

Low-1 Medium-3 High-9

SEC I – PC Package Lab

(For Students Admitted From 2022 – 23)

Semester: I **Hours/ week: 2**
Subject Code: IBCCS15P **Credit: 2**

Course Objectives:

1. To acquire knowledge about word processing, spread sheet, Data base creation and slide preparation
2. To improve creative thinking in presentations

List of Programs

Word Processing

1. Create a word processing document consists of two pages in a Book named "XX" andthen do the following:
   a) Formatting Text, Alignment and Font Style

b) Perform Find and Replace
c) Add Header and Footer option to specify name of the Book Chapter Heading and page number in all pages

2. Create a word processing document having details of our college courses using bulleted and numbered lists. Type the title using Word
3. Design an invitation to invite seniors for a farewell party and use Font Setting/Page Borders/Word Art/Clip Art/Symbols in it
4. Create a Newsletter Article (using Columns, Drop cap)
5. Create your class time table (using Table)
6. Use Mail Merge to create many letters to send it to more recipients
7. Create your resume in a word document

Spread Sheet

1. Create a Spreadsheet consists of Student details and then do the following:
   a. Calculate student wise total and subject wise total.
   b. Find maximum and minimum marks of the subject.
   c. Grade is calculated as
      i. If % of marks >=90, then grade A
      ii. If % >=80 and <90, then grade B
      iii. If % >=70 and <80, then grade C
      iv. If % >=60 and <70, then grade D
      v. If % < 60, then grade F
2. Create a Spreadsheet having employee details suitably and then do following.
   a. Use functions to calculate Net Pay and Gross Pay.
   b. Perform conditional formatting and validation.
   c. Create a chart for these details
3. Create a purchase order list for a company.
   a. Prepare a purchased item list with price
   b. Prepare a flow chart for the price wise item.
4. Create a macro

Presentation

1. Create a presentation showing various activities of your department and applySlide transition and background designs

2. Create a presentation showing various activities of your college. Apply animations andinsert Audio in this presentation
3. Create a presentation using design templates and then perform the following one:
   a. Include Table and Pictures b.Set time duration for each slide

4. Include Hyperlink within slides and link other documents

Database

1. Create a Student Database having Name, Reg no, Tamil, English, Maths, Total, and Average. Calculate Total and Average and apply validation.
2. Create an Inventory database having Item Name, Item no, Quantity and Price. Perform query operation to retrieve data.
3. Create a form to enter the details of the Book database.

4. Create a report for the Book database.

Note:- Questions for Internal and External examination will be based on concepts learnt.

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Recall various options of Office Applications
CO2: Identify the icons to work with document, presentation, spreadsheet and database
CO3: Simplify the process of creating reports to solve the problems of manual report handling
CO4: Compare the options of different Office Applications to use appropriately
CO5: Create Presentations, Advertisements, Reports etc for enterprises

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	3	9	3	9	**45**
CO2	9	9	3	9	9	9	9	**57**
CO3	9	9	3	9	9	9	9	**57**
CO4	9	3	3	3	9	3	9	**39**
CO5	9	9	3	3	9	3	9	**45**
Total	**45**	**39**	**15**	**27**	**45**	**27**	**45**	**243**

Low-1 Medium-3 High-9

AECC III – Database Management System

(For Students Admitted from 2022-23)

Semester: II **Hours/week: 3**
Subject Code: IBCCA23 **Credit: 2**

Course Objectives:

1. To understand the basic concepts of database systems, relational model, database design principles and SQL queries
2. To understand the design and implementation of a database security, Transaction concepts and advanced topics in DBMS

Unit I **(9 hours)**

Introduction to Database Systems: Introduction - Database Management Systems (DBMS) - An Overview of Database Management - Brief introduction to SQL - Embedded SQL - Dynamic SQL. **The Relational Model:** Relational Databases Primer - Relational Database Characteristics - Relational Algebra - Relational Calculus Keys - Entity and Referential Integrity –Views.

Unit II **(9 hours)**

Database Design: Design Considerations - Functional Dependency - Normalization and Normal Forms Entity/Relationship (E/R) Modeling - **Transaction Processing and**

Management: Transaction – Recovery - Transaction Models - Two-Phase Commit - Locking Deadlocks.

Unit III **(9 hours)**

Database Security: Threats and Risks -Cryptography - Digital Signature - Database Control - Users and Database Privileges - Types of Privileges - **Distributed Databases:** Distributed Database Concepts-Distributed Database Architectures - Advantages of Distributed Databases.

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Unit IV **(9 hours)**

Indexing and hashing: Hash organization - Bit mapped Indexing- Static Hashing -Dynamic Hashing - Comparison of ordered indexing & Hashing - **Transactions:** Transaction concept - Transaction state - Implementation of Atomicity and Durability – Recoverability.

Unit V **(9 hours)**

Object Technology and DBMS: An Introduction to Object Technology - Abstraction - Encapsulation - Inheritance - Object Technology and RDBMS - **Advanced Topics in DBMS:** Internet and DBMS - Multimedia Databases - Digital Libraries - Mobile Databases.

Course Outcomes:

After successful completion of this course, students will be able to:

CO1: Explore about DBMS concepts such as database designs, database modeling, security indexing and Hashing and Advanced DBMS
CO2: Extend about database design and security
CO3: Distinguish the Relational model, Indexing and Hashing
CO4: Apply Structured query language (SQL), Transactions and Constraints
CO5: Evaluate the functions of ODBMS and Advanced DBMS

Text Book:

1. Atul Kahate, *Introduction to Database Management Systems*, Pearson Education, Tenth Impression, 2012.

Reference Books:

1. Abraham Silberschatz, Henry Forth, S.Sudarshan, *Database System Concepts*, Tata McGrawHill, Fifth Edition, 2006.
2. C J Date, *An Introduction to Database System***,** Addison- Wesley Publishing Company, Third Edition, 1998.

E-Resources:

1. https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm
2. https://www.coursera.org/projects/introduction-to-relational-database-and-sql
3. https://onlinecourses.nptel.ac.in/noc21_cs04/preview

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total

CO1	9	1	3	3	3	3	3	**25**
CO2	9	1	1	3	3	3	3	**23**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	1	9	3	9	9	9	**49**
CO5	9	3	9	3	9	9	9	**51**
Total	**45**	**9**	**25**	**15**	**33**	**33**	**33**	**193**

Low-1 Medium-3 High-9

AECC IV – DBMS Lab

(For Students Admitted From 2022 –23)

Semester: II **Hours/week: 2**
Subject Code: IBCCA24P **Credit: 2**

Course Objectives:

1. To get practical knowledge on designing and creating Tables
2. To understand various queries such as relational constraints, joins, set operations, aggregate functionsand views

SQL Programs

DDL

1. Create an address table with fields name , doorno , street & city
   - Describe its structure
   - Alter the table to include pincode
   - Alter the table to modify street column
   - Drop the table

DML

2. Create a student table with regno, name, age and dept.
   - Insert records
   - Delete the students with age above 20
   - Truncate and drop the table

Functions

3. Create an employee table with fields eno , ename , sex ,age & years of experience
   - Find out the no. of female employees
   - Find out the employees with age ranging between 30 and 35
   - List out the employees who are working more than 5 years
4. Create a library file with fields accno, title, author, cost & no of copies
   - Arrange the books according to accno
   - Find out the total no. of books available in the library
   - Find out the book of minimum cost
5. Create a player table with fields name, sports(cricket,hockey,etc.),age & country
   - Find out the eldest and youngest player
   - Group players according to sports

- List out the Indian players

6. Write the SQL queries to illustrate all number functions
7. Write the SQL queries to illustrate date functions
8. Write the SQL queries to illustrate all string functions
9. Create an item table with field's item no, item name, quantity & price and insert records.Illustrate the comparison operators (between, like, in & isnull)
10. Create a table with the fields client no , client name & phone no Illustrate the set operatorsUnion, union all, minus & intersect
11. Create a student table with fields' regno, name, English, Tamil, Maths and Total & insert records
    - Arrange all records according to Total
    - Find the student who got first mark in Maths
    - List out the students whose name starts with "S"
12. Create an inventory table with fields' itemno, itemname, qnty, price and reorder level
    - Insert records
    - Update the qnty when it goes less than reorderlevel
    - List the items with price less than 100
13. Create an employee table with fields ecode, ename, age & salary and create a department table withfields ecode, designation, deptcode & dept. Illustrate joins and sub queries using the above tables.

Constraints

14. Create a vendormaster table with fields vencode,venname,place and phoneno
15. Create a ordermaster table with fields itemno, itemcode, vencode, qnty and orderdate . Illustrate the following constraints using the above tables
    - vencode as primary key in vendormaster
    - vencode as foreign key in ordermaster
    - phoneno as unique
    - place as notnull &
    - qnty > 100

Note: - Questions for Internal and External examination will be based on concept learnt

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Build DDL, DML Commands
CO2: Make use of implementing constraints in tables
CO3: Apply to create block structure programming language
CO4: Create the concepts of functions
CO5: Develop the Real Time database

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	3	3	3	**27**
CO2	9	1	1	3	3	3	3	**23**
CO3	9	1	3	3	3	9	3	**31**

CO4	9	1	3	3	9	3	9	**37**
CO5	9	3	9	3	3	9	9	**45**
Total	**45**	**9**	**19**	**15**	**21**	**27**	**27**	**163**

Low-1 Medium-3 High-9

SEC II –Designing Lab I

(For students admitted from 2022-23)

Semester: II **Hours/week: 2**
Subject Code: IBCCS25P **Credit: 2**

Course Objectives:

1. To understand the basic concepts of GIMP
2. To gain knowledge about various tools of GIMP

GIMP

1. Design a Business card
2. Create a logo
3. Convert an image into pencil drawing
4. Design a scenery using various brushes
5. Design a greeting card
6. Create clipping mask- place an image inside text
7. Create passport size photo
8. Animate a still photo
9. Create ashadow effect for an objkect
10. Create a mirror effect for an image
11. Apply the following tools in an image
    a.smudge b.Blur Sharpen c.Dodge Burn
12. Create a mosaic photo collage

Note: Questions for the External Examinations shall be based on the concepts learnt

Course Outcomes:

After completion of this course, student will be able to

CO1: Recognize the uses of various tools and effects in GIMP
CO2: Identify the steps to start designing with images
CO3: Simplify the process of desingning, editing, masking to solve the difficulties of designs
CO4: Support studios to create passport size photo
CO5: Design Visiting card, ID card, Birthday card, logo etc.

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	9	9	1	**43**
CO2	9	1	9	9	3	9	3	**43**
CO3	9	3	9	9	3	9	9	**51**
CO4	9	1	3	9	3	9	3	**37**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**17**	**39**	**39**	**27**	**45**	**25**	**237**

Low-1 Medium-3 High-9

AECC V – PHP Lab

(For students admitted from 2022-23)

Semester: III **Hours/week: 4**
Subject Code: IBCCA33P **Credit: 4**

Course Objectives:

1. To understand the concepts of regular expressions including modifiers, operators and meta characters
2. To develop PHP programs that use various PHP library functions and that manipulate files and directories

List of Programs

1. Develop a PHP program to print Sum of digits.
2. Develop a PHP program to print factorial of a number.
3. Develop a PHP program to display count, from 10 to 20 using loop.
4. Develop a PHP program to print prime number.
5. Develop a PHP program to check Armstrong number.
6. Develop a PHP program to check Palindrome number.
7. Develop a PHP program to swap two numbers with and without using third variable.
8. Develop a PHP program to reverse the number with strrev ().
9. Develop a PHP program to show day of the week (for eg: Monday) based on numbers using Switch/casestatements
10. Develop a PHP program to print alphabet triangle
11. Develop a PHP program to check student grade based on the marks using if-else statement
12. Develop a PHP program Using nested for loop that creates a chess board

Note: Questions For the External Examinations shall be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe the fundamentals of PHP Language in trivial problem solving
CO2: Determine solution to a problem and apply control structures
CO3: Simplify the use of Strings and String Handling functions
CO4: Justify real time applications using PHP language feat
CO5: Build skill on problem solving by constructing algorithms

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	9	1	1	**25**
CO2	9	3	3	3	9	3	3	**33**
CO3	9	3	1	3	9	9	3	**37**
CO4	9	3	3	3	9	9	3	**39**
CO5	9	3	3	3	9	9	3	**39**
Total	**45**	**15**	**11**	**13**	**45**	**31**	**13**	**173**

Low-1 Medium-3 High-9

AECC VI – Programming in Java

(For students admitted from 2022-23)

Semester: IV **Hours/week: 3**
Subject Code: IBCCA43 **Credit: 2**

Course Objectives:

1. To Gain knowledge about basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods etc
2. To Understand the fundamentals of object-oriented programming in Java, including definingClasses, objects, invoking methods etc. and exception handling mechanisms

Unit I **(9 hours)**

Fundamentals of Object Oriented Programming: Introduction, object oriented paradigm – Basic concepts of oops – benefits of oops – applications of OOPs. Java Evolution: java features – java Versus C and C++ - java and internet – java and WWW – web browsers **Overview of Java Language:** simple java program - more of java – application with two classes –java program structure – java tokens – java statements-implementing a java program.

Unit II **(9 hours)**

Constants, Variables, data types: Declaration of variables- giving values to variables-Scope of variables-symbolic constants- type casting- getting values of variables -standard default values-**Operators and Expressions**: Arithmetic operators-Relational operators-logical operators-assignment operators-increment and decrement operators-conditional operator-bitwise operator-special operators-arithmetic expressions-evaluation of expressions - precedence of arithmetic operators.

Unit III **(9 hours)**

Decision making and Branching: if statement –switch - ? : Operator –Decision Making and Looping: while statement – do statement – for statement – jumps in loops - labelled loops. **Classes, Objects and Methods**: Introduction – defining a class, field declaration–methods declaration– creating objects – accessing class members – constructors – methods overloading – static members – nesting of methods – inheritance – overriding methods – final variables and methods – final classes – finalizer methods.

Unit IV **(9 hours)**

Arrays Strings and Vectors: one dimensional array- creating an array –two dimensional arrays. **Multithreaded Programming**: creating threads- extending the thread class-stopping and blocking a thread - life cycle of a thread – using thread methods - thread exceptions-thread priority –synchronization – implementing the runnable interface.

Unit V **(9 hours)**

Applet Programming: Introduction –how applets differ from applications –building applet code – applet life cycle – creating an executable applet –designing a web page - applet tag – adding applet to html file –running the applet – more about applet tags –passing parameters

to Applets– aligning the display.

Text Book:

1. E. Balaguruswamy, *Programming with JAVA - A Primer*, McGraw Hill Professional, 2015.

Reference Books:

1. Herbert Schildt, *Java: The Complete Reference***,** McGraw Hill Professional, 2017.
2. Robert Sedgewick & Kevin Wayne, *Introduction to Programming in Java*, Addison Wesley,2017.
3. Y. Daniel Liang, *Introduction to Java Programming*, Brief Version Pearson Education 2017.

E-Resources:

1. https://spokentutorial.org/tutorialsearch/?search_foss=Java&search_language=English
2. https://onlinecourses.swayam2.ac.in/aic20_sp13/preview
3. https://spoken-tutorial.org/watch/Java/First+Java+Program/English/
4. https://onlinecourses.nptel.ac.in/noc19_cs84/preview

Course Outcomes:

After successful completion of this course, student will be able to:

CO1: Remember the importance of java with its data types, control statements and class fundamentals

CO2: Apply the concepts of inheritance, method overriding and implement packages and interfaces

CO3: Analyze the concept of exception handling and multi-threading

CO4: Evaluate string buffer handling functions

CO5: Create applet programming through awt controls, layout managers and menus

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	9	9	**37**
CO2	9	3	3	1	9	9	9	**46**
CO3	9	3	3	1	9	9	9	**37**
CO4	9	3	3	1	9	9	9	**37**
CO5	9	3	3	1	9	9	9	**37**
Total	**45**	**15**	**15**	**5**	**45**	**45**	**45**	**185**

Low-1 Medium-3 High-9

AECC VII – Programming in Java Lab

(For students admitted from 2022-23)

Semester: IV **Hours/week: 2**

Subject Code: IBCCA44P **Credit: 2**

Course Objectives:

1. To make the students to understand Programming language 'Java'
2. To enhance the students to develop inheritance and exception handling programs

List of Programs

Formula Substitution

1. Develop a java program to find the factorial and binomial coefficient
2. Develop a java program to calculate mean, variance and standard deviation
3. Develop a java programs for Number conversions (Decimal to Binary, etc.)

Checking

4. Develop a java program for perfect number checking

Generation

5. Develop java programs for Number generation (prime, Fibonacci)

Array

6. Develop a java program to arrange numbers in order
7. Develop a java program to perform matrix addition and subtraction

String

8. Develop a java program for String manipulations (case conversion, reversing, etc.)

OOP Concepts

9. Develop a java program for implementing inheritance
10. Develop a java program for implementing exception handling
11. Develop a java program for implementing multithreading

Note: - Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Outline Java programs that solve simple mathematical problems, number checking and generation

CO2: Demonstrate the concepts of String Manipulation

CO3: Illustrate OOP in Java programming like inheritance

CO4: Evaluate the multi-threaded programs

CO5: Develop Exception handling programs

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	3	9	**39**
CO2	9	3	3	3	9	3	9	**39**
CO3	9	9	3	9	9	9	9	**57**
CO4	9	9	9	9	9	9	9	**63**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**33**	**27**	**33**	**45**	**33**	**45**	**261**

Low-1 Medium-3 High-9

Core XI– Web Designing

(For students admitted from 2022-23)

Semester: V **Hours/week: 4**

Subject Code: IBCCC53 **Credit: 3**

Course Objectives:

1. To understand the uses of various HTML elements
2. To gain knowledge in designing web pages using CSS &Java Script

Unit I **(12 hours)**

Learning the basics of HTML: Structuring your HTML: The <html> Tag – The <head> Tag–The <body> Tag -The Title- Headings- Paragraphs – Comments. **Organizing information with lists**: Lists: An Overview – Numbered Lists – Unordered Lists – Definition Lists – Nesting of Lists – Other uses of Lists.

Unit II **(12 hours)**

Working with Links: Creating Links – Linking local pages using relative and absolute path names – Links to other documents on the web – Linking to specific places within documents. **Formatting Text with HTML and CSS:** Character Level Elements – Character formatting using CSS – Preformatted Text – Horizontal Rules – Line Break – Addresses – Quotations – Special Characters – Fonts and Font Sizes.

Unit III **(12 hours)**

Using CSS to style a site: Including Style Sheets in a page – Selectors – Units of measure – Using Color – Links – The Box Model. **Using images on your web pages**: **Inline Images in HTML**:The <img> Tag – Images and Text – Images and Links – Image Background – Image Map.

Unit IV **(12 hours)**

Building Tables: Creating Tables – Table Parts – Sizing tables, borders and cells – Table and cell color– Aligning your table content – Spanning multiple rows or columns. **Designing forms**: Using the <form> tag – Using the <label> tag – Creating form controls with the <input> tag – Using other formcontrols.

Unit V **(12 hours)**

Introducing JavaScript: The <script> tag - The JavaScript Language -Events. Working with Frames and Linked Windows- frames -Working with Linked Windows – Inline Frames – Opening Linked Windows with JavaScript.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the uses of various HTML tags
CO2: Solve the problems of website users by using CSS for effective designing
CO3: Associate web developers to include frames, forms, tables while designing web pages
CO4: Discover different kinds of web pages using Java script
CO5: Create websites for enterprises, educational institutions etc.

Text Book:

1. Laura Lemay, Rafe Colburn, Jennifer Kyrnin, *SamsTeach Yourself HTML,CSS & JavaScript Web Publishing in one hour a day*, Pearson Education, Seventh Edition, 2016.

Reference Books:

1. Wendy Willard, *HTML: A Beginner's Guide*, McGraw-Hill Education, Fifth Edition, 2013.
2. John Docket, *HTML and CSS: Design and Build Websites***,** John Wiley & Sons Publisher, First Edition, 2011.
3. Marijn Haverbeke, *Eloquent JavaScript: A Modern Introduction to Programming*, No Starch Press, Second Edition, 2014.

E - Resources:

1. https://www.coursera.org/learn/html-css-javascript-for-web-developers
2. https://www.tutorialspoint.com/internet_technologies/website_designing.htm
3. https://www.udemy.com/topic/html/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	9	9	**45**
CO2	9	9	9	3	9	9	3	**51**
CO3	9	1	9	9	9	9	9	**55**
CO4	9	1	9	3	9	9	9	**49**
CO5	9	1	9	9	9	9	9	**55**
Total	**45**	**15**	**39**	**27**	**45**	**45**	**39**	**255**

Low-1 Medium-3 High-9

Core XII – Web Designing Lab

(For students admitted from 2022-23)

Semester: V **Hours/week: 3**
Subject Code: IBCCC54P **Credit: 3**

Course Objectives:

1. To design web pages using HTML Elements
2. To make use of frames in web designing

List of Programs

1. Create a HTML page for displaying the personal information by using various tags such as background color, heading tag, font tag
2. Create a HTML page for displaying the Tender notice which is given to you
3. Create a Time Table of your class using HTML
4. Create a HTML page to advertise the opportunities for the job in a Company
5. Create a web page depicting the application form of our College
6. Create a HTML page for displaying your Curriculum vitae
7. Create a web page to advertise a product of the company using images and audio
8. Create a simple web page for a company which includes the following details: History, LOGO, Departments, and Sales reports of the company
9. Design a web page by using lists and links

Frames

10. To create a simple web site for our college which includes the following details: History of the college and courses offered for both UG and PG, Individual department Details,

Fee particulars for the courses using frames

11. To create dictionary using frames. The words are displayed in one frame and when you click the word, the meaning will be displayed on the other frame

Note: Questions for the External examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Illustrate the uses of various HTML tags
CO2: Identify the HTML tags to use it appropriately
CO3: Simplify the process of designing a web page by including frames
CO4: Support web developers by designing effective web pages
CO5: Develop web pages for enterprises

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	9	9	**45**
CO2	3	3	9	9	3	9	9	**45**
CO3	3	3	9	9	1	9	9	**43**
CO4	3	3	9	9	3	3	3	**33**
CO5	3	3	3	9	1	9	3	**31**
Total	**21**	**15**	**33**	**39**	**17**	**39**	**33**	**197**

Low-1 Medium -3 High-9

SEC V– Graphics and Animation Lab

(For students admitted from 2022-23)

Semester: V **Hours/week: 2**
Subject Code: IBCCS55P **Credit: 2**

Course Objectives:

1. To understand the basic concepts of animation
2. To gain knowledge about creating animated pictures using Blender

Blender

1. Create a coffee cup
2. Create a dinner table fork
3. Create a cup with wooden texture
4. Create a wooden table
5. Model a leather couch
6. Create a teddy bear
7. Create a photo realistic ring
8. Create a simple character
9. Create a stylized number animation
10. Animate a bouncing ball
11. Animate a shape of an object into another shape

Course Outcomes:

After successful completion of this course, student will be able to
CO1: Recognize the uses of various tools in macromedia flash
CO2: Predict the steps that are needed to create animation
CO3: Critically analyze the required options to create animation with respect to its nature
CO4: Evaluate the use of 'Motion tween' in the given concept
CO5: Create animated scenes, animated logos, animated cartoon characters etc.

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	3	3	9	3	**31**
CO2	9	1	9	3	3	9	3	**37**
CO3	9	1	9	3	9	9	9	**49**
CO4	9	1	3	3	9	9	9	**43**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**13**	**33**	**21**	**33**	**45**	**33**	**223**

Low-1
Medium-3
High-9

SEC VI –

Designing Lab II

(For students admitted from 2022-23)

Semester: VI **Hours/week: 2**
Subject Code: IBCCS65P **Credit: 2**

Course Objectives:

1. To understand various menu bars and graphic tools of Corel Draw
2. To make designs with very great accuracy

Corel Draw

1. Create a newspaper advertisement using CorelDraw's text formatting tools
2. Create a Bitmap Image and apply the auto tracing technique to that image
3. Create an object and apply transformation technique
4. Create a Parachute using the given special fills methods such as
    a. Filling object using foundation fills
    b. Pattern Fill
    c. Interactive Fill Tool
5. Create a certificate template & merged with data files
6. Create any kind of invitation
7. Create a Mirror object using Mirror command
8. Create any kind of LOGO using Fit Text to Path technique
9. Create a Flyer design
10. Design a magazine cover
11. Design a College Identity Card
12. Design a participation certificate for workshop

Note: Questions for the external examination will be based on concept learnt

Course Outcomes:

After successful completion of this course, student will be able to
CO1: Describe the concepts of tools and techniques in CorelDraw
CO2: Apply the concept of Creation and modification of objects for graphic design purposes

CO3: Analyze various tools to design Flyers
CO4: Develop any kind of LOGO using techniques in CorelDraw
CO5: Build design magazine and presentations

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	9	1	1	**25**
CO2	9	3	3	1	9	3	3	**31**
CO3	9	3	3	3	9	3	3	**33**
CO4	9	3	3	3	9	3	3	**33**
CO5	9	3	9	3	9	3	9	**45**
Total	**45**	**15**	**19**	**11**	**45**	**13**	**19**	**167**

Low-1 Medium-3 High-9

B Sc Data Science

(Three Year Regular Programme)

(For Students Admitted from 2022-23)

Programme Specific Outcomes:

On completion of this programme, student will be able to gain

PSO 1: Disciplinary Knowledge: Apply computing theory, languages and algorithms, as well as mathematical and statistical models and the principles of optimization to appropriates, formula and use data analyze. Formulate and use appropriate models of data analysis to solve hidden solution to business related challenges

PSO 2: Effective Communication: Organize, visualize and analyze large, complex datasets using descriptive statistics and graphs to make decisions

PSO 3: Research Skill and Critical Thinking: Critically apply the theories and methodologies of data science to new research in their primary area of study.

PSO 4: Ethical Awareness: Develop and implement data analysis Strategies base on theoretical principles, ethical considerations and detailed knowledge of the underlying data

PSO 5: Digital Literacy: Demonstrate an ability to articulate, assess and apply appropriate theories and principles of information management. Student can construct complex statistical models, assess the fit of such models to the data and apply the models in real-world contexts

PSO 6: Problem Solving Skill: Identify, assess and select appropriate among data analytics methods and models for solving a particular real-world problem, weighing their advantages and disadvantages.

PSO 7: Self-Learning: Recognize the need for lifelong learning and have the ability to engage independent learning keeping in mind the rapid technological changes

PROGRAMME STRUCTURE - PROGRAMME CODE: UDS

Sem	Part	Subject code	Course	Subject Title	Hours / Week	Credit	Marks		
							CIA	ESE	Total
I	I	IBLT11/ IBLA11/ IBLH11	Language I	Tamil I / Arabic I / Hindi I	5	3	40	60	100
	II	IBLEI12 IBLEII12	Language II	English I a or b	5	3	40	60	100

	III	**IBDSC11**	**Core I**	○ **Programming in C**	5	4	40	60	100
		IBDSC12	**Core II**	**R Programming**	6	5	40	60	100
		IBDSA13	AECC I	Mathematical Statistics - I	5	4	40	60	100
	IV	**IBDSS14P**	**SEC I**	**Programming in C Lab**	2	2		50	50
			Library / Browsing		1				
			Remedial / Games		1				
				Total	**30**	**21**	**200**	**350**	**550**
II	I	IBLT21/ IBLA21/ IBLH21	Language I	Tamil II / Arabic II / Hindi II	5	3	40	60	100
	II	IBLEI22 IBLEII22	Language II	English II a or b	5	3	40	60	100
	III	IBDSC21	Core III	Discrete Mathematics	5	5	40	60	100
		IBDSC22	**Core IV**	**Python Programming**	4	4	40	60	100
		IBDSA23	AECC II	Mathematical Statistics - II	5	4	40	60	100
	IV	**IBDSS24P**	**SEC II**	**Data Analytics Lab - I**	2	2		50	50
		IBES2	GIC I	Environmental studies	2	2		50	50
		IBDSX2/ IBDSX20	Extra Credit	Arithmetic for Competitive Examinations/ * Online Course		2		100	100
			Library/ Browsing		1				
			Remedial/ Games		1				
				Total	**30**	**23+2**	**200**	**400 +100**	**600+ 100**
III	I	IBLT31/ IBLA31/ IBLH31	Language I	Tamil III / Arabic III / Hindi III	5	3	40	60	100
	II	IBLEI32 IBLEII32	Language II	English III a or b	5	3	40	60	100
	III	IBDSC31	Core V	Calculus & Differential Equations	4	4	40	60	100
		IBDSC32	**Core VI**	**Structured Query language**	4	4	40	60	100
		IBDSA33	**AECC I**	**Natural Language Processing**	4	4	40	60	100
	IV	IBOE3DS	OEC I		2	2		50	50
		IBDSS34P	**SEC III**	**PHP Lab**	2	2		50	50
		IBHR3	GIC II	Human Rights	2	2		50	50
	V	IBXTN3	Extension	NSS/CSS	2	2	100		100
		IBDSX3/ IBDSX3O	Extra Credit	Logical Reasoning/*Online course		2		100	100

				Total	**30**	**26+2**	**300**	**450+ 100**	**750+ 100**
IV	I	IBLT41/ IBLA41/ IBLH41	Language I	Tamil IV / Arabic IV / Hindi IV	5	3	40	60	100
	II	IBLEI42 IBLEII42	Language II	English IV a or b	5	3	40	60	100
	III	IBDSC41	Core VII	Matrix Theory & Linear Algebra	4	4	40	60	100
		IBDSC42	**Core VIII**	**o Machine Learning & Artificial Intelligence**	5	4	T-20 P-20	60	100
		IBDSA43	**AECC II**	**Big Data Analytics**	5	4	40	60	100
	IV	IBLVE4	GIC III	Life Skills and Value Education	2	2		50	50
		IBOE4DS	OEC II		2	2		50	50
		IBDSS44P	**SEC IV**	**Data Analytics Lab - II**	2	2		50	50
		IBDSX4/ IBDSX4O	Extra Credit	Applications of Group Theory /*Online Course		2		100	100
				Total	**30**	**24+2**	**200**	**450+ 100**	**650+ 100**
V	III	IBDSC51	Core IX	Numerical Methods I	6	5	40	60	100
		IBDSC52	**Core X**	**Deep Learning**	6	5	40	60	100
		IBDSC53	Core XI	Graph Theory	6	5	40	60	100
		IBDSE5A / IBDSE5B	**DSE I.a/ DSE I.b**	**Time series analysis and Forecasting / Operating Systems**	4	4	40	60	100
		IBDSE5C/ **IBDSE5D**	DSE II.a/ **DSE II. b**	Operations Research / **Distributed systems**	4	4	40	60	100
	IV	**IBDSS54P**	**SEC V**	**Programming in Java Lab**	2	2		50	50
		IBWE5/	GIC IV	Women Entrepreneurship	2	2		50	50
		IBDSX5O	Extra Credit	Employability Skills/ *Online Course		2	100		100
				Total	**30**	**27+2**	**200+ 100**	**400**	**600+ 100**
VI	III	IBDSC61	Core XII	Numerical Methods II	6	5	40	60	100
		IBDSC62P W	Core XIII	Project	6	5	40	60	100
		IBDSC63	**Core XIV**	**Computer Vision**	5	4	40	60	100
		IBDSC64	Core XV	Regression Analysis	6	4	40	60	100
		IBDSE6A / IBDSE6B	**DSE III. a/ DSE III.b**	**Data Structures and Algorithms /Data base Security**	4	4	40	60	100
	IV	**IBDSS65P**	**SEC VI**	**Data Mining Lab**	2	2		50	50
			Library/ Browsing		1				

		IBDSX6/ IBDSX6O	Extra Credit	Quantitative Techniques/* Online Course		2		100	100
				Total	**30**	**24+2**	**200**	**350+ 100**	**550+ 100**
				Grand Total	**18 0**	**145 + 10**	**1300 +100**	**2400 +400**	**3700 +500**

* For Online certification, credits alone will be assigned on submission of certificate obtained through appearing for Online Examination from SWAYAM, EDX, Spoken Tutorial, NPTEL or Coursera.

o Integrated Course

Internship

AECC - Ability Enhancement Compulsory Course
SEC – Skill Enhancement Course
DSE - Discipline Specific Elective
OEC – Open Elective Course

Core I - Programming in C

(For Students Admitted from 2022-23)

Semester: I **Hours/week: 5**
Subject Code: IBDSC11 **Credit: 4**

Course Objectives:

1. To improve the knowledge of complete understanding of Programming language C
2. To understand the main features of operators, input/ output statements, control statements and program structure of C Language.

Unit I **(15 hours)**

Introduction to C Programming: C Character Set-Writing first program of C - Identifier and- Constants-Variables and Arrays-Declarations-Expressions-Statements-Symbolic constants

Operators and Expressions: Arithmetic Operators-Unary Operators-Relational and logical Operators- Assignment Operators- The conditional Operators - Library functions.

Unit II **(15 hours)**

Data Input and Output: Preliminaries – The getchar function – The putchar function – The scanf function – The print f function – gets and puts function – Interactive programming.

Control Statements: Preliminaries – **Branching:** The If-else Statement - Looping – while statement – do-while statement – for statement – nested control structures – switch statement – break statement – continue statement – coma operator – goto statement - **Functions:** A brief overview – Defining a function – Accessing a function - Function prototypes – Passing arguments to a function – Recursion.

Unit III **(15 hours)**

Program Structure: Storage classes -Automatic - External variables -Static variables- Multi File programs – More about library functions

Arrays: Defining an Array-Processing an Array-Passing arrays to Functions- Multidimensional arrays.

Unit IV **(15 hours)**

Strings: Defining a String – NULL Character – Initialization of Strings – Reading and writing a string – Processing strings – Character arithmetic – Searching and sorting of strings – Some more library Functions for strings

Pointers: Fundamentals – Pointer Declarations – Passing pointers to a function – Pointers and one dimensional arrays – Dynamic memory allocation – Operations on pointers - Pointers and multidimensional arrays – Arrays of Pointers - Passing functions to other functions – More about pointer declarations.

Unit V **(15 hours)**

Structures and Unions: Defining a Structure – Processing a Structure – User defined data types - Structures and pointers – Passing structures to functions – Self Referential structures -Unions

File Handling: Why Files - Opening and closing a Data file -Reading and writing a data file - Processing a data file - Unformatted data - Concept of binary files - Accessing the file randomly.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Describe the basic programming knowledge of C, operators and expressions
CO 2: Demonstrate data input and output, control statements & functions
CO 3: Analyze program structure and arrays
CO 4: Evaluate strings and pointers
CO 5: Formulate structures, unions and file handling

Text Book:

1. Byron Gottfried, *Programming with C*, Tata McGraw Hill Education, Fourth Edition, 2018.

Reference Books:

1. Balagurusamy E, *Programming in ANSI C*, Tata McGraw-Hill Publishing Company, Sixth Edition, 2012.
2. Venugopal K R Sudeep R Prasad, *Programming with C*, Tata McGraw-Hill Publishing Company, 2008.
3. Mullish, Henry Cooper, Herbert, The Spirit of C - *An Introduction to Modern Programming*, Jaico Publishing House, Third Edition, 2006.

E – Resources:

1. https://onlinecourses.nptel.ac.in/noc19_cs42/preview
2. https://nptel.ac.in/courses/106/105/106105171/
3. https://onlinecourses.nptel.ac.in/noc21_cs01/preview

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	3	3	9	9	3	9	45
CO2	9	3	3	3	9	3	9	39
CO3	9	3	3	3	9	9	9	45
CO4	9	3	3	3	9	9	9	45
CO5	9	9	9	3	9	9	9	45
Total	45	21	21	21	45	27	45	225

Low-1 Medium-3 High-9

Core II - R Programming

(For Students Admitted from 2022-23)

Semester: I **Hours/week: 6**
Subject Code: IBDSC12 **Credit: 5**

Course Objectives:

1. To know the fundamentals of statistical analysis in R environment
2. To understand probability and sampling distributions

Unit I **(18 hours)**

Introduction to R Programming

R and R Studio, Logical Arguments, Missing Values- Characters- Factors and Numeric- Help in R- Vector to Matrix- Matrix Access- Data Frames- Data Frame Access- Basic Data Manipulation Techniques- Usage of various apply functions – apply- lapply- sapply and tapply- Outlier's treatment.

Unit II **(18 hours)**

Descriptive Statistics

Types of Data- Nominal, Ordinal, Scale and Ratio- Measures of Central Tendency- Mean, Mode and Median- Bar Chart- Pie Chart and Box Plot- Measures of Variability- Range- Inter-Quartile- Range- Standard Deviation- Skewness and Kurtosis- Histogram- Stem and Leaf Diagram- Standard Error of Mean and Confidence Intervals.

Unit III **(18 hours)**

Probability- Probability& Sampling Distribution

Experiment- Sample Space and Events- Classical Probability- General Rules of Addition- Conditional Probability- General Rules For Multiplication- Independent Events- Bayes' Theorem- Discrete Probability Distributions: Binomial- Poisson- Continuous Probability Distribution- Normal Distribution & t-distribution- Sampling Distribution and Central Limit Theorem.

Unit IV **(18 hours)**

Statistical Inference and Hypothesis Testing

Population and Sample- Null and Alternate Hypothesis- Level of Significance- Type I and Type II Errors- One Sample t Test- Confidence Intervals- One Sample Proportion Test- Paired Sample t Test- Independent Samples t Test- Two Sample Proportion Tests- One Way

Analysis of Variance and Chi Square Test.

Unit V **(18 hours)**

Correlation and Regression

Analysis of Relationship- Positive and Negative Correlation- Perfect Correlation- Correlation Matrix- Scatter Plots- Simple Linear Regression- R Square, Adjusted R Square- Testing of Slope- Standard Error of Estimate- Overall Model Fitness- Assumptions of Linear Regression- Multiple Regression- Coefficients of Partial Determination- Durbin Watson Statistics- Variance Inflation Factor.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Describe key terminologies, concepts and techniques employed in Statistical Analysis
CO 2: Demonstrate fundamentals of statistical analysis in R environment
CO 3: Analyse the purpose of exploration using Descriptive and Inferential Statistics
CO 4: Evaluate the variety of Hypothesis Tests to aid Decision Making
CO 5: Create application of Linear Regression in multivariate context for predictive purpose

Text Book:

1. Ken Black, 2013, *Business Statistics*, New Delhi, Wiley.

Reference Books:

1. Lee, Cheng. et al., 2013, *Statistics for Business and Financial Economics*, New York: Heidelberg Dordrecht.
2. Anderson, David R., Thomas A. Williams and Dennis J. Sweeney, 2012, *Statistics for Business and Economics*, New Delhi: Southwestern.
3. Waller, Derek, 2008, *Statistics for Business*, London: BH Publications.
4. Levin, Richard I. and David S. Rubin, 1994, *Statistics for Management*, New Delhi: Prentice Hall.

E Resources:

1.https://onlinecourses.nptel.ac.in/noc19_ma33/preview
2.https://onlinecourses.nptel.ac.in/noc22_ma69/preview
3.https://onlinecourses.nptel.ac.in/noc22_ma34/preview

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	9	9	**43**
CO2	9	3	3	1	9	9	9	**43**
CO3	9	3	3	1	9	9	9	**43**
CO4	9	3	3	1	9	9	9	**43**
CO5	9	3	3	1	9	9	9	**43**
Total	45	15	15	5	45	45	45	**215**

Low-1 Medium-3 High-9

SEC I- Programming in C Lab

(For Students Admitted from 2022-23)

Semester : I **Hours/week: 2**
Subject Code: IBDSS14P **Credit: 2**

Course Objectives:

1. To introduce the programming skills using C language
2. To enhance the analyzing and problem solving skills and use the same for writing Programs in C

List of Programs

Formula Substitution

1. Check whether the given number is odd or even
2. Find sum of the digits and reverse the digits
3. Generate the Fibonacci series
4. Generate Prime number within range
5. Find whether a given number is Armstrong or not
6. Count the number of positive, negative and zero in the list
7. C Program to solve the Quadratic Equation
8. C Program to find the area of various shapes using switch case

Array

9. Create a C Program to Find Matrix Addition , Subtraction, Multiplication and Transpose of a matrix using switch case
10. Create a C Program to Check whether the element is present in the given list or not
11. Create a C Program to sort numbers in ascending and descending order
12. Create a C Program to sort names in Alphabetical order

Functions & Structures

13. Create a C Program to find the factorial of a given number using function declaration
14. Create a C Program to find the factorial of a given number using recursion function
15. Create a C Program to Prepare student mark list using structure
16. Create a C Program to Prepare electricity bill using structure

String Manipulation

17. Create a C Program to count the vowels in the given string
18. Create a C Program to convert the case of given string from upper case to lower case and vice versa

Pointers

19. Create a C Program to sort numbers in ascending order using pointers
20. Create a C Program to find average of two numbers using pointers

Note:-Questions for Internal and External examination will be based on concept learnt

Course Outcomes:

After successful completion of this course, student will be able to
CO1: Remember the control structures and loops
CO2: Apply the concepts of functions and pointers
CO3: Analyze the concepts of structures by creating student mark list and electricity bill
CO4: Evaluate string handling functions
CO5: Create programs with pointers, arrays and structures

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	9	9	**43**
CO2	9	3	3	1	9	9	9	**43**
CO3	9	3	3	1	9	9	9	**43**
CO4	9	3	3	1	9	9	9	**43**
CO5	9	3	3	1	9	9	9	**43**
Total	45	15	15	5	45	45	45	**215**

Low-1 Medium-3 High-9

Core IV - Python Programming

(For Students Admitted from 2022-23)

Semester: II **Hours/week: 4**
Subject Code: IBDSC22 **Credit: 4**

Course Objectives:

1. To know lists, tuples and dictionaries in Python programs.
2. To understand exception handling in Python applications for error handling.

Unit I **(12 hours)**
Introduction
History of Python- Need of Python Programming- Applications Basics of Python Programming Using the REPL(Shell)- Running Python Scripts- Variables- Assignment- Keywords- Input- Output- Indentation.

Unit II **(12 hours)**
Types, Operators and Expressions
Types - Integers- Strings- Booleans; Operators- Arithmetic Operators- Comparison (Relational) Operators- Assignment Operators- Logical Operators- Bitwise Operators- Membership Operators- Identity Operators- Expressions.

Unit III **(12 hours)**
Data Structures and Control Flow
Lists- Operations- Slicing- Methods- Tuples- Sets- Dictionaries- Sequences- Comprehensions- Conditional blocks using If- Else and El-if- For Loop- For loop using

Ranges- String- list and Dictionaries- While Loop- Loop Manipulation using Pass- Continue- Break and Else- Conditional and Loops Block.

Unit IV **(12 hours)**

Functions, Modules and Packages

Defining Functions- Calling Functions- Passing Arguments- Keyword Arguments- Default Arguments- Variable-length arguments- Anonymous Functions- Function Returning Values- Scope of the Variables in a Function - Global and Local Variables. Creating modules- Name Spacing- Introduction to PIP- Installing Packages via PIP- Using Python Packages.

Unit V **(12 hours)**

Object Oriented Programming & Exception Handling

Classes- Self-Variable- Methods- Constructor Method- Inheritance- Overriding Methods- Data Hiding- Difference between an Error and Exception- Handling Exception- Try Except Block- Raising Exceptions- and User Defined Exceptions.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Outline lists, tuples, and dictionaries in Python programs
CO2: Demonstrate the concepts of loops and decision statements in Python
CO3: Illustrate functions and pass arguments in Python
CO4: Design object- oriented programs with Python classes
CO5: Develop Python applications.

Text Book:

1. R. Nageswara Rao, 2018, *Core Python Programming*, Dreamtech.

Reference Books:

1. John Hearty, 2016, *Advanced Machine Learning with Python*, Packt.
2. Jake VanderPlas, 2016, *Python Data Science Handbook: Essential Tools for Working with Data*, O'Reilly.
3. Mark Lutz, 2010, *Programming Python*, O'Reilly.
4. Tim Hall and J-P Stacey, 2009, *Python 3 for Absolute Beginners*, Apress.

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc22_cs32/preview
2. https://onlinecourses.nptel.ac.in/noc22_cs31/preview

Course Outcome	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	1	9	9	9	**49**
CO2	9	3	9	1	9	9	9	**49**
CO3	9	3	9	1	9	9	9	**49**
CO4	9	3	9	1	9	9	9	**49**

CO5	9	3	9	1	9	9	9	**49**
Total	**45**	**15**	**45**	**5**	**45**	**45**	**45**	**245**

Low-1 Medium-3 High-9

SEC II - Data Analytics Lab- I

(For Students Admitted from 2022-23)

Semester: II **Hours/week: 2**
Subject Code: IBDSS24P **Credit: 2**

Course Objectives:

1. To know the modern quantitative tools to data analysis in a business context
2. To apply the tools to transform the data into useful information

List of Programs

Using Spread Sheet

1. To perform Basic Functions in Spread sheets
2. To perform Formatting and Proofing
3. To perform Mathematical & Text Functions
4. To Implement Date and Time Functions
5. To Implement Sorting
6. To Implement Filtering Techniques
7. To perform Logical Functions
8. To perform Data Validation
9. To display Pivot Tables
10. To display Charts and Slicers
11. To perform Lookup Functions

Note:-Questions for Internal and External examination will be based on concept learnt

Course Outcomes:

After successful completion of this course, student will be able to
CO1: Outline Excel functions to solve mathematical, text, date and time operations
CO2: Demonstrate the concepts of sorting, filtering using Excel
CO3: Illustrate Data validation feature of spread sheet
CO4: Evaluate Statistical operations using Pivot Table tool
CO5: Develop spread sheet with visualization using charts

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	1	9	9	**43**
CO2	9	1	9	3	1	9	9	**41**
CO3	9	1	9	3	1	9	9	**41**

CO4	9	1	9	3	1	9	9	**41**
CO5	9	3	9	3	1	9	9	**43**
Total	**45**	**9**	**45**	**15**	**5**	**45**	**45**	**209**

Low-1 Medium-3 High-9

Core VI - Structured Query Language

(For Students Admitted from 2022-23)

Semester: III **Hours/week: 4**
Subject Code: IBDSC32 **Credit: 4**

Course Objectives:

1. To know the basic concepts and the applications of Database Systems
2. To understand the basics of SQL and queries using SQL

Unit I **(12 hours)**

Introduction to Database Management Systems

Introduction-Database System Applications- Purpose of Database Systems- Views of Data- Data Abstraction- Instances and Schemas- Data Models- Database Languages- DDL- DML- Database Architecture- Database Users and Administrators- Database Design- ER Diagrams- Entities- Attributes and Entity Sets- Relationships and Relationship sets- Integrity Constraints- Views.

Unit II **(12 hours)**

SQL Operators and Relational Theorems

Relational Algebra and Calculus- Selection and Projection- Set Operations- Renaming- Joins- Division- Relational calculus- Tuple Relational Calculus- Domain Relational Calculus- Forms of Basic SQL Query- Nested Queries- Comparison Operators- Aggregate Operators- NULL values- Logical connectives- AND, OR and NOT- Outer Joins- Triggers.

Unit III **(12 hours)**

Normalization

Problems Caused by Redundancy- Decompositions- Functional Dependencies- Normal Forms- First, Second, Third Normal forms- BCNF- Properties of Decompositions- Loss less Join Decomposition- Dependency Preserving Decomposition- Multi Valued Dependencies- Fourth Normal Form- Join Dependencies- Fifth Normal Form.

Unit IV **(12 hours)**

Transactions

Transaction Management- Transaction Concept- Transaction State- Implementation of Atomicity and Durability- Concurrent Executions- Serializability- Recoverability- Implementation of Isolation- testing for serializability- Concurrency Control- Lock- Timestamp Based Protocols- Validation Based Protocols- Recovery- Failure Classification- Storage Structure- Atomicity- Log Based Recovery- Remote Backup Systems.

Unit V **(12 hours)**

No SQL

Overview of No SQL- Types of No SQL Databases- No SQL Storage Architecture- CRUD Operations in MongoDB- Querying- Modifying and Managing No SQL Databases- Indexing and Ordering- Migrating from RDBMS to No SQL- No SQL in Cloud- Database Administration.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe the basic concepts and the applications of Database Systems
CO2: Demonstrate basics of SQL and queries using SQL
CO3: Illustrate Normalization
CO4: Evaluate indexing and ordering in No SQL
CO5: Create No SQL data bases

Text Book:

1. Guy Harrison, 2015, *Next Generation Databases: No SQL and Big Data*, Apress.

Reference Books:

1. Ramez Elmasri, ShamkatB.Navathe, 2013, *Database Systems*, Pearson.
2. Pramod J. Sadalage, Martin Fowler, 2012, *No SQL Distilled*, Addison Wesley.
3. A.Silberschatz, H.F. Korth, S.Sudarshan, 2006, *Database System Concepts*, McGraw Hill.
4. Raghurama Krishnan, Johannes Gehrke, 2003, *Database Management Systems*, McGraw Hill.

E-Resources:

1. https://archive.nptel.ac.in/courses/106/105/106105175/
2. https://onlinecourses.nptel.ac.in/noc21_cs04/preview

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	3	3	**31**
CO2	9	3	9	1	9	9	3	**43**
CO3	9	3	9	1	9	9	3	**43**
CO4	9	3	3	1	9	3	3	**31**
CO5	9	3	3	1	9	3	3	**31**
Total	**45**	**15**	**27**	**5**	**45**	**27**	**15**	**179**

Low-1 Medium-3 High-9

AECC I -Natural Language Processing

(For Students Admitted from 2022-23)

Semester: III **Hours/week: 4**
Subject Code: IBDSA33 **Credit: 4**

Course Objectives:

1. To know the concepts of Text Analytics, Unstructured Information Analysis for better decision making

2. To understand the roots behind Text Mining which evolved from Machine Learning, Natural Language Processing and Statistics

Unit I **(12 hours)**

Introduction to Text Mining

Basics of Text Mining- Natural Language Content Analysis- Core Text Mining Operations- Associations- Using Background Knowledge for Text Mining- Domain Ontologies- Domain Lexicons. Text Mining Pre-processing Techniques- Task Oriented Approaches- NLP Tasks- Tokenization- Part-of-Speech Tagging- Syntactical Parsing and Shallow Parsing.

Unit II **(12 hours)**

Extracting Features, Relations from Text

Finding Implicit Features- Finding Opinion Phrases and their Polarity- Context-Specific Word Semantic Orientation- Analysis of Word- and Document Frequency- tf-idf - Zipf's Law- bind tf-idf Function- Subsequence Kernels for Relation Extraction- Capturing Relation Patterns with a String Kernel.

Unit III **(12 hours)**

Text Categorization and Clustering

Applications of Text Categorization- Document Representation- Knowledge Engineering Approach to Text Categorization- Machine Learning Approach to Text Categorization- Evaluation of Text Classifiers. Clustering Tasks in Text Analysis- Clustering Algorithms and Clustering of Textual Data.

Unit IV **(12 hours)**

Relationships between Words

Tokenizing by N-gram- Counting and Filtering N-gram- Analyzing Bigrams to provide Context in Sentiment Analysis- visualizing a Network of Bigrams using ggraph- Counting and Correlating Pairs of Words with the widyr Package- Counting and Correlating among Sections- Examining Pairwise Correlation.

Unit V **(12 hours)**

Topic Modelling and Probabilistic Models for Information Extraction

Latent Dirichlet Allocation- Word Topic Probabilities- Per-Document Classification- By-words Assignments- Alternative LDA Implementations. Hidden Markov models- Stochastic Context Free Grammar- Conditional Random fields- Parallel Learning Algorithms.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe the approaches to Syntax and Semantics in NLP

CO2: Demonstrate various methods for Statistical approaches to Machine Translation

CO3: Illustrate Topic Modelling and Probabilistic Models for Information Extraction.

CO4: Implement and deploy programs based on Relationship Extraction, POS Tagging and Clustering Algorithms based on NLP.

CO5: Build Models which extract information from Textual Unstructured Data

Text Book:

1. Julia Silge, David Robinson, 2018, *Text Mining with R-A Tidy Approach*, O'Reilly

Reference Books:

1. Matthew L. Jockers, 2014, *Text Analysis with R for Students of Literature*, Springer.
2. James Pustejovsky, Amber Stubbs, 2012, *Natural Language Annotation for Machine Learning*, O'Reilly.
3. Steve R. Poteet, 2007, *Natural Language Processing with Text Mining*, Springer.
4. James Sanger, Ronen Feldman, 2002, *The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data*, Cambridge.

E-Resources:

1. https://nptel.ac.in/courses/106105158
2. https://nptel.ac.in/courses/106101007

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	3	3	**31**
CO2	9	3	3	1	9	3	3	**31**
CO3	9	3	3	1	9	3	9	**37**
CO4	9	3	3	1	9	3	3	**31**
CO5	9	3	3	1	9	3	9	**37**
Total	**45**	**15**	**15**	**5**	**45**	**15**	**27**	**167**

Low-1 Medium-3 High-9

SEC III – PHP Lab

(For Students Admitted from 2022-23)

Semester: III **Hours/week: 2**
Subject Code: IBDSS34P **Credit: 2**

Course Objectives:

1. To understand the concepts of regular expressions including modifiers, operators and met characters
2. To develop PHP programs that use various PHP library functions and that manipulate files and directories

List of Programs

1. Develop a PHP program to print Sum of digits
2. Develop a PHP program to print factorial of a number
3. Develop a PHP program to display count, from 10 to 20 using loop
4. Develop a PHP program to print prime number
5. Develop a PHP program to check Armstrong number
6. Develop a PHP program to check Palindrome number
7. Develop a PHP program to swap two numbers with and without

using third variable.

8. Develop a PHP program to reverse the number with strrev ().
9. Develop a PHP program to show day of the week (for eg: Monday) based on numbers using Switch/case statements
10. Develop a PHP program to print alphabet triangle
11. Develop a PHP program to check student grade based on the marks using if- else statement
12. Develop a PHP program Using nested for loop that creates a chess board

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe the fundamentals of PHP Language in trivial problem solving
CO2: Determine solution to a problem and apply control structures
CO3: Simplify the use of Strings and String Handling functions
CO4: Justify real time applications using PHP language features.
CO5: Build skill on problem solving by constructing algorithms

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	9	1	1	**25**
CO2	9	3	3	3	9	3	3	**33**
CO3	9	3	1	3	9	9	3	**37**
CO4	9	3	3	3	9	9	3	**39**
CO5	9	3	3	3	9	9	3	**39**
Total	**45**	**15**	**11**	**13**	**45**	**31**	**13**	**173**

Low-1 Medium-3 High-9

Core VIII - Machine Learning & Artificial Intelligence

(For Students Admitted from 2022-23)

Semester: IV **Hours/week: 5**
Subject Code: IBDSC42 **Credit: 4**

Course Objectives:

1. To gain critical knowledge and understanding about major Data Mining procedures like Decision Tree, Cluster Analysis
2. To apply and practice this gained knowledge in variety of Business Scenario

Unit I **(15 hours)**

Classification and Regression Tree

Classification & Regression- working of a Decision Tree- Attribute Selection Measures- Information Gain- Gain Ratio- Gini Index- Building Decision Trees- CART- C5.0 and CHAID Trees- Prediction by Decision Tree- Advantages and Disadvantages of Decision Trees- Model Overfitting- Building Decision Trees in R.

Unit II **(15 hours)**

Clustering

Cluster Analysis versus Factor Analysis- Overview of Basic Clustering Methods- Agglomerative Hierarchical Clustering- Within-Group Linkage- Nearest Neighbor or Single Linkage- Furthest Neighbor or Complete Linkage- Centroid Clustering- Ward's Method- K- Means Algorithm- Dendrogram- Profiling of Cluster- Cluster Evaluation.

Unit III **(15 hours)**

Support Vector Machine

Decision Boundaries for Support Vector Machine- Maximum Margin Hyperplanes- Structural Risk Minimization- Linear SVM-Separable Case- Linear SVM-Non-Separable Case- Kernel Function- Kernel Trick- Kernel Hilbert Space- Model Evaluation.

Unit IV **(15 hours)**

Marret Basket Analysis

Market Basket Analysis and Association Analysis- Market Basket Data- Stores- Customers- Orders- Items- Order Characteristics- Product Popularity- Tracking Marketing Interventions- Association Rules- Support- Confidence- Lift- Chi-Square Value- Sequential Pattern Analysis.

Unit V **(15 hours)**

Introduction to Artificial Intelligence

Current Trends in AI- Intelligent Agents- Environments- Problem Solving Agents- Searching Techniques- Knowledge and Reasoning in AI- Forms of Learning- Structure of a Neural Network- Analogy with Biological Neural Network- Activation Functions- Gradient Descent- Model Accuracy.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Describe the wide variety of Statistical and Machine Learning Algorithms

CO 2: Demonstrate Machine Learning techniques

CO 3: Analyze the performance of machine learning algorithms

CO 4: Evaluate performance of machine learning algorithms and select the best one based on the solution.

CO 5: Create Programming Framework to obtain acceptable decisions for the Real-World problems.

Text Book:

1. Kevin Knight, Elaine Rich, B.Nair, 2017, *Artificial Intelligence,* McGraw Hill

Reference Books:

1. Han, Jiawei and Kamber, Micheline, 2012, *Data Mining: Concepts and Techniques*, Morgan Kaufman Publishers.
2. AnandRajaraman, 2011, *Mining of Massive Datasets*, Cambridge University Press.
3. Mitchell, 2013, *Machine Learning*, McGraw Hill.
4. Stuart Russell, Peter Norvig, 2004, *Artificial Intelligence – A Modern Approach*, Pearson.

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc21_cs42/preview
2. https://onlinecourses.nptel.ac.in/noc22_cs24/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	1	9	9	9	**49**
CO2	9	3	9	1	9	9	9	**49**
CO3	9	3	9	1	9	9	9	**49**
CO4	9	3	9	1	9	9	9	**49**
CO5	9	3	9	1	9	9	9	**49**
Total	**45**	**15**	**45**	**5**	**45**	**45**	**45**	**245**

Low-1 Medium-3 High-9

AECC II - Big Data Analytics

(For Students Admitted from 2022-23)

Semester: IV **Hours/week: 5**
Subject Code: IBDSA43 **Credit: 4**

Course Objectives:

1. To understand about Big Data Technology, Hadoop Ecosystem and various tools related to it.
2. To learn about the HDFS File System, Map Reduce Framework, analyzing data using Hbase and Hive along with the Integration of R with Hadoop.

Unit I **(15 hours)**

Introduction to Big Data

What Is Big Data? - History of Data Management- Evolution of Big Data- Structuring of Big Data- Elements of Big Data- Application of Big Data in the Business Context- Careers in Big Data. Business Applications of Big Data: The Significance of Social Network Data- Financial Fraud and Big Data- Fraud Detection in Insurance- Use of Big Data in the Retail Industry.

Unit II **(15 hours)**

Technologies for Handling Big Data

Distributed and Parallel Computing for Big Data- Understanding Hadoop- Cloud Computing- Grid Computing- and In-Memory Technology for Big Data. VMWare Installation of Hadoop- Linux and its Shell Commands- Different Hadoop Distributions and their advantages- Horton works- Cloudera- MapR.

Unit III **(15 hours)**

Understanding the Hadoop Ecosystem

The Hadoop Ecosystem- Storing Data with HDFS- Design of HDFS- HDFS Concepts- Command Line Interface to HDFS- Hadoop File Systems- Java Interface to Hadoop- Anatomy of a file read- Anatomy of a file write- Replica placement and Coherency

Model- Parallel Copying with distcp- keeping an HDFS Cluster Balanced.

Unit IV **(15 hours)**

Map Reduce Fundamentals

Origins of Map Reduce- How Map Reduce Works- Optimization Techniques for Map Reduce Jobs- Applications of Map Reduce- Java Map Reduce classes (new API)- Data flow- combiner functions- running a distributed Map Reduce Job. Configuration API- setting up the development environment- Managing Configuration.

Unit V **(15 hours)**

Integrating R with Hadoop, Understanding Hive & Hbase

Understanding R-Hadoop- Integration Procedure- Packages needed for R under Hadoop Ecosystem- Text Mining for Deriving Useful Information using R within Hadoop- Introduction to Hive & Hbase- Hive and Hbase Architecture- Understanding Queries- Mining Big Data with Hive & Hbase.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the fundamentals of Big Data and its Applications in various Domains
CO2: Apply HDFS File Structure, Map Reduce Framework to solve complex problems
CO3: Analyze the technologies behind Big Data
CO4: Implement Hive/ Hbase shell pertaining to relational data handling under Hadoop.
CO5: Build applications integrating R with Hadoop

Text Book:

1. Arshdeep Bahga, 2016, *Big Data Science & Analytics: A Hands-On Approach*, VPT.

Reference Books:

1. Tom White, 2012, *Hadoop: The Definitive Guide*, O'Reilly.
2. Adam Shook and Donald Miner, 2012, *Map Reduce Design Patterns: Building Effective Algorithms and Analytics for Hadoop and Other Systems*, O'Reilly.
3. Dean Wampler, Edward Capriolo & Jason Rutherglen, 2012, *Programming Hive*, O'Reilly.
4. Lars George, 2011, *HBase - The Definitive Guide: Random Access to Your Planet-Size Data*,O'Reilly.

E-Resources:

1. https://nptel.ac.in/courses/106104189
2. https://www.naukri.com/learning/big-data-computing-by-nptel-course-nptel33?enModal=Y&logFlow=N

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	3	3	1	9	3	3	31
CO2	9	3	9	1	9	9	3	43
CO3	9	3	3	1	9	9	9	43

CO4	9	3	9	1	9	9	9	**49**
CO5	9	3	3	1	9	9	9	**43**
Total	**45**	**15**	**27**	**5**	**45**	**39**	**33**	**209**

Low-1 Medium-3 High-9

SEC IV - Data Analytics Lab II

(For Students Admitted from 2022-23)

Semester: IV **Hours/week: 2**
Subject Code: IBDSS44P **Credit: 2**

Course Objectives:

1. To identify datasets and explain how they are organized and manipulate data
2. To use functions for data visualization

List of Programs

Using R Tool:

1. To get the input from user and perform numerical operations (MAX, MIN, AVG, SUM, SQRT, ROUND)
2. To perform data import (.CSV, .XLS, .TXT) operations
3. To perform data export (.CSV, .XLS, .TXT) operations
4. To get the input matrix from user and perform Matrix addition, subtraction, multiplication, inverse transpose and division operations using vector concept
5. To create data frames and performs operations on it
6. To perform data pre-processing operations -Handling Missing data
7. To perform data pre-processing operations - Min-Max normalization
8. To perform statistical operations (Mean, Median, Mode and Standard deviation)
9. To perform Simple Linear Regression
10. To perform K-Means clustering operation and visualize for iris data set

Course Outcomes:

After successful completion of this course, student will be able to
CO1: Outline R functions to perform numerical operations
CO2: Demonstrate the concepts of import/export operations
CO3: Illustrate data pre-processing operations
CO4: Evaluate Statistical operations
CO5: Develop an application using K-Means algorithm with visualization

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	1	9	9	**43**
CO2	9	1	9	3	1	9	9	**41**
CO3	9	1	9	3	1	9	9	**41**
CO4	9	1	9	3	1	9	9	**41**
CO5	9	3	9	3	1	9	9	**43**
Total	45	9	45	15	5	45	45	**209**

Low-1 Medium-3 High-9

Core X - Deep Learning

(For Students Admitted from 2022-23)

Semester: V **Hours/week: 6**
Subject Code: IBDSC52 **Credit: 5**

Course Objectives:

1. To understand about the Deep learning, its principles and approaches
2. To learn about the Deep Learning algorithms and approaches.

Unit I **(18 hours)**

Fundamentals of Deep Networks

Defining Deep Learning- Common Architectural Principles of Deep Networks- Parameters- Layers- Activation Functions- Loss Functions- Optimization Algorithms- Hyper parameters and Frameworks to Deploy Deep learning Networks - Building Blocks of Deep Networks- Restricted Boltzmann Machines – Auto-encoders and Variational Auto-encoders.

Unit II **(18 hours)**

Regularization & Optimization for Training Deep Models

Parameter Norm Penalties- Norm Penalties as Constrained Optimization- Regularization and Under-Constrained Problems- Dataset Augmentation- Multitask Learning- Parameter Tying and Sharing- Sparse Representations- Ensemble Methods and Challenges in Neural Network Optimization- Basic Algorithms and Algorithms with Adaptive Learning Rates- Approximate Second Order- Optimization Strategies and Meta Algorithms.

Unit III **(18 hours)**

Convolutional Neural Networks

Convolution Operation- Pooling- Shortcomings of Feature Selection- Filters and Feature Maps- Convolutional layer- Architecture of CNN- Working with MNIST dataset- Image Pre- processing Pipelines- Accelerating Training with Batch Normalization- Building a CNN - The Neuro- Scientific Basis for CNN.

Unit IV **(18 hours)**

Sequence Analysis

Analyzing Variable-Length Inputs- tackling seq2seq with Neural N-Grams- Implementing Part-of- Speech Tagger- Unfolding Computation Graphs- Recurrent Neural Networks- Bidirectional-RNN- Recursive Neural Network- Echo-State Networks- Long Short-Term Memory- Tensor flow Primitives for RNN models- Implementing Sentiment Analysis Model.

Unit V **(18 hours)**

Applications of Deep Learning

Deep Reinforcement Learning- Markov Decision Processes- Versus Exploit- Policy versus Value learning- Open AI Gym- Q-Learning and Deep Q-Networks- Applications of Deep Learning in various disciplines such as Computer Vision- Speech Recognition- NLP and others.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe Deep Learning algorithms and approaches
CO2: Apply Deep Learning algorithms to solve problems which are almost impossible to handle via Traditional Approaches
CO3: Illustrate different types of Deep Neural Networks like CNN
CO4: Apply deep learning algorithms in real time problems
CO5: Develop applications such as NLP using Deep Learning Algorithms

Text Book:

1. Josh Patterson and Adam Gibson. (2018). *Deep Learning: A Practitioner's Approach.* O'Reilly.

Reference Books:

1. Francois Chollet. (2018). *Deep Learning with Python*. O'Reilly.
2. Sandro Skansi. (2018). *Introduction to Deep Learning: From Logical Calculus to Artificial Intelligence*. Springer.
3. Antonio Gulli and Sujit Pal. (2017). *Deep Learning with Keras.* Packt.
4. Nikhil Buduma. (2017). *Fundamentals of Deep Learning*. O'Reilly.
5. Ian GoodFellow, Yoshua Bengio and Aaron Courville. (2016). *Deep Learning.* MITPress.

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc20_cs62/preview
2. https://nptel.ac.in/courses/106106184

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	1	9	9	9	**49**
CO2	9	3	9	1	9	9	9	**49**
CO3	9	3	9	1	9	9	9	**49**
CO4	9	3	9	1	9	9	9	**49**
CO5	9	3	9	1	9	9	9	**49**
Total	**45**	**15**	**45**	**5**	**45**	**45**	**45**	**245**

Low-1 Medium-3 High-9

DSE I - a) Time Series Analysis and Forecasting

(For Students Admitted from 2022-23)

Semester: V **Hours/week: 4**
Subject Code: IBDSE5A **Credit: 4**

Course Objectives:

1. To equip students with various time series and forecasting methods and techniques to increase the knowledge on modern statistical methods for analyzing time series data
2. To understand the principles behind time series and forecasting techniques for analyzing various Stationary and Nonstationary time series model

Unit I **(12 hours)**

Introduction to Time Series: Examples of Time Series - Objectives of Time Series Analysis - Some Simple Time Series Models - **Introduction to Forecasting:** The Nature and Uses of Forecasts – Some Example of Time Series – The Forecasting Process – Data for Forecasting – Resources for Forecasting.

Unit II **(12 hours)**

Statistics Background for Forecasting: Introduction – Graphical Displays – Numerical Description of Time Series Data – Use of Data Transformations and Adjustments- General Approach to Time Series Modeling and Forecasting – Evaluating and Monitoring Forecasting Model Performance.

Unit III **(12 hours)**

Stationary Processes: Basic Properties - Linear Processes - Introduction to ARMA Processes - Properties of the Sample Mean and Autocorrelation Function – Forecasting Stationary Time Series - **ARMA Models**: ARMA(p, q) Processes - The ACF and PACF of an ARMA(p, q) Process - Forecasting ARMA Processes.

Unit IV **(12 hours)**

Nonstationary and Seasonal Time Series Models: ARIMA Models for Nonstationary Time Series - Identification Techniques - Forecasting ARIMA Models - Seasonal ARIMA Models - **Forecasting Techniques:** The ARAR Algorithm - The Holt–Winters Algorithm.

Unit V **(12 hours)**

Survey of other Forecasting Methods: Multivariate Time Series Models and Forecasting -State Space Model – Arch and Garch Model – Neural Networks and Forecasting – Spectral Analysis – Bayesian Methods in Forecasting.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the concept of Time Series & Forecasting, Stationary, Nonstationary Process and Forecasting Methods

CO2: Apply the models of ARMA, ARIMA and various methods in forecasting process

CO3: Examine an example of time series models, general approach to time series modeling and forecasting and various methods in forecasting

CO4: Evaluate the performance of forecasting models, ARAR Algorithm and Holt -Winters Algorithm

CO5: Elaborate an objective of time series analysis, uses of forecasts, statistics

background of forecasting and using various models in forecasting

Text Books:

1. Peter J. Brockwell, Richard A. Davis, *Introduction to Time Series and Forecasting*, Springer New York, Second Edition, 2002.
2. Douglas C. Montgomery, Cheryl L. Jennings, Murat Kulahci, *Introduction to Time Series Analysis and Forecasting*,John Wiley and Sons Publication, Second Edition, 2016.

Reference Books:

1. Bruce L. Bowerman, Richard O'Connell, Anne Koehler, *Forecasting, Time Series, and Regression***,** Cengage Unlimited Publishers, Fourth Edition, 2005.
2. George E. P. Box, Gwilym M. Jenkins, Gregory C. Reinsel, Greta M. Ljung, *Time Series Analysis Forecasting and Control*, John Wiley and Sons Publication, Fifth Edition, 2016.

E – Resources:

1. https://nptel.ac.in/courses/111/104/111104098/
2. https://www.udacity.com/course/time-series-forecasting--ud980

Course Outcome	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	1	1	1	1	9	**23**
CO2	9	1	3	1	1	3	9	**27**
CO3	9	1	3	1	1	1	9	**25**
CO4	9	3	9	3	3	3	9	**39**
CO5	9	3	9	3	3	9	9	**45**
Total	**45**	**9**	**25**	**9**	**9**	**17**	**45**	**159**

Low-1 Medium-3 High-9

DSE I - b) Operating Systems

(For Students Admitted from 2022-23)

Semester: V **Hours/week: 4**
Subject Code: IBDSE5B **Credit: 4**

Course Objectives:

1. To understand the services provided by and the design of an operating system
2. To understand what a process is and how processes are synchronized and scheduled

Unit I **(12 hours)**

Introduction: What is an Operating System -Mainframe systems- desktop systems- Multiprocessor Systems- Distributed systems- Clustered Systems- Real time systems- Hand held systems.

Operating System Structure: System components- Operating System services-System calls- System structure.

Unit II **(12 hours)**

Processes: Process concept- process scheduling- operations on processes- Inter process Communication

CPU Scheduling: Basic Concepts- Scheduling Criteria- Scheduling algorithms **Process Synchronization**: Background- The critical section problem- Mutex Locks-semaphores-Monitors.

Unit III **(12 hours)**

Deadlock: System Model-Deadlock Characterization- Methods of Handling Deadlock-Deadlock Prevention-Deadlock Avoidance- Deadlock Detection- Recovery from Deadlock **Memory management**: Background- Contiguous memory allocation- Swapping.

Unit IV **(12 hours)**

Virtual memory: Background- Demand paging- Copy-on-Write - Page replacement – Thrashing **File system interface**: File concepts- access methods- Directory structure **Mass storage structure**: Overview of mass storage structure - HDD Scheduling-NVM Scheduling.

Unit V **(12 hours)**

Protection: Goals of protection- domain of protection- Access matrix- Implementation of Access matrix- revocation of access rights

Security: The security problem- User authentication- Program threats- System threats-securing systems and facilities- Intrusion detection - Cryptography.

Course Outcomes:

On the successful completion of the course, student will be able to

CO1: Remember the structure of operating system and scheduling algorithms
CO2: Apply the concept of process scheduling, deadlocks and its recovery
CO3: Analyze the background of memory with segmentation and paging
CO4: Evaluate file management with file organization, and disk scheduling
CO5: Create Securing systems and facilities

Text Book:

1. Abraham G Silberschatz, *Operating System*, Wiley Publisher, Tenth Edition, 2017.

Reference Books:

1. Milan Milenkovic, *Operating System Concepts & Design***,** Tata, McGraw Hill Publishing Limited, Second Edition, 1997.
2. Peter Baer Galvin, Robert Neilson Boyd, *Applied Operating system concepts*, John Wiley & Sons Publisher, First Edition, 2000.
3. Dhananjay M. Dhamdhere, *Operating System, A Concept-Based Approach*, Tata Mc GrawHill Publishing Limited, Third Edition, 2012.
4. W. Stallings, *Operating Systems, Internals & Design Principles,* Prentice Hall of India, Fifth Edition, 2008.

E-Resources:

1. https://nptel.ac.in/courses/106/106/106106144/
2. https://www.coursera.org/lecture/nand2tetris2/unit-6-1-operating-system-uxqgJ

Course Outcome	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	1	1	1	1	9	**23**
CO2	9	1	3	1	1	3	9	**27**
CO3	9	1	3	1	1	1	9	**25**
CO4	9	3	9	3	3	3	9	**39**
CO5	9	3	9	3	3	9	9	**45**
Total	**45**	**9**	**25**	**9**	**9**	**17**	**45**	**159**

Low-1 Medium-3 High-9

DSE II - b) Distributed Systems

(For Students Admitted from 2022-23)

Semester: V **Hours/Week: 4**
Subject Code: IBDSE5D **Credit: 4**

Course Objectives:

1. To learn the architecture and processes of distributed systems
2. To understand the security of distributed systems

Unit I **(12 hours)**

Introduction: Definition of distributed system-Design goals -Types of distributed systems. **Architectures:** Architectural styles-Middleware organization-System architecture- Example architecture.

Unit II **(12 hours)**

Processes: Threads- Virtualization- Clients - Servers- Code migration. **Communication:** Foundations-Remote Procedure Call-Message–Oriented Communication- Multicast communication.

Unit III **(12 hours)**

Naming: Names, identifiers and address-Flat naming-structure naming-Attribute- based naming. **Coordination:** Clock synchronization-Logic clocks-Mutual exclusion-Election algorithms- Location systems-Distributed event matching-gossip based coordination.

Unit IV **(12 hours)**

Consistency and replication: Introduction-Data centric consistency models-Client-centric consistency models-Replica management-Consistency protocols-Example: Caching and replication in the web**. Fault tolerance**: Introduction to fault tolerance-Process resilience- Reliable client server communication-Reliable group communication.

Unit V **(12 hours)**

Fault tolerance: Distributed commit-Recovery. **Security:** Introduction to security-Security channels-Access Control-Secure naming-Security Management.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Tell about distributed systems

CO2: Illustrate processor, process, naming, communication, synchronization, thread, remote procedure calls in distributed systems

CO3: Analyze the types, architecture, client, server, logical clocks and election algorithms and protocols of distributed programs

CO4: Determine the architecture, thread, reliable client server and group communication

CO5: Build security of distributed systems

Text Book:

1. Maarten Van Steen Andrew S. Tanenbaum *Distributed Systems***,** Pearson Education, Third Edition, 2017.

Reference Books:

1. Andrew S. Tanenbaum, Maarten Van Steen, *Distributed Systems Principles And Paradigms*, Pearson Education, Second Edition, 2007.
2. George Coulouris, Jean Dellimore and Tim KIndberg, *Distributed Systems Concepts and Design*, Pearson Education, Fourth Edition, 2005.

E-Resource:

1. https://www.confluent.io/learn/distributed-systems/

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	1	9	9	9	**49**
CO2	9	9	3	1	9	3	9	**43**
CO3	9	3	3	1	9	3	9	**37**
CO4	9	3	3	1	9	9	9	**43**
CO5	9	3	3	1	9	3	9	**37**
Total	**45**	**27**	**15**	**5**	**45**	**27**	**45**	**209**

Low-1 Medium-3 High-9

SEC V– Programming in Java Lab

(For Students Admitted from 2022-23)

Semester: V **Hours/week: 2**

Subject Code: IBDSS54P **Credit: 2**

Course Objectives:

1. To make the students to understand Programming language Java to implement sorting and searching techniques

2. To create programs to solve simple calculations, check whether the given number is prime, perfect or Armstrong

List of Programs

Formula Substitution

1. Find the factorial and binomial coefficient
2. Calculate mean, variance and standard deviation
3. Develop the programs for Number conversions (Decimal to Binary, etc.)

Checking

4. Develop the programs for Number checking (prime, perfect, etc.)

Generation

5. Develop the programs for Number generation (prime, perfect, etc.)

Array

6. Arrange numbers and names in order
7. Perform matrix addition, subtraction, multiplication & transpose

Searching

8. Develop the programs for performing Linear search and binary search

String

9. Develop the programs for String manipulations (case conversion, reversing, etc.)

OOP Concepts

10. Develop the program for implementing inheritance
11. Develop the program for implementing exception handling
12. Develop the program for implementing multithreading

Note: -Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Outline Java programs that solve simple mathematical problems, number checking and number generation

CO2: Demonstrate the concepts of String Manipulation, Linear Search and Binary Search

CO3: Illustrate OOP in Java programming like inheritance

CO4: Evaluate the multi-threaded programs

CO5: Develop Exception handling programs

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	3	9	**39**
CO2	9	3	3	3	9	3	9	**39**
CO3	9	9	3	9	9	9	9	**57**
CO4	9	9	9	9	9	9	9	**63**
CO5	9	9	9	9	9	9	9	**63**

Total	**45**	**33**	**27**	**33**	**45**	**33**	**45**	**261**

Low-1 Medium-3 High-9

Core XIV- Computer Vision

(For Students Admitted from 2022-23)

Semester: VI **Hours/week: 5**
Subject Code: IBDSC63 **Credit: 4**

Course Objectives:

1. To know the fundamentals of Image Processing, Formation Models and Model Estimation Techniques
2. To able to implement fundamental image processing required for computer vision

Unit I **(15 hours)**

Introduction

Image Processing- Computer Vision and Computer Graphics- Levels in Computer Vision- Applications- Document Image Analysis- Biometrics- Object Recognition- Tracking- Medical Image Analysis- Content-Based Image Retrieval- Video Data Processing.

Unit II **(15 hours)**

Image Formation Models

Monocular Imaging System- Radiosity- Radiance- Irradiance- Colour- Orthographic and Perspective Projection- Camera Model and Camera Calibration- Binocular Imaging Systems- Multiple Views Geometry- Structure Determination- Photometric Stereo- Depth from Defocus- Construction of 3D Model from Images.

Unit III **(15 hours)**

Image Processing and Model Estimation

Image Representation and Processing- Continuous and Discrete Processing Methods- Edge Detection- Regularization Theory- Optical Computation- Motion Estimation Techniques- Structure from Motion- Stereo Vision.

Unit IV **(15 hours)**

Shape Representation and Segmentation

Contour Based Representation- Region Based Representation- Deformable Curves and Surfaces- Snakes and Active Contours- Level Set Representations- Fourier and Wavelet

Descriptors- Medial Representations- Multi Resolution Analysis.

Unit V **(15 hours)**

Applications of Computer Vision

Object Detection and Recognition- Face Detection- Face Recognition- Eigen Faces- Active Appearance and 3D Shape Models of Faces- Surveillance- Foreground and Background Separation- Particle Filters- Chamfer Matching- Tracking and Occlusion- Combining Views from Multiple Cameras.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Interpret the image formation process.

CO2: Determine the fundamental image processing techniques required for computer vision.

CO3: Illustrate shape analysis, extract features, and generate 3D Models from Images.

CO4: Evaluate video processing, motion capturing, and 3D Vision

CO5: Develop applications using computer vision techniques.

Text Book:

1. D. Forsyth and J. Ponce. (2018). *Computer Vision – A Modern Approach*. Prentice Hall.

Reference Books:

1. E. Trucco. (2017). *Introductory Techniques for 3D Computer Vision.* Prentice Hall.
2. R.C. Gonazlez. (2017). *Digital Image Processing.* Addison Wesley.
3. Mark Nixon (2016). *Feature Extraction and Image Processing for Computer Vision*. Academic Press.
4. Simon J. D. Prince (2015). *Computer Vision – Models, Learning and Inference*. Cambridge.
5. Richard Szeliski (2013). *Computer Vision – Algorithms and Applications*. Springer.

E-Resources:

1. https://nptel.ac.in/courses/108103174
2. https://onlinecourses.nptel.ac.in/noc19_cs58/preview

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	1	9	9	9	**49**
CO2	9	3	3	1	9	9	9	**43**
CO3	9	3	9	1	9	9	9	**49**
CO4	9	3	9	1	9	9	9	**49**
CO5	9	3	3	1	9	9	9	**43**
Total	**45**	**15**	**33**	**5**	**45**	**45**	**45**	**233**

Low-1 Medium-3 High-9

DSE III - a) Data Structures and Algorithms

(For Students Admitted from 2022-23)

Semester: VI **Hours / week: 4**
Subject Code: IBDSE6A **Credit: 4**

Course Objectives:

1. To understand the concepts of abstract data types. linear and nonlinear data structures
2. To be able to implement the ADTs stack, queue, and dequeue and to provide students with solid foundations to deal with variety of computational problems

Unit I **(12 hours)**

Introduction: Mathematical Notations and Functions - Algorithmic Notations - Complexity of Algorithms - Other Asymptotic Notations for Complexity of Algorithms- Sub algorithms. **Linear Data Structures:** List ADT, Singly linked lists - Doubly linked lists and Circular Linked Lists - Stack ADT, Implementation of Stacks and applications. Queue ADT, Implementation of Queue and applications.

Unit II **(12 hours)**

Non-Linear Data Structure: Trees: Introduction – Binary Trees-Representing Binary Trees in memory-Traversing Binary Trees - Traversal algorithms using Stacks- **Graphs:** Graph Notation – Searching a Graph- Kruskal's algorithm-Dijkstra's algorithm-Graph representations.

Unit III **(12 hours)**

Balanced Binary Search Trees: Binary Search Trees-AVL Trees - Splay Trees-Iterative Splaying - Recursive Splaying - Performance Analysis.

Unit IV **(12 hours)**

B-Trees: Relational Databases - B-Tree Organization -The Advantages of B-Trees - B-Tree Implementation -B-Tree Insert - B-Tree Delete. **Sorting:** Preliminaries – Insertion Sort – Shell sort – Heap sort – Merge sort – Quicksort - Bucket Sort.

Unit V **(12 hours)**

Algorithm Design Techniques: Greedy Algorithms – Huffman Codes – Approximate Bin Packing- Divide and Conquer – Running Time of Divide and Conquer Algorithms– Dynamic Programming- Backtracking Algorithms.

Course Outcomes:

After successful completion of the course, the students will be able to

CO 1: Explain the basics concept of data structures and Algorithm stacks, queues and lists
CO 2: Distinguish about knowledge of tree and graphs concepts
CO 3: Analyze the concepts about searching and sorting techniques
CO 4: Demonstrate the types of Trees
CO 5: Evaluate about Algorithm and step by step approach in solving problems with the help of fundamental data structure

Text Books:

1. Seymour Lipchutz, *Data Structures*, Special Indian Edition, Revised First Edition, 2014.
2. Mark Allen Weiss — *Data Structures and Algorithm Analysis in C++*, Pearson Education Limited, 4th Edition, 2014.
3. Kent D. Lee, Steve Hubbard, *Data Structures and Algorithms with Python* Springer International Publishing, Switzerland, 2015.

Reference Books:

1. Ellis Horowitz & Sartaj Sahni, *Fundamentals of Data Structures*, Galgotia Book Source, 2nd Edition, New Delhi, 1992.
2. Alfred V.Aho Johne, Hopcroft, *Data Structures and Algorithm*, 3rd Edition, Addison-Wesley, 2012.
3. S.Sridhar, *Design and Analysis of Algorithms*, 2014.

E-Resources:

1. http://www.math.tau.ac.il/~matias/ds03.html
2. https://onlinecourses.nptel.ac.in/noc20_cs70/preview
3. https://www.tutorialspoint.com/python_data_structure/python_data_structure_tutorial.pdf

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	3	1	1	**19**
CO2	9	3	9	1	9	1	3	**35**
CO3	9	1	9	9	1	1	3	**33**
CO4	9	3	3	3	3	3	3	**27**
CO5	9	1	1	9	9	9	3	**41**
Total	**45**	**11**	**23**	**23**	**25**	**15**	**13**	**155**

Low-1 Medium-3 High-9

DSE III - b) Database Security

(For Students Admitted from 2022-23)

Semester: VI **Hours / week: 4**
Subject Code: IBDSE6B **Credit: 4**

Course Objectives:

1. To understand the fundamentals of security, and how it relates to information Systems
2. To provide an overview of database security concepts and techniques and describe new directions of database security in the context of information technology

Unit I **(12 hours)**

Security and Information Technology: Why Database Security? - A Secure Data Environment - Database Security Objectives - Who Are We Securing Ourselves Against? - Hackers - Network and Database Administrators-E-Mails. Malware: Computer Viruses - Worms-Trojan Viruses-Bots. Security Architecture: Assessment and Analysis-Design and Modeling -Deployment-Management and Support.

Unit II **(12 hours)**

Global Policies for the Database Environment: Security Policies- Update and Upgrade Management- Backup Management Plan- The Disaster Plan. Database Review: Database Structure Components - Database Models-Database Types- Database Management Systems.

Unit III **(12 hours)**

Oracle Architecture: The Instance and the Database- The Physical Structure- The Memory Structure- The Processes. Password, Profiles, Privileges, and Roles: Authentication - Authorization. Security Auditing: Security Auditing - Audit Classification - The Goal of an Audit - The Auditing Process.

Unit IV **(12 hours)**

Database Auditing: Preparation and Planning for a Database Security Audit-**The Database**. Audit-Reporting a Database Security Audit-Vendor-Specific Auditing Information.

Unit V **(12 hours)**

Security Testing: Security Testing Classification- The Goal of Security Testing. **Testing Methodology**: Planning and Preparation Phase- Execution Phase- Escalating Privileges- Reporting Phase.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Describe the concepts of Database security and access control
CO 2: Demonstrate the database systems structure
CO 3: Analyze security auditing and security testing
CO 4: Determine Database issues in Trust Management
CO 5: Build skill for solving complex problems in a team of database workers

Text Book:

1. Alfred Basta and Melissa Zgola, *Database Security*, Course Technology, Cengage Learning, 2012.

Reference Books:

1. Alan Williams, Angeline Janet Dhanarani, Ashok Swaminathan, Bettina Schäumer, Manish Choudhary, Michael Mesaros, *Securing the Oracle Database A technical primer***,** Fourth Edition, 2021.
2. Michael Gertz, Sushil Jajodia George Mason, *Handbook of Database Security Applications and Trends*, Springer Science + Business Media, LLC, 2008.

E- Resources:

1. https://nptel.ac.in/courses/106/104/106104135/
2. https://www.careers360.com/courses-certifications/swayam-database- management- courses-brp-org

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	3	9	1	3	**29**
CO2	9	3	1	1	9	1	1	**25**
CO3	9	3	3	3	9	3	3	**33**
CO4	9	3	1	1	9	3	3	**29**
CO5	9	3	9	3	9	9	3	**45**
Total	**45**	**15**	**15**	**11**	**45**	**17**	**13**	**161**

Low-1 Medium-3 High- 9

SEC VI - Data Mining Lab

(For those who joined since 2022-23)

Semester: VI **Hours / week: 2**
Subject Code: IBDSS65P **Credit: 2**

Course Objectives:

1. To understand data mining process and important issues around data cleaning, pre-processing and integration, principle algorithms and techniques used in data mining, such as clustering, association mining, classification and prediction.
2. To get exposure to real life data sets for analysis and prediction and learn performance evaluation of data mining algorithms in a supervised and an unsupervised learning

PROGRAM LIST

1. Demonstration of preprocessing on dataset student.arff
2. Demonstration of preprocessing on dataset labor.arff
3. Demonstration of Association rule process on dataset contactlenses.arff using apriori algorithm
4. Demonstration of Association rule process on dataset test.arff using apriori algorithm
5. Demonstration of classification rule process on dataset student.arff using j48 Algorithm
6. Demonstration of classification rule process on dataset employee.arff using j48 algorithm
7. Demonstration of classification rule process on dataset employee.arff using id3 algorithm
8. Demonstration of classification rule process on dataset empl
9. Demonstration of clustering rule process on dataset iris.arff using simple k-means
10. Demonstration of clustering rule process on dataset student.arff using

simple k means

Note: - Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Apply Data mining concept
CO 2: Extract knowledge using data mining techniques
CO 3: Adapt to new data mining tools
CO 4: Explore recent trends in data mining such as web mining, spatial-temporal mining
CO 5: Explore different types of algorithm

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	1	9	9	**43**
CO2	9	1	9	3	1	9	9	**41**
CO3	9	1	9	3	1	9	9	**41**
CO4	9	1	9	3	1	9	9	**41**
CO5	9	3	9	3	1	9	9	**43**
Total	**45**	**9**	**45**	**15**	**5**	**45**	**45**	**209**

Low-1 Medium-3 High-9

B.Com Fin Tech

Three Year Regular Programme

(For Students Admitted from 2022-23)

Programme Specific Outcomes:

On completion of this programme, student will be able to gain

PSO 1: Disciplinary Knowledge: Apply computing theory, languages and algorithms, as well as mathematical and statistical models and the principles of optimization to appropriates, formula and use data analyze. Formulate and use appropriate models of data analysis to solve hidden solution to business related challenges

PSO 2: Effective Communication: Organize, visualize and analyze large, complex datasets using descriptive statistics and graphs to make decisions

PSO 3: Research Skill and Critical Thinking: Critically apply the theories and methodologies of data science to new research in their primary area of study.

PSO 4: Ethical Awareness: Develop and implement data analysis Strategies base on theoretical principles, ethical considerations and detailed knowledge of the underlying data

PSO 5: Digital Literacy: Demonstrate an ability to articulate, assess and apply appropriate theories and principles of information management. Student can construct complex statistical models, assess the fit of such models to the data and apply the models in real-world contexts

PSO 6: Problem Solving Skill: Identify, assess and select appropriate among data analytics methods and models for solving a particular real-world problem, weighing their advantages and disadvantages.

PSO 7: Self-Learning: Recognize the need for lifelong learning and have the ability to engage independent learning keeping in mind the rapid technological changes

PROGRAMME STRUCTURE – PROGRAMME CODE: UFT

Sem	Sub Code	Part	Course	Subject Title	Hours/ Week	Credit	CIA	ESE	TOTAL
	IBLT11/ IBLA11/ IBLH11	I	Language I	Tamil I/ Arabic I(a(or)b) / Hindi I(a(or) b)	5	3	40	60	100

I	IBLEI12/ IBLEII12	II	Language II	English I (a (or)b)	5	3	40	60	100
	IBFTC11	III	Core I	Business Mathematics	6	4	40	60	100
	IBFTC12	III	Core II	Accounting Package for Business(Tally Prime)	5	5	40	60	100
	IBFTA13	III	AECCI	**Introduction to Financial Markets**	5	4	40	60	100
	IBFTS14	IV	SEC	Logical Reasoning	2	2	-	50	50
				Library/ Browsing	1		-	-	-
				Games/ Remedial	1		-	-	-
	Total				**30**	**21**	**200**	**350**	**550**
II	IBLT21/ IBLA21/ IBLH21	I	Language I	Tamil II/ Arabic II (a(or)b) / Hindi II (a(or)b)	5	3	40	60	100
	IBLEI22/ IBLEII22	II	Language II	English II (a (or)b)	5	3	40	60	100
	IBFTC21	III	Core III	**Introduction to Financial Technology**	4	4	40	60	100
	IBFTC22	III	Core IV	**R & Python for Finance**	5	**5**	40	60	100
	IBFTA23	III	AECC II	Financial Accounting	5	4	40	60	100
	IBFTS24P	IV	SEC	**# PC Package Lab**	2	2	-	50	50
	IBES2	IV	GICI	Environmental Science	2	2	-	50	50
				Library/Browsing/Lectures	1		-	-	-
				Games	1		-	-	-
	IBFTX2/ IBFTX2O		Extra Credit	Business Communication/Online Course*		2	-	100	100
	Total				**30**	**23+2**	**200**	**400+ 100**	**600+ 100**
III	IBFTC31	I	Core V	Business Statistics	5	4	40	60	100
	IBFTC32	III	Core VI	**Fintech & Cyber Security**	5	4	40	60	100
	IBFTC33	III	Core VII	**Digital Marketing for Financial Sector**	4	3	40	60	100
	IBFTC34	III	Core VIII	**AI / ML for Financial Sector***	4	3	40	60	100
	IBFTA35	III	AECCIII	Banking Theory Law & Practice	4	4	40	60	100
	IBFTS36	IV	SEC	○ Customer Relationship Management	2	2	-	50	50
		IV	OEC		2	2	-	50	50
	IBHR3	IV	GICII	Human Rights	2	2	-	50	50
	IBXTN3	V	Extension	NSS/CSS	2	2	100	-	100
	IBFTX3/IBFTX3O		Extra Credit	International Marketing/Online Course*		2	-	100	100
	Total				**30**	**26+2**	**300**	**450 +100**	**750+ 100**
	IBFTC41	I	Core IX	Management Accounting	4	4	40	60	100

IV	IBFTC42	II	Core X	**Block Chain Management**	5	4	40	60	100
	IBFTC43	III	Core X I	Corporate Accounting	5	3	40	60	100
	IBFTC44	III	Core XII	**Financial Derivatives**	5	3	40	60	100
	IBFTA45	III	AECCIV	Fin Tech Ethics and Corporate Governance	5	4	40	60	100
	IBFTS46	IV	SEC	International Financial Reporting and Standards	2	2	-	50	50
	IBLVE4	IV	GICIII	Life Skills and Value Education	2	2	-	50	50
		IV	OEC		2	2	-	50	50
	IBFTX4/ IBFTX4O		Extra Credit	Project/Online Course*		2	-	100	100
	Total				**30**	**24+2**	**200**	**450+ 100**	**650+ 100**
V	IBFTC51	III	Core XIII	Income Tax Theory Law & Practices–I	5	4	40	60	100
	IBFTC52	III	Core XIV	Cost Accounting	5	3	40	60	100
	IBFTC53	III	Core XV	**Analytics for Finance**	4	3	40	60	100
	IBFTC54	III	Core XVI	○ **Big Data Analytics**	4	3	40	60	100
	IBFTE5A/ IBFTE5B	III	DSEI	Fin Tech Startups and Innovations /Commercial Law	4	4	40	60	100
	IBFTE5C/ IBFTE5D	III	DSE–II	**Financial Modeling** /Company Law	4	4	40	60	100
	IBFTS55	IV	SEC	Corporate Compliance Management	2	2	-	50	50
	IBWE5	IV	GICIV	Women Entrepreneurship	2	2	-	50	50
	IBESX5/ IBFTX5O		Extra Credit	Employability Skills/Online Course*		2	100	-	100
	Total				**30**	**27+2**	**240+ 100**	**460**	**700+ 100**
VI	IBFTC61	III	Core XVII	**FinTech Intelligence**	6	5	40	60	100
	IBFTC62	III	Core XVIII	Income Tax Theory Law & Practices–II	6	5	40	60	100
	IBFTC63	III	Core XIX	Human Resource Management	5	4	40	60	100
	IBFTC64	III	Core XX	Strategic Management	6	4	40	60	100
	IBFTE6A/ IBFTE6B	III	DSE III	Security Analysis and Portfolio Management / Logistics And Supply Chain Management	4	4	40	60	100
	IBFTS65	IV	SEC	Total Quality Management	2	2	-	50	50
				Library/Browsing	1				
	IBFTX6/ IBFTX6O		Extra Credit	Principles and Practices of Insurance/Online Course*		2	-	100	100

	Total	**30**	**24+2**	**200**	**350 +100**	**550+ 100**
	Grand Total	**180**	**145+10**	**1340 + 100**	**2460 +400**	**3800 +500**

***** For Online certification credit alone will be assigned on submission of certificate obtained through appearing for Online Examination from SWAYAM, EDX, Spoken Tutorial, NPTEL or Coursera.

#For internship course, refer www.internshala.com

○ For online course integration, syllabus will be taken from spoken tutorial.

AECC–Ability Enhancement Compulsory Course
SEC–Skill Enhancement Course
DSE – Discipline Specific Elective
OEC–Open Elective Course

AECC I - Introduction to Financial Markets

(For Students Admitted from 2022-23)

Semester: I **Hours/week: 5**
Subject Code: IBFTA13 **Credit: 4**

Course Objectives:

1. To get a basic understanding of the products, players and functioning of financial markets, particularly the capital market.
2.To understand the terms and jargons used in the financial newspapers and periodicals
3.To understand the concepts of derivatives

Unit I **(15 hours)**

Markets and Financial Instruments : Types of Markets: Equity Debt, Derivatives Commodities; Meaning and features of private, Public companies; Types of investment avenues

Unit II **(15 hours)**

Primary Market : Initial Public Offer (IPO); Book Building through Online IPO; Eligibility to issue securities; Pricing of Issues; Fixed versus Book Building issues; allotment of Shares; Basis of Allotment; Private Placement.

(15 hours)

Unit III

Secondary Market :Role and functions of Securities and Exchange Board of India (SEBI); Depositories; Stock exchanges Intermediaries in the Indian stock market Listing; Membership; Trading Clearing and settlement and risk management; Investor protection

fund (IPF); and Do's and Don'ts for investors, Equity and debt investment.

(15 hours)

Unit IV

Derivatives : Types of derivatives; Commodity and commodity exchanges; Commodity versus financial derivatives

Unit V **(15 hours)**

Financial Statement Analysis : Balance sheet; Profit & loss account; Stock market related ratios; Simple analysis before investing in the shares; understanding annual report; Director's report

Course Outcomes:

After completion of this course, student will be able to

CO1: Understand various constituents of capital market
CO2: Remember the basic concepts relating to different avenues of investment
CO3: Evaluate the difference between primary and the secondary market
CO4: Apply knowledge related to derivatives market
CO5: Analyze financial statement

Text Book:

1. NCFM -Financial Markets: Beginners Module, Mumbai: NSE

Reference Books:

- 1. H.R. Machiraju (2019). Indian Financial System. New Delhi: Vikas Publishing

2. J. K. Sharma, *Business Mathematics*, Dreamtech Publisher, 3rd Edition 2019.
3. Joydeep Sen, Abhishek Apte (2013), Fixed Income Markets in India. Mumbai: Shroff Publishers & Distributors Pvt. Ltd

E-Resources:

MOOC, NSE Website etc.

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	9	3	3	**39**
CO2	9	3	3	9	3	3	3	**33**
CO3	9	3	3	3	9	3	9	**39**
CO4	9	9	3	9	3	3	3	**39**
CO5	9	3	3	9	3	3	9	**39**
Total	**45**	**21**	**21**	**33**	**27**	**15**	**27**	**189**

Low–1 Medium– 3 High– 9

Core - III Introduction to Financial Technol

(For Students Admitted from 2022-23)

Semester: II **Hours/week: 4**

Subject Code: IBF **Credit: 4**

Course Objectives:

1.To have an in-depth understanding of the relationships existing among the key global financial systems

2.To demonstrate and advanced knowledge of key theoretical finance and economic concepts under pinning financial markets

Unit I **(12 hours)**

Introduction: Introduction of Fintech industry-Areas of Fintech-History of Fintech-Fintech importance-**New Entrants to Banking:** New banking entrants in a flash-The traditional banking Landscape-New Operating Models for Banking-Banking as a service and Open APIs-Neo-banks, Challenger banks and I Banks

Rethinking payments and remittances: Payments adremittancesinaflash-Traditionalremittances-sizeoftheremittances market-upcoming trends in remittances–Innovative ways of sending money.

Unit II **(12 hours)**

Digital Lending innovation: Digital Lending innovation in a flash- short history of lending-peer-to-peerlending-P2Pmarket place lending business model-consumer lending-digital lending for students-digital lending for SMEs-digital mortgages

Commercial banking transactions: Commercial banking transactions in a flash-Working Nature of commercial banking-SME market size –the impact of Fintech on business banking-the impact of Fintech on corporate banking Online accounting for SMEs and integration with business banking-Tools for SMEs

Next Generation Commerce: Next Generation Commerce in a flash- changes in customer shopping behaviour -point of sales(POS)evolution-mPOS Business Model-Tablet based cash registers-Online acquiring

Unit III **(12 hours)**

Crowd funding and Crowd investing: Crowd funding and Crowd investing in flash – Businesses traditionally fund – Crowd funding business model-market size-key crowd funding platforms-top crowd funding campaigns-crowd investing

Innovative wealth management: Innovative wealth management in flash-Wealth management works-changes in customer expectations-changes in advisors-changes in data analytics-changes in access to products-social investing-Personal finance management.

Unit IV **(12 hours)**

The power of big data: The power of big data in a flash- History of Data- Big Data Working principles- Uses Big Data Innovatively-Big Data in the Financial Services Industry.

The Internet of Things: The Internet of Things in a Flash- Growth of IoT- The

Impact of IoT on Businesses- The IoT in Categories- Combining IoT and Block chain- The IoT in Financial Services- O2O and IoT in FinTech- Challenges Faced by the IoT.
Block chain and Distributed Ledgers Block chain and DistributedLedgersinaFlash-AboutDistributedLedgers-Blockchain-TheComponentsofBlockchain-TopCryptocurrencies- Impacts of Financial Services-Investment in Block chain-Use Cases for Block chain.

Unit V **(12 hours)**

The Rise of Insurtech: The Rise of Insurtech in a Flash- Insurance Working principle-Market Size- Drivers ofDisruption-Peer-to-PeerInsurance-BlockchainedInsuranceandMachineLearning-WearablesinInsurance- Working Principle of Traditional Insurance Firms-Interesting Insurtech Ideas
Identification, Cyber security, and Regtech: Identification, Cyber security, and Regtechina Flash-Traditional Ways of Using Identification-Unique Identification System in India-Identification for the Unbanked-Using Biometrics as Identification- Using Biometrics in Bank Transactions- Using a Distributed Ledger forIdentification-TheUNIdentityAspiration-CybercrimeandItsHistory-TheCybersecuritySector-Typesof Cybercrime-Cyber security Categories and Players-Regulation Technology(Regtech).

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Definethefinancial technology
CO2: Apply the digital lending innovation and IoT
CO3: Analyze the cyber security and block chain
CO4: Evaluate the crowd funding and crowd investing funding models
CO5: Create the distributed ledgers

Text Book:
1. Agustin Rubini, *Fintech in a Flash: Financial Technology Made Easy,* Walter de Gruyter Publisher, Third Edition, 2018.

Reference Books:
1.Susanne Chishti and Janos Barberis, *The FINTECH Book: The Financial Technology Handbook for Investors, Entrepreneurs and Visionaries*, JohnWiley Publisher, First Edition, 2016.
2.The oLynn, JohnG. Mooney, Pierangelo Rosati,Mark Cummins, *Disrupting Finance: FinTech and Strategy inthe21st Century*, Palgrave, First Edition,2018.
3.Abdul Rafay, *FinTech, as a Disruptive Technology for Financial Institutions*, IGIGlobal, 2019.
4.Bernardo Nicoletti, *The Future of FinTech: Integrating Finance and Technology in Financial Services*, Palgrave Macmillan, 2018.

E-Resources:
1. https://www.coursera.org/courses?query=fintech
2. https://www.edx.org/course/introduction-to-fintech

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	9	9	3	3	9	9	51
CO2	9	9	9	9	9	9	9	63
CO3	9	3	9	3	9	9	9	51
CO4	9	9	9	3	9	9	9	57
CO5	9	3	9	9	9	9	9	57
Total	45	33	45	27	39	45	45	279

Low-1 Medium-3 High-9

Core IV – R & Python for Finance

(For Students Admitted from 2022 -23)

Semester: II **Hours/week: 5**
Subject Code: IBFTC22 **Credit: 5**

Course Objectives:

1. To provide a broad understanding of the principles and techniques of Python coding for finance applications.
2. Illustrate how data analytics can improve financial decision-making.
3. Provide students with a foundation for performing data analytics in finance-related roles both inside the financial sector and outside the financial sector.

Unit I **(15 hours)**

Python and Finance : Python- History of Python- Python Ecosystem- Technology in Finance- Rise of Real-Time Analytics- Finance and Python Syntax- Efficiency and Productivity Through Python- From Prototyping to Production- Python Deployment- Anaconda- Python- Spyder- Algorithmic Trading- Python for Algorithmic Trading- Machine and Deep Learning.

Unit II **(15 hours)**

Working with Financial Data : Reading Financial Data from Different Sources- Working with Open Data Sources- Retrieving Historical Structured Data- Retrieving Historical Unstructured Data- Storing Financial Data Efficiently- The process of algorithmic trading- Moving averages- Technical analysis techniques- Crossovers- Pairs trading- Data Visualization- Two-Dimensional Plotting- One-Dimensional Data Set- Two-Dimensional Data Set- Other Plot Styles- Financial Plots- Financial Data- Regression Analysis.

.

Unit III **(15 hours)**

Models and Concepts : Supervised Learning Models: An Overview- Linear Regression- Ordinary Least Squares- Regularized Regression- Logistic Regression- K-Nearest

Neighbors- Linear Discriminant Analysis- Classification and Regression Trees- Ensemble Models- ANN-Based Models- ANN using sklearn- Using ANNs for supervised learning in finance- Model Performance- Over fitting and Under fitting- Cross Validation- Evaluation Metrics- Unsupervised Learning: Dimensionality Reduction- Clustering Techniques- k-means Clustering

Unit IV **(15 hours)**

Advanced Machine Learning Models in Finance : Investigating advanced classifiers- Random Forest- Gradient Boosted Trees- XGBoost- Using stacking for improved performance- Investigating the feature importance- Investigating different approaches to handling imbalanced data- Under sampling- Oversampling- SMOTE- Bayesian hyper parameter optimization.

Unit V **(15 hours)**

Financial Analytics and Development : Excel Integration- Basic Spreadsheet Interaction- Scripting Excel with Python- Object Orientation and Graphical User Interfaces- Object Orientation- Basics of Python Classes- Simple Short Rate Class- Cash Flow Series Class- Graphical User Interfaces- Short Rate Class with GUI- Updating of Values- Cash Flow Series Class with GUI- Web Integration- Web Basics- Web Plotting- Static Plots- Interactive Plots- Real-Time Plots- Rapid Web Applications- Web Services.

Course Outcomes:

After completion of this course, student will be able to

CO1: Understand the need and advantages of using python for financial analytics
CO2: Apply advanced calculation, generate outputs, create variables, abstract from data using python.
CO3: Remember python models and techniques that aid design, analysis and evaluation of financial decision-making.
CO4: Analyze advanced machine learning models in finance using python
CO5: Create Excel, Web and GUI based design for trading platforms to support analytics.

Text Books:

1. Lookabaugh, B., Tatsat, H., Puri, S. (2020). *Machine Learning and Data Science Blueprints for Finance. China:* O'Reilly Media.
2. Hilpisch, Y. (2014). *Python for Finance: Analyze Big Financial Data*. United States: O'Reilly Media.
3. Hilpisch, Y. (2020). *Python for Algorithmic Trading*. United States: O'Reilly Media.
4. Fletcher, S., Gardner, C. (2010). *Financial Modelling in Python*. Germany: Wiley.
5. Lewinson, E. (2020). *Python for Finance Cookbook: Over 50 Recipes for Applying Modern Python Libraries to Financial Data Analysis*. United Kingdom: Packt Publishing

Reference Books:

1. Naik, K. (2019). Hands-On Python for Finance: A Practical Guide to Implementing Financial Analysis Strategies Using Python. United Kingdom: Packt Publishing.
2. Website Link: Molin, S. (2019). Hands-On Data Analysis with Pandas: Efficiently Perform Data Collection, Wrangling, Analysis, and Visualization Using Python. United

Kingdom: Packt Publishing.

Note: Question paper shall cover 100% theory.

E-Resources:

1.https://towardsdatascience.com/python-for-finance-the-complete-beginners-guide-764276d74cef
2.https://pythonforfinance.net/
3.https://github.com/yhilpisch/py4fi
4.https://github.com/wilsonfreitas/awesome-quant

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	9	9	3	9	**45**
CO2	9	3	3	3	9	3	9	**39**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	3	3	3	9	3	9	**39**
CO5	9	9	9	3	9	9	9	**57**
Total	**45**	**21**	**21**	**21**	**45**	**27**	**45**	**225**

Low-1 Medium-3 High-9

SEC II– PC Package Lab

(For Students Admitted from 2022-23)

Semester: II **Hours/week: 2**
Subject Code: IBFTS24P **Credit: 2**

Course Objectives:

1. To explain the basic concepts of windows operating systems
2. To emphasize the students to practically demonstrate the windows operating system

Unit I **(6 hours)**

Word Processor

1. Document creation, text manipulation with scientific notation
2. Table creation with formatting & conversion
3. Mail merge and letter preparation
4. Drawing flow chart- auto shapes Alignment setup and hyperlink

(6 hours)

Unit II

Electronic Spreadsheet

1.Spreadsheet chart
2.Formula editor- functions
3. Sorting data, filter

Unit III **(6 hours)**

Professional Presentation

1.Slidescreation (blank and presentation templates)
2.Changingslidedesignandlayout
3. Setting animation effects

Unit IV **(6 hours)**

Database Management Tool

1.Tablecreation
2.Queries (total, average)

Unit V **(6 hours)**

Personal Information Management

1.SetupanE-mail
2.Exchangeemailandpublicfolders
3.Setup calendar
4. a. Create, edit and delete new appointments
5. b. Create recurring appointments

Note: Questions for the external examination will be based on the concepts learnt

Course Outcomes:

After completion of this course, student will be able to
CO1: Acquirepracticalknowledgein word processor
CO2: Demonstrate the concepts of electronic spreadsheet management for business
CO3: Use professional presentation for business purpose
CO4: Explain database management tool
CO5: Develop personal information management system

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO 3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	3	3	3	**27**
CO2	9	3	9	3	3	3	3	**33**
CO3	9	3	3	3	9	3	3	**33**
CO4	9	3	3	3	9	3	9	**39**
CO5	9	9	9	3	9	3	9	**51**
Total	**45**	**21**	**27**	**15**	**33**	**15**	**27**	**183**

Low–1 Medium– 3 High– 9

Core VI - Fintech and Cyber Security

(For Students Admitted from 2022-23)

Semester: III **Hours/week: 5**
Subject **Credit: 4**
Code:IBFTC32

Course Objectives:

1.To understand the impact of digital transformation on cyber security
2.To understand financial and operation a implications of cyber security

Unit I **(15 hours)**

Introduction to Cyber Security and the Economy: Introduction of Cyber security-The scope of cyber security-General Description of Hacking groups and Cyber espionage-Cyber security Objectives-Financial repercussion of reputational damage caused by cyber-attacks Introduction to cybercrime-Threat actors.

Unit II **(15 hours)**

Counting the Costs: Cost of a cyber-security attack-Breakdown of the cost of a cyber-attack-Break down of the cost of securing an organization- Bonus. **The Threat Landscape**: Threat against end Customers-Threat against Financial Institutes.

Unit III **(15 hours)**

Phishing, Spamming and scamming to steal data: Phishing scams-Spamming-**The Malware Plague**: Malware Categories- Malware trends- Malware Infection vectors-Vulner abilities and Exploits detecting Vulner abilities Exploitation techniques.

Unit IV **(15 hours)**

Attacking online e-banking systems- Online banking benefits for financial services-Online Banking Process-Attack techniques. **Vulnerable networks and services**-A Gateway for Intrusion-Vulnerable network Protocols and network Intrusions-Attacking Web servers and web-based system-Hacking Wireless networks

Unit V **(15 hours)**

Responding to service disruption: Cyber security incidents fundamentals-Incident response, Management-Securing, Perimeter, and protecting the assets-Network Models-Endpoint security-**Audit, Risk Management, and Incident Handling:** IT Auditing-Risk Management- Incident Handling.

Course Outcomes:

After successful completion of this course, student will be able to
CO1: Classifyand develop a Security model to prevent, detect and recover from the Attacks
CO2: Illustrate the methods and tools used for cybercrime investigation
CO3: Develop various cyber threat models and threat management
CO4: Examine Audit risk, management and protecting the assets
CO5: Apply security principles to system design

Text Book:

1. Erdal Ozkaya and Milad Aslane**,** *Hands-On Cyber security for Finance: Identify Vulnerabilities and Secure Your Financial Services from Security Breaches,* Packet Publishing, 2019.

Reference Books:

1. Ec -Council, *Ethical Hacking and Counter measures: Attack Phases,* Delmar Cen gage Learning, 2009.
2. Kimberly Graves, *CEH™ Certified Ethical Hacker Study Guide,* Wiley Publishing Inc., 2013.

Note: The questions should be asked in the ratio of 70% problem and 30%theory.

E-Resources:
1. https://www.udemy.com/topic/ethical-hacking/
2. https://www.coursera.org/courses?query=ethical%20hacking
3. https://nptel.ac.in/courses/110/107/110107073/
4. https://onlinecourses.swayam2.ac.in/cec22_lw07/preview
5. https://nptel.ac.in/courses/106/106/106106129/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	3	3	9	9	**51**
CO2	9	9	9	9	9	9	9	**63**
CO3	9	3	9	3	9	9	9	**51**
CO4	9	9	9	3	9	9	9	**57**
CO5	9	3	9	9	9	9	9	**57**
Total	**45**	**33**	**45**	**27**	**39**	**45**	**45**	**279**

Low-1 Medium-3 High-9

Core VII – Digital Marketing for Financial Sector

(For Students Admitted from 2022-23)

Semester: III **Hours/week: 4**
Subject Code: **Credit: 3**
IBFTC33

Course Objectives:

1 .To understands the impact of technology on the traditional marketing mix.
2. To provide a broad understanding of the principles and techniques of digital marketing for financial applications.
3.To become familiar with the elements of the digital marketing plan
4.To understand how to reach your online target market and develop basic digital marketing objectives
5. Illustrate the use of Facebook, Google Ad words, Youtube and Email in various contexts of Digital Marketing.
6. Design digital media campaign using appropriate mix of Facebook, Google Ad words, Youtube and Email.

Unit I **(12 hours)**

Digital Marketing Planning and Structure : Inbound vs. Outbound Marketing- Content

Marketing- Understanding Traffic- Understanding Leads- Strategic Flow for Marketing Activities- WWW- Domains- Buying a Domain- Website Language & Technology- Core Objective of Website and Flow- One Page Website- Strategic Design of Home Page- Strategic Design of Products & Services Page- Strategic Design of Pricing Page- Portfolio- Gallery and Contact Us Page- Call to Action (Real Engagement Happens)- Designing Other Pages- SEO Overview- Google Analytics Tracking Code- Website Auditing- Designing Word press Website.

Unit II **(12 hours)**

Facebook Marketing Fundamentals: Profiles and Pages- Business Categories- Getting Assets Ready- Creating Facebook Pages- Page Info and Settings- Facebook Page Custom URL- Invite Page Likes- Featured Video- Pin Post and Scheduling Posts- Facebook Events- Reply and Message- Facebook Insights Reports- Competitor's Facebook Page- Ban User on Facebook Page- Connect with Twitter. Facebook Ad Campaigns: Organic v/s Paid- Defining Ad Objective- Performance Matrix- Ad Components- Designing Creative Image- Facebook Ad Structure- Setting Up Facebook Ad Account- Create Ad –Targeting- Create Ad –Budgeting- Create Ad –Creative- Content and CTA- Boosting Page Posts- Page Promotion- Video Promotion- Similar Ads and Audiences- Tracking Pixels Code- Remarketing -Website Visitors- Custom Audiences -Look Alike- Custom Audience -Saved Group- Managing and Editing Ads- Ad Reports and Ad Insights- Billing and Account. Facebook Business Manager- People- Pages and Roles- Ad Accounts Configurations- Ad Agencies and Assigning- Shared Login for FB Business A/c- Power Editor- Email Targeting on Facebook- Facebook Offers- CTA on Page- Posts for Location- Save Time with Third Party Tools- Case Studies.

Unit III **(12 hours)**

Google Ad words: Understanding Ad words- Google Ad Types- Pricing Models- PPC Cost Formula- Ad Page Rank- Billing and Payments- Ad words User Interface- Keyword Planning- Keywords Control- Creating Ad Campaigns- Creating Text Ads- Creating Ad Groups- Bidding Strategy for CPC- Case Studies. PPC- CPM- CPA - Other Measuring Tools- Bidding Strategy on Location- Bidding Strategy on Schedule- Bidding Strategy on Devices- Conversion Tracking Code- Designing Image Ads- Creating Animated Ads- Examples on Animated Ads- Creating Video Ads- Youtube Video Promotion- Hi-Jack Competitor's Video Audience- Case Studies. Remarketing Strategies- Remarketing Rules- Remarketing Tracking Code- Linking Google Analytics- Designing Remarketing Images- Shared Budget- GWD Software- Case Studies.

Unit IV **(12 hours)**

YouTube Marketing : Video Flow- Google Pages for YouTube Channel- Verify Channel- Webmaster Tool –Adding Asset- Associated Website Linking- Custom Channel URL- Channel ART- Channel Links- Channel Keywords- Branding Watermark- Featured Contents on Channel- Channel Main Trailer- Uploading Videos- Uploading Defaults- Creator Library- Case Studies. Channel Navigation- Video Thumbnail- CTA –Annotation- CTA –Extro- CTA –Cards for Mobile- Redirect Traffic to Website- Post Upload Enhancements- Live Broadcasting- Managing Playlists- Managing Comments- Managing Messages- Monetization with Adsense- Paid Youtube Channel- Channel Analytics- Real Time Analytics- Case Studies.

Unit V **(12 hours)**

Email Marketing - Content Writing: Email Machine –The Strategy- Email Frequency- Why People Don't Buy- The Fuel –Value- Triggers in Email using 4Ps- Sequence of Email Triggers- Email Example - Topic- Intro- Product- Secondary Value- Fear- Regret- Ask for Sales- Reinforcement- Offers Announcements- Urgency- Cross Sales- Re-Engagement- Buyer vs Consumer. Email Software and Tools- Importing Email Lists- Planning Email Campaign- Email Templates and Designs- Sending HTML Email Campaigns- Web Forms Lead Importing- Integrating Landing Page Forms- Campaign Reports and Insights- Segmentation Strategy- Segmentation Lists- Auto-Responder Series- Triggering Auto – Responder Emails- Auto Responder Actions- Case Studies.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Demonstrate the understanding of Digital marketing and media concepts.
CO2: Describe, define and apply the major components of Digital Marketing
CO3: Learn and apply Facebook Marketing strategies.
CO4: Utilize Google Adwords for efficient digital marketing scenarios
CO5: Learn and implement techniques using youtube for real time marketing analytics and apply email marketing and content writing for developing and enhancing digital marketing.

Text Book:

1. Digital Marketing, Vandhana Ahuja, Oxford University Press

E-Resources:

1. https://www.naukri.com/learning/basics-of-digital-marketing-by-nptel-course-nptel43
2. https://www.classcentral.com/course/swayam-digital-marketing-14006

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	9	9	9	**43**
CO2	9	3	3	1	9	3	9	**37**
CO3	9	3	3	1	9	3	9	**37**
CO4	9	3	3	1	9	3	9	**37**
CO5	9	3	3	1	9	3	9	**37**
Total	**45**	**15**	**15**	**5**	**45**	**21**	**45**	**191**

Low-1 Medium-3 High-9

Core VIII– AI / ML for Financial Sector

(For Students Admitted from 2022-23)

Semester: III **Hours/week: 4**
Subject Code: IBFTC34 **Credit: 3**

Course Objectives:

- To identify, formulate, and implement a machine learning project.
- To explore various applications of machine learning in all business aspects.

- To introduce the basic concepts, theories and state-of-the-art techniques of artificial intelligence.
- To introduce basic concepts and applications of machine learning.
- To help students to learn the application of machine learning /A.I algorithms in the different fields of science, medicine, finance etc.

Unit I **(12 hours)**

Basics concepts of Machine Learning: ML Definition- Various kind of problems tackled using ML- Some standard learning tasks- Learning Stages- Learning Scenarios- Generalization- Data, Models and Learning- Parameter Estimation- Probabilistic Modeling and Inference- Directed Graphical Models- Setting up your working Environment- Supervised vs. Unsupervised Learning- Cross Validation- Evaluation metrics.

Unit II **(12 hours)**

Advanced concepts of Machine Learning: Fundamentals of statistical learning theory- Convergence and learnability- Kullback-Leibler Information- Model selection and the bias variance trade-off- Cross-validation- Regularization- Generative vs. Discriminative models- Neural Networks- The Perceptron- Feed-Forward Neural Networks- Back-propagation and stochastic gradient descent- Regularization and drop-out-Application to investment management.

Unit III **(12 hours)**

Supervised Learning: Linear Regression- Parametric Problems- Decision trees- Random forests- Classifications- K Nearest Neighbors- Support Vector- Naive Bayesian Model.

Unit IV **(12 hours)**

Unsupervised Learning: Clustering- K-Means clustering- Dimensionality Reduction- Principle Component Analysis- Hierarchical Clustering- DBSCAN- Semi-supervised learning- Reinforcement Learning.

Unit V **(12 hours)**

Advanced Neural Networks: Convolutional Neural Networks- Recurrent Neural Networks- Long Short-Term Memory (LSTM)- Autoencoders- Applying Learning to Real problems- Image Classification & Segmentation- Scoring Opinion and Sentiments- Recommending Products and Movies- Bitcoin Prediction- Predicting from the Limit Order Book.

Unit VI **(12 hours)**

Applications of AI/ML in Financial Markets: Webinars – Quiz - Online Assignments

Course Outcomes:

After completion of this course, student will be able to

CO1: Understand the basic definition and need for machine learning
CO2: Understand the core aspects behind any machine learning project
CO3: Ability to implement a machine learning project
CO4: Ability to identify potential applications of machine learning in real time
CO5: Apply the machine learning concepts in real life problems

Text Books:

1. Mac Namee, B., D'Arcy, A., Kelleher, J. D. (2015). *Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, and Case Studies*. United Kingdom: MIT Press
2. N P Padhy, *Artificial Intelligence and Intelligent Systems*, Oxford University Press
3. Lopez de Prado, M. (2018). *Advances in Financial Machine Learning*. Germany: Wiley
4. Dixon, M. F., Halperin, I., Bilokon, P. A. (2020). *Machine Learning in Finance: From Theory to Practice*. Germany: Springer International Publishing
5. Mueller, J. P., Massaron, L. (2021). *Machine Learning For Dummies*. United States: Wiley

Reference Books:

1. Guido, S., Müller, A. C. (2016). *Introduction to Machine Learning with Python: A Guide for Data Scientists*. United States: O'Reilly Media
2. Mueller, J. P., Massaron, L. (2021). *Machine Learning For Dummies*. United States: Wiley
3. Cooper, S. (2018). *Machine Learning for Beginners: An Introduction for Beginners, Why Machine Learning Matters Today and How Machine Learning Networks, Algorithms, Concepts and Neural Networks Really Work*. (n.p.): Steven Cooper

E-Resources:

1. https://www.kdnuggets.com/2020/03/trends-machine-learning-2020.html
2. https://mobidev.biz/blog/future-ai-machine-learning-trends-to-impact-business
3. https://venturebeat.com/2020/01/02/top-minds-in-machine-learning-predict-where-ai-is-going-in-2020/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	9	3	3	9	**39**
CO2	9	3	3	9	1	1	9	**35**
CO3	3	3	3	9	1	1	9	**29**
CO4	9	1	3	9	1	1	9	**33**
CO5	9	3	1	9	1	3	9	**35**
Total	**39**	**13**	**13**	**45**	**7**	**9**	**45**	**171**

Low-1 Medium-3 High-9

Core X – Block Chain Management

(For Students Admitted from 2022-23)

Semester: IV **Hours/week: 5**
Subject Code: IBFTC42 **Credit: 4**

Course Objectives:

1. To give an overview on block chain technology

2.To gain knowledge on Bit coin and network structure
3. Familiarize with crypto currencies.
4. To learn the technical challenges in Block chain technology.
5. To develop & integrate ideas from various domains and implement the technology in different perspectives

Unit I **(15 hours)**

Overview of Block Chain: A Payment System- Two types of Software Architecture- Advantages of Distributed Systems- Disadvantages of Distributed Systems- Mixing Centralized and Distributed Systems- Purpose of Block chain- Layers of Block chain- Block chain Uses and Use Cases- Laying the Block chain Foundation- Cryptography- The Structure of Block chains- Block chain Applications- The Block chain Life Cycle-Block chains in Use.

Unit II **(15 hours)**

Overview of Bitcoins : History of Money- Dawn of Bitcoin- Bitcoin Definition- Working with Bitcoins- The Bitcoin Block chain- Block Structure- Merkle Tree- The Genesis Block- The Bitcoin Network- Network Discovery for a New Node- Bitcoin Transactions- Consensus and Block Mining- Block Propagation- Bitcoin Scripts- Bitcoin Wallets.

Unit III **(15 hours)**

Block Chain 1.0, 2.0 and 3.0: Block chain 1.0: Currency- How a Crypto currency Works- Block chain 1.0 in Practical Use- Block chain 2.0: Contracts- Financial Services- Crowd funding- Bitcoin Prediction Markets- Smart Property- Smart Contracts- Block chain 2.0 Protocol Projects- Ethereum: Turing Complete Virtual Machine- Automatic Markets and Trade nets- The Block chain as a Path to Artificial Intelligence- Block chain 3.0: Applications - Beyond Currency, Economics, and Markets- Block chain Science: Grid coin, Folding coin.

Unit IV **(15 hours)**

Impacts of Block Chain: Block chain Learning: Bitcoin MOOCs and Smart Contract Literacy- Learn coin- Currency, Token, Tokenizing- Community coin- Campus coin- Currency Multiplicity-Demurrage Currencies- Technical Challenges- Business Model Challenges- Scandals and Public Perception- Government Regulation- Privacy Challenges for Personal Records- Block chain Genomics- Block chain Health.

Unit V **(15 hours)**

The Real Business Block chain : Block chain Inspired Solution- Business Currencies with Block chain Inspired Solution- Block chain complete solution- Seeking Value Consorting with the Enemy- Game on for Tokenization- Embracing Consensus through Decentralization- Market Access and Participation- Enhanced Block chain Solutions- Unleashing the Power of Smart Things- The Block chain Organization- The Block chain Society.

Course Outcomes:

After completion of this course, student will be able to

CO1: Learn the basic concepts of distributed systems and structure of Block chain

CO2: Gain insights on Bitcoin and understand the mechanics of Bitcoin transactions

CO3: Know the importance of various crypto currencies

CO4: Understand Block chain Learning and its application for various Business Models

CO5: Analyze the Block chain Solutions and understand the idea of Block chain Society

Text Books:

1. Block chain Basics: A Non-Technical Introduction in 25 Steps, Daniel Drescher, Apress Publishers,2017
2. Dhameja, G., Singhal, B., Panda, P. S. (2018). Beginning Blockchain: A Beginner's Guide to Building Blockchain Solutions. Germany: Apress
3. Swan, M. (2015). Blockchain: Blueprint for a New Economy. United States: O'Reilly Media
4. Uzureau, C., Furlonger, D. (n.d.). The Real Business of Blockchain: How Leaders Can Create Value in a New Digital Age. United States: Harvard Business Review Press

Reference Books:

1.Daniel Drescher, "Block Chain Basics", Apress; 1stedition, 2017

2/Anshul Kaushik, "Block Chain and Crypto Currencies", Khanna Publishing House, Delhi

3.Imran Bashir, "Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained", Packt Publishing, first edition – 2012

E-Resources:

1. https://www.blockchain.com/learning-portal/bitcoin-faq
2. https://www.bitdegree.org/crypto/tutorials/blockchain-explained
3. https://link.springer.com/article/10.1007/s00287-020-01246-7

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	3	3	3	3	**25**
CO2	9	1	1	3	3	3	3	**23**
CO3	9	3	3	3	9	9	9	**45**
CO4	9	1	9	3	9	9	9	**49**
CO5	9	3	9	3	9	9	9	**51**
Total	**45**	**9**	**25**	**15**	**33**	**33**	**33**	**193**

Low-1 Medium-3 High-9

Core XII– Financial Derivatives

(For Students Admitted from 2022-23)

Semester: IV **Hours/week: 5**

Subject Code: IBFTC44 **Credit: 3**

Course Objectives:

1.To understand the fintech ethical and social responsibilities
2.To tackle the current corporate governance issues in the techno era

Unit I **(15 hours)**

Basics of Derivatives & Understanding Index: Basics of Derivatives - Evolution - Indian Derivatives Market - Market participants – Types - Significance - Various risk faced by the participants - Introduction to Index - Significance - Types – Attributes - Index management - Major Indices in India, - Applications of Index.

Unit II **(15 hours)**

Introduction to Forwards, Futures & Options : Payoff Charts - Futures pricing - Cash and carry / Non-arbitrage model - Expectancy model of futures pricing - Concept of convergence of cash and futures prices - Basic differences in Commodity - Equity and Index Futures - Uses of futures - Role of different players - Use of futures contract as an effective instrument for managing risk, Strategies for hedging, speculation and arbitrage.

Unit III **(15 hours)**

Option Trading Strategies & Systems: Option spreads - Payoff charts - Straddle - Strangle - Covered Call - Protective Put Collar - Butterfly spread. Trading Systems, Corporate hierarchy, Order types and conditions, Selection criteria of Stock for trading and Index for trading - Adjustments for Corporate Actions - Position Limits - Daily newspapers to track

Unit IV **(15 hours)**

Clearing and Settlement system & Legal and Regulatory Environment: Clearing Members - Role and Eligibility norms - Mechanism and computation of open positions - Settlement of stock and index - margining and mark to market under SPAN, Risk Management features and position limits. - Rules and regulations - Recommendations of the L.C Gupta Committee, Recommendations of the J R Verma Committee.

Unit V **(15 hours)**

Taxation & Sales Practices and Investors Protection Services: Accounting of contracts, Taxation of securities. Risk profile - Importance of Sales process, Importance of KYC, Documents to trade in Derivatives contract, Best practices in Derivatives sales, Investors Grievance Mechanism.

Unit VI **(15 hours)**

Contemporary Issues: Webinars – Quiz - Online Assignments

Course Outcomes:

After completion of this course, student will be able to
CO1: Understand business ethics
CO2: Outline Fintech ethics and its principles
CO3: Explicate computer ethics and business values
CO4: Execute and justify corporate governance
CO5: Discuss governance and ethics in practice

Text Books:

1.NISM (2019), NISM Series VIIIA Equity Derivative Module, Delhi: Taxman
2.NCFM – Derivatives Market – Dealers Module, by NSE Academy, Mumbai
3. Robert Baker (2010), "The Trade Lifecycle: Behind the Scenes of the Trading Process. New Delhi, Wiley India

Reference Books:

1. Franklin R. Edwards (1992) Cindy W.Ma. Futures & Options. Bangalore: McGraw Hill
2. Jagadish R. Raiyani (2011).Financial Derivatives in India, Chennai: New Century Publication
3. Bhushan Vijay Kumar Jadhav (2018), Option Trading Strategies: Independently Published

E–Resources:
MOOC, SWAYAM, NPTEL, Websites etc.

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	3	1	1	**19**
CO2	9	3	9	1	9	1	3	**35**
CO3	9	1	9	9	1	1	3	**33**
CO4	9	3	3	3	3	3	3	**27**
CO5	9	1	1	9	9	9	3	**41**
Total	**45**	**11**	**23**	**23**	**25**	**15**	**13**	**155**

Low-1 Medium-3 High-9

Core XV– Analytics for Finance

(For Students Admitted from 2022-23)

Semester: V **Hours/week: 4**
Subject Code: IBFTC53 **Credit: 3**

Course Objectives:

1. To gain understanding on the need and significance of Financial Analytics for various business requirements.
2.To understand the Basic concepts of R
3.To gain financial analytics knowledge using python
4.To identify, formulate, and implement a Fintech project using R
5.To prepare the project using Python.

Unit I **(12 hours)**

Financial Analytics

Introduction: Meaning-Importance of Financial Analytics Uses-Features-Documents used in Financial Analytics: Balance Sheet, Income Statement, Cash flow statement-Elements of Financial Health: Liquidity, Leverage, Profitability. Analysts: Role and Responsibilities Information and Knowledge-Methodology-Data-Required Competencies for the Analyst-

Hypothesis Driven Methods-Data Mining with Target Variables-Explorative Methods-Business requirements.

Unit II **(12 hours)**

Financial Analytics with R:

What is R and its application - Language features: functions, Assignment, Arguments and types. financial Statistics: Concept and mathematical expectation - Probability - Mean; SD and Variance - Skewness and Kurtosis - Covariance and correlation - Capital Asset Pricing model. Financial Securities: Bond and Stock investments - Housing and Euro crisis - Securities Datasets and Visualization - Plotting multiple series. Time Series and Sharpe ratio: Examining and Stationary - Auto Regressive and integrated moving average Processes. Time periods and Annualizing - Ranking investment candidates - Sharpe Ratio for Income Statement growth.

Unit III **(12 hours)**

Financial Analytics with Python

Numbers in Python: Using type with different and creating an imaginary number - using numbers: using math operations and number formats. Python ingredients: Variables, names and objects - Numbers: Integers - Precedence - Bases - type. Conversion, Strings: Create coin Quotes-Reading Crossovers- Pairs trading- Financial Plots- Financial Data- Regression Analysis. Supervised Learning: Linear Regression- Ordinary Least Squares- Regularized Regression- Logistic Regression- K-Nearest Neighbors- Linear Discriminant Analysis- Classification and Regression Trees- Unsupervised Learning: Dimensionality Reduction- Clustering Techniques- k-means Clustering.

Unit IV **(12 hours)**

Financial Analytics Applications using R:

Ganging the market Sentiment: Mark or Regime Switching model - Bayesian reasoning - Beta distribution. Stimulating Trading Strategies: Foreign exchange markets - Chart analytics - Initialization and finalization - Bayesian Reasoning within Positions. Prediction using fundamentals and binomial model for options: Best income statement Portfolio - obtaining Price Statistics - combining the income statement with Price statistics - Prediction using classification trees and Recursive Partitioning. Applying Computational finance - risk Neutral Pricing and No Arbitrage - High Risk - Free Rate Environment.

Unit V **(12 hours)**

Financial Analytics and Development using Python

Excel Integration- Basic Spreadsheet Interaction- Scripting Excel with Python- Object Orientation and Graphical User Interfaces- Object Orientation- Basics of Python Classes- Simple Short Rate Class- Cash Flow Series Class- Graphical User Interfaces- Short Rate Class with GUI- Updating of Values- Cash Flow Series Class with GUI- Web Integration- Web Basics- Web Plotting- Static Plots- Interactive Plots- Real-Time Plots- Rapid Web Applications- Web Services.

Unit VI

Contemporary Issues: Webinars – Quiz - Online Assignments

Course Outcomes:

After completion of this course, student will be able to

CO1: Describe, define and apply the major components of the Financial Analytics and its importance in Fintech

CO2: Describe, define and apply the major components of the Financial Analytics and its importance in Fintech

CO3: Learn and apply the financial analytics process in Python

CO4: Learn and implement the applications of Financial Analytics using R

CO5: Apply python concepts and practices to advanced financial analytics

Text Book:

1.Financial Analytics with R _ Mark J. Bennets, Cambridge University Press

2.Introducing Python - OREILLY modern computing in simple packages - BILL LUBANOVIC - Shroff Publishers & Distributors Pvt. Ltd, Sep, 2015 , Mumbai

3. Beginning Python - Peter Norton Ctl, - WILEY - 2005 , New Delhi

4. Mac Namee, B., D'Arcy, A., Kelleher, J. D. (2015). Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, and Case Studies. United Kingdom: MIT Press

5. Lopez de Prado, M. (2018). Advances in Financial Machine Learning. Germany: Wiley

6. Dixon, M. F., Halperin, I., Bilokon, P. A. (2020). Machine Learning in Finance: From Theory to Practice. Germany: Springer International Publishing

Reference Books:

1. Fundamentals of Business Analytics -R N Prasad,. Seema Achavya,Wiley India PVT Ltd, New Delhi, P.No: 87-100, P.No:115-125 3Prof. M.L. Agarwa l& Dr. K.L.Gupta, *Cost Accounting*, Sahitya Bhawan Publications, 1st January,2021

2. Naik, K. (2019). Hands-On Python for Finance: A Practical Guide to Implementing Financial Analysis Strategies Using Python. United Kingdom: Packt Publishing

3. Molin, S. (2019). Hands-On Data Analysis with Pandas: Efficiently Perform Data Collection, Wrangling, Analysis, and Visualization Using Python. United Kingdom: Packt Publishing

Note: Question paper shall cover 100% theory.

E-Resources:

1. https://towardsdatascience.com/python-for-finance-the-complete-beginners-guide-764276d74cef
2. https://pythonforfinance.net/
3. https://github.com/yhilpisch/py4fi
4. https://github.com/wilsonfreitas/awesome-quant
5. https://www.incworx.com/blog/sql-server-2020

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	3	1	1	**19**
CO2	9	3	9	1	9	1	3	**35**

CO3	9	1	9	9	1	1	3	**33**
CO4	9	3	3	3	3	3	3	**27**
CO5	9	1	1	9	9	9	3	**41**
Total	**45**	**11**	**23**	**23**	**25**	**15**	**13**	**155**

Low-1 Medium-3 High-9

Core XVI - Big Data Analytics

(For Students Admitted from 2022-23)

Semester: V **Hours/week: 4**
Subject Code: IBFTC54 **Credit: 3**

Course Objectives:

1. To understand the Big Data Platform and its Use cases and Map Reduce Jobs
2. To provide an overview of Apache Hadoop, HDFS Concepts and Interfacing with HDFS and apply analytics on Structured, Unstructured Data

Unit I **(12 hours)**

Introduction to Big Data: Introduction-Understanding Big data-Capturing Big data-Volume-velocity-variety-veracity-Benefiting Big Data- Management of big data-Organizing big data- Technology challenges.

Unit II **(12 hours)**

Big data Sources and Architecture: Big data sources-People to people communication-m2m- Big data applications- Examining big data types- Structured data – Unstructured data- Semi structured data-Integrating data type into big data environment-Big data Architecture.

Unit III **(12 hours)**

HADOOP: Big Data – Apache Hadoop &Hadoop EcoSystem – Moving Data in and out of Hadoop – Understanding inputs and outputs of Map Reduce - Data Serialization- Hadoop Architecture, Hadoop Storage. Hadoop Map Reduce paradigm, Map and Reduce tasks, Job, Task trackers: HDFS- Hive Architecture and Installation, Comparison with Traditional Database, Hive QL - Querying Data - Sorting and Aggregating, Map Reduce Scripts, Joins &Sub queries, HBase.

Unit IV **(12 hours)**

Analytics and Big Data: Basic analytics-Advanced analytics-Operationalized analytics-Monetizing analytics-Modifying business intelligence products to handle big data- Big data analytics solution-Understanding text analytics-Tools for Big data.

Unit V **(12 hours)**

Data Visualization and R: Introduction-Excellence in visualization- Types of chart-Business Intelligence: Tools-Skills applications – Health care- Education-retail- E-Governance- Working with R- Import a dataset in R Plotting a histogram-Big data mining.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe Data sources, generations, data formats, Data Evolution, Data from various domains

CO2: Determine Big Data Characteristics, Frameworks, components and Limitation of traditional approaches and map Big Vs. to Data Domains

CO3: Analyse various domains of Data Characteristics, Platform, Programming Model and Design Data Analytic ecosystem, and data processing framework

CO4: Evaluate the Concepts of Data Analytics Phases and Techniques

CO5: Formulate Data Analytics Techniques practically using R environment

Text Books:

1. Anil Maheshwari, *Data Analytics Made Accessible*, Kindle Edition, 2017.
2. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, *Big Data for Dummies*, Wiley India Private Limited, 2014.

Reference Books:

1. Boris Lublinsky, Kevin T. Smith, Alexey Yakubovich, *Professional Hadoop Solutions*, Wiley India Private Limited, 2013.
2. Chris Eaton, Dirk Deroos, Understanding *Big data*, McGraw Hill, 2012.
3. Tom White, *HADOOP: The definitive Guide*, O Reilly, 2012.
4. Tom Plunkett, Brian Macdonald, *Oracle Big Data Handbook*, Oracle Press, 2014.
5. JyLiebowitz, *Big Data and Business analytics*, CRC Press, 2013.
6. VigneshPrajapati, *Big Data Analytics with R and Hadoop*, Packet Publishing, 2013.

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc20_cs92/preview
2. https://nptel.ac.in/courses/110/106/110106072/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	9	9	1	9	**55**
CO2	9	9	9	9	9	1	9	**55**
CO3	9	9	9	9	9	1	9	**55**
CO4	9	9	9	9	9	1	9	**55**
CO5	9	9	9	9	9	1	9	**55**
Total	**45**	**45**	**45**	**45**	**45**	**5**	**45**	**275**

Low-1 Medium-3 High-9

DSE II - a) Financial Modeling

(For Students Admitted from 2022-2023)

Semester: V **Hours/week: 4**

Subject Code: IBFTE5C **Credit: 4**

Course Objectives:

1.To make the students understand how Financial models are used to estimate the valuation of a business

2. To apply knowledge and understanding of financial statements

3. To learn to compare businesses to their peers in the industry through various models.

4. To understand how financial models are used in strategic planning to test various scenarios,

5. Calculate the cost of new projects, decide on budgets, and allocate corporate resources.

6. To build valuation models using different methods

Unit I **(12 hours)**

Principles of Modeling :A Good Model- Model Design- Selection of Model Variables and their Dependencies- Level of Detail or Aggregation- Model Structure and Planning- Model Building- Results Presentation and Other Uses of Sensitivity Analysis- Model Auditing.

Unit II **(12 hours)**

Financial Statement, Cash Flow and Valuation Modeling

Financial Statement Modeling: Core Points and Example- Income Statement Forecasting- Sales Forecasts- Cost Forecasts- Operating Profit- Taxable Profit, Tax and Net Income- Dividends and Retained Earnings Balance Sheet Forecasting- Error Checks and Feasibility Checks- Cash Flow Statement Forecasting- Cash Flow Valuation.

Unit III **(12 hours)**

Developing Financial Models : Financial Modeling- Basics of Design- Design process and method- Menu structure- Management reports and summaries- Development- Testing and auditing- Protection as an application- Documentation- Features and techniques - Data validation- Controls- Graphics- Sample model planning- Example model.

Unit IV **(12 hours)**

Applications of Financial Modeling: Analyzing performance- Forecasting models- Portfolio analysis- Cost of capital- Bonds- Investment analysis- Risk- Depreciation- Leasing- Company valuation- Optimization- Decision trees- Risk management- Modeling checklist.

Unit V **(12 hours)**

Financial Modeling in Python: Welcome to Python- PPF package- Basic Mathematical Tools- Data Model- Timeline- The Hull White Model- Pricing using Numerical Methods- Pricing Financial Structures in Hull White-Python Excel Integration.

Course Outcomes:

After completion of this course, student will be able to

CO1: Learn the basic concepts of modeling and its perspective in analysis and auditing.

CO2: Gain insights on Financial Statement and forecasting various finance parameters.

CO3: Develop a financial model suitable that aids management and documentation

CO4: Understand potential applications of Finance Models and its implementation

CO5: Practice and implement Financial modeling in Python Environment.

Text Books:

1. Rees, M. (2015). Financial Modeling in Practice: A Concise Guide for Intermediate and Advanced Level. United Kingdom: Wiley.
2. Day, A. (2012). Mastering Financial Modeling in Microsoft Excel 3rd Edn: A Practitioner's Guide to Applied Corporate Finance. United Kingdom: Pearson Education Limited.
3. Gardner, C., Fletcher, S. (2010). Financial Modeling in Python. Germany: Wiley.

Reference Books:

1. Mastering Financial Modeling In Microsoft Excel: A Practitioner'S Guide To Applied Corporate Finance, 2/E. (2008). India: Pearson Education.
2. Benninga, S. Z., Benninga, D. F. o. M. S., Benninga, S., Czaczkes, B. (2000). Financial Modeling. United Kingdom: MIT Press.

E-Resources

1.https://corporatefinanceinstitute.com/resources/knowledge/modeling/types-of-financial-models
2.https://www.wallstreetprep.com/knowledge/financial-modeling-best-practices-and-conventions/
https://www.ey.com/en_nl/finance-navigator/the-ultimate-guide-to-financial-modeling-for-startups

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	3	1	1	3	1	1	19
CO2	9	3	9	1	9	1	3	35
CO3	9	1	9	9	1	1	3	33
CO4	9	3	3	3	3	3	3	27
CO5	9	1	1	9	9	9	3	41
Total	45	11	23	23	25	15	13	155

Low -1 Medium- 3 High – 9

DSE III - Financial Intelligence

(For Students Admitted from 2022-23)

Semester: VI **Hours/week: 6**
Subject Code: IBFTC61 **Credit: 5**

Course Objectives:

1. To enable the students to understand the basic concepts and terms related to Income Tax
2. To enable the students to compute income under various heads namely income from

clubbing of income, deductions, assessment procedures, assessment of individual and assessment of firms and companies

Unit I **(18 hours)**

Clubbing of Income: Deemed Income–Set Off and Carry Forward of Losses

Unit II **(18 hours)**

Deductions: Deductions in the Computation of Total Income. Deduction under Section 80Cto 80U

Unit III **(18 hours)**

Assessment Procedures: Procedure for Assessment – Collection and Recovery – Refund of Tax–Deduction of Tax at Source–Advance Payment of Tax–E-Filing–PAN–Rectification of Mistakes

Unit IV **(18 hours)**

Assessment of Individual: Individual–Hindu Undivided Family

Unit V **(18 hours)**

Assessment of Firms and Companies: Firms and Companies

Course Outcomes:

After completion of this course, student will be able to

CO1: Acquire knowledge in clubbing of income
CO2: Illustrate deductions in the computation of total income
CO3: Plan the assessment procedure
CO4: Assess the income of individual and Hindu undivided family
CO5: Deal with the assessment of firms and companies

Text Book:

1.Mehrotra H.C.& Goyal S.P, *Income Tax Law & Accounts*, Sathya Bhawan Publication, Relevant Assessment Year Edition, New Delhi, 2021.

Reference Books:

1. Dr.VinodK. Singhania, *Direct Taxes law & Practices*, Tan Prints India Pvt Ltd, Relevant Assessment Year Edition, 2021.
2. Lal.B.B and Vashisht.N, *Direct Taxes Practices & Planning*, Pearson Publications, Relevant Assessment Year Edition, New Delhi, 2021.
3. Dr. Bhushan and Sharma. K, *Income Tax*", Kalyan Publishers, Relevant Assessment Year Edition, New Delhi, 2021.

Note: The questions should be asked in the ratio of 70%problem and 30%theory.

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	9	3	9	9	**45**

CO2	9	3	3	3	9	9	9	**45**
CO3	9	3	9	9	3	9	9	**51**
CO4	9	3	9	3	9	9	9	**51**
CO5	9	3	9	9	9	9	9	**57**
Total	**45**	**15**	**33**	**33**	**33**	**45**	**45**	**249**

Low-1 Medium-3 High-9

Ability Enhancement Compulsory Course (AECC) FOR BSc Maths
(For Students Admitted From 2022 – 23)

PREAMBLE

The Board of Studies of Computer Science revamped the curriculum with the following changes

1. The course 'Programming in C' is replaced with 'Programming in C Lab'
2. The course 'Object Oriented Programming in C++' is replaced with 'Programming in Java'

Sem	Subject Code	Course	Subject Title	Hours / week	Credit	CIA	ESE	Total Marks
III	IBMXA33P	AECC	Programming in C lab	4	4	40	60	100
IV	IBMXA43	AECC	Programming in Java	5 (T-3, P-2)	4	40 (T-20, P-20)	60	100
IV	IBMXS44P	SEC	R Tool Lab	2	2		50	50

AECC III – Programming in C Lab

(For Students Admitted From 2022-23)

Semester: III **Hours/week: 4**
Subject Code: IBMXA33P **Credit: 4**

Course Objectives:

1. To implement formula substitution using C language
2. To gain knowledge in implementing numerical methods using C language

Programs

Formula substitution

1. Develop a C Program to check whether the given number is odd or even
2. Develop a C Program to find sum of the digits
3. Develop a C Program to find whether a given number is Armstrong or not

4. Develop a C Program to find the area of various shapes using switch case

Array

5. Develop a C Program to Check whether the element is present in the given list or not

Functions & Structures

6. Develop a C Program to find the factorial of a given number using recursion function
7. Develop a C Program to prepare student mark list using structure

String Manipulation

8. Develop a C Program to count the vowels in the given string

Pointers

9. Develop a C Program to find average of two numbers using pointers

Numerical methods

10. Develop a C program to illustrate the use of Taylor Series method
11. Develop a C program to implement Euler's method
12. Develop a C program to implement Newton Raphson method
13. Develop a C program to implement bisection method
14. Develop a C program to implement Simpson's 1/3 rule
15. Develop a C program to implement Runge Kutta Method
16. Develop a C program to implement Fixed point iteration Method

Note:-Questions for Internal and External examination will be based on concepts learnt

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Illustrate the different concepts of C language
CO2: Identify the steps to implement functions, structures and pointers in C language
CO3: Simplify the process of solving differential equations using numerical methods
CO4: Discover new logic to solve the critical problems
CO5: Design algorithm with simple problems and control structures

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	9	9	9	**51**
CO2	9	1	9	1	9	9	9	**47**
CO3	9	3	9	3	3	9	9	**45**
CO4	9	9	9	3	3	9	9	**51**
CO5	9	9	9	3	9	9	9	**57**
Total	**45**	**25**	**45**	**13**	**33**	**45**	**45**	**251**

Low-1 Medium-3 High-9

AECC IV – Programming in Java

(For Students Admitted From 2022 – 23)

Semester: IV **Hours/week: 5 (T: 3 P: 2)**
Subject Code: IBMXA43 **Credit: 4**

Course Objectives:

1. To gain knowledge about basic Java language syntax and semantics to write Java programs and useconcepts such as variables, conditional and iterative execution methods etc
2. Understand the fundamentals of object-oriented programming in Java, including defining classes,object invoking methods etc and exception handling mechanisms

Unit I **(9 hours)**

Fundamentals of Object Oriented Programming: Introduction, object oriented paradigm-basic concepts of oops – benefits of oops – applications of OOPs. **Java Evolution**: java features –java Versus C and C++ - java and internet – java and WWW – web browsers **Overview of Java Language**: simple java program - more of java – application with two classes –java program structure – java tokens – java statements implementing a java program.

Unit II **(9 hours)**

Constants, Variables, data types: Declaration of variables- giving values to variables – scope of variables –symbolic constants – type casting – getting values of variables – standard default values – **Operators and Expressions**: Arithmetic operators –Relational operators-logical operators – assignment operators – increment and decrement operators –conditional operator – bitwise operator – special operators –arithmetic expressions –evaluation of expressions –precedence of arithmetic operators-type conversion in expression –operator precedence and associativity – mathematical functions.

Unit III **(9 Hours)**

Decision making and Branching: if statement-switch - ? : Operator –**Decision Making and Looping:**while statement -do statement - for statement- jumps in loops - labeled loops. **Classes, Objects and Methods**: Introduction – defining a class, field declaration–methods declaration– creating objects -accessing class members- constructors- methods overloading -static members –nesting of methods - inheritance -overriding methods – final variables and methods – final classes.

Unit IV **(9 Hours)**

Arrays Strings and Vectors: one dimensional array – creating an array –two dimensional arrays – strings –vectors –wrapper classes – **Interfaces, Multiple Inheritance**: defining interfaces – extending interfaces –implementing interfaces –accessing interface variables. **Packages , Putting classes together :** Introduction - java API packages : using system packages – naming conventions –creating packages –accessing a package –using a package – adding a class to a package –hiding classes.

Unit V **(9 Hours)**

Multithreaded Programming: creating threads – extending the thread class– stopping and blocking a thread - life cycle of a thread – using thread methods – thread exceptions – thread priority – synchronization – implementing the runnable interface. **Managing Errors and Exception:** Introduction – types of errors –exceptions -syntax of exception handling

code – multiple catch statements –using finally statement –throwing our own exceptions – usingexceptions for debugging.

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Identify the importance of java with its data types, control statements and class fundamentals

CO2: Make use of inheritance, method overriding and implement packages and interfaces

CO3: Experiment with exception handling and multithreading

CO4: Apply string and string buffer handling functions and analyze the concept of interfaces and streams

CO5: Build java programs for real time applications

Text Book:

1. E. Balaguruswamy, *Programming with JAVA - A Primer*, McGraw Hill Professional, 2015

Reference Books:

1. Herbert Schildt, *Java: The Complete Reference***,** McGraw Hill Professional, 2017.
2. Robert Sedgewick & Kevin Wayne, *Introduction to Programming in Java*, Addison Wesley, 2017.
3. Y. Daniel Liang**,** *Introduction to Java Programming*, Brief Version Pearson Education, 2017.

E-Resources:

1. https://spoken-tutorial.org/tutorial-search/?search_foss=Java&search_language=English
2. https://onlinecourses.swayam2.ac.in/aic20_sp13/preview
3. https://spoken-tutorial.org/watch/Java/First+Java+Program/English/
4. https://onlinecourses.nptel.ac.in/noc19_cs84/preview

Programming in Java (Lab)

Hours/week: 2

Programs

Formula Substitution

1. To find the factorial and binomial coefficient
2. To calculate mean, variance and standard deviation
3. To perform number conversions (Decimal to Binary, etc.)

Checking

4. To check whether the given number is perfect or not

Generation

5. To perform prime number generation

Array

6. To arrange numbers in order
7. To perform matrix addition and subtraction

Searching

8. To perform Linear search and binary search

String

9. To perform String manipulation (case conversion, reversing, etc.)

OOPs Concept

10. To implement inheritance
11. To implement exception handling
12. To implement multithreading

Note: -Questions for the external examination will be based on the concepts learnt

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	3	9	**39**
CO2	9	3	3	3	9	3	9	**39**
CO3	9	9	3	9	9	9	9	**57**
CO4	9	9	9	9	9	9	9	**63**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**33**	**27**	**33**	**45**	**33**	**45**	**261**

Low-1 Medium-3 High-5

SEC IV - R Tool Lab

(For Students Admitted from 2022-23)

Semester: IV **Hours / week: 2**
Subject Code: IBMXS44P **Credit: 2**

Course Objectives:

1. To navigate and optimize the R integrated development environment (IDE) R Studio and install and load add-in packages
2. To import external data into R for data processing and statistical analysis, learn the main R data structures and compute basic summary statistics

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Classify the basics concept in R programming in terms of constructs, control statements and functions
CO 2: Identify data analytics software
CO 3: Enhance the problem solving, programming and debugging skill
CO 4: Apply the R programming from a statistical perspective
CO 5: Learn and implement the various data structures of R

List of Programs

1. Develop a program to implement correlation analysis
2. Develop a program to implement regression analysis
3. Develop a program to implement t-test
4. Develop a program to implement z-test
5. Develop a program to implement f-test
6. Develop a program to implement chi-square test
7. Develop a Program to implement analysis of variance (ANOVA)

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	9	3	1	9	**35**
CO2	9	1	9	1	3	1	3	**27**
CO3	3	3	3	9	3	1	9	**31**
CO4	3	9	9	9	9	3	9	**51**
CO5	3	9	1	9	9	3	1	**35**
Total	**27**	**23**	**25**	**37**	**27**	**9**	**31**	**179**

Low-1 Medium-3 High-9

Open Elective Course

(For Students Admitted From 2022-23)

PREAMBLE

The Board of Studies of Computer Science revamped the curriculum with the following changes

1. The course 'Non Major Elective' is renamed as 'Open Elective Course'
2. Hours/week is changed for this course
3. 'Multimedia Lab' is replaced with 'PC Assembly' Lab

PROGRAMME STRUCTURE

Sem	**Subject Code**	**Course**	**Subject Title**	**Hours / week**	**Credit**	**CIA**	**ESE**	**Total Marks**
III	IBOE3ITP	OEC	PC Package Lab	2	2	-	50	50
IV	IBOE4ITP	OEC	PC Assembly Lab	2	2	-	50	50

OEC- PC Package Lab

(For Students Admitted From 2022-23)

Semester: III **Hours/week: 2**
Subject Code: IBOE3ITP **Credit: 2**

Course Objectives:

1. To acquire knowledge about word processing, spread sheet, Data base creation and slide preparation
2. To improve creative thinking in presentations

Lab Exercises

Word Processing

1. Create a word processing document consists of two pages in a Book named "XX" and then do the following:
   a. Formatting Text, Alignment and Font Style
   b. Perform Find and Replace
   c. Add Header and Footer option to specify name of the Book Chapter Heading and page number in all pages
2. Create a word processing document having details of our college courses using bulleted and numbered lists. Type the title using Word Art
3. Design an invitation to invite seniors for a farewell party and use Font Setting/Page Borders / Word Art / Clip Art / Symbols in it
4. Create a Newsletter Article (using Columns, Drop cap)
5. Create your class time table (using Table)
6. Use Mail Merge to create many letters to send it to more recipients
7. Create your resume in a word document

Spread Sheet

1. Create a Spreadsheet consists of Student details and then do the following:
   i. Calculate student wise total and subject wise total.
   ii. Find maximum and minimum marks of the subject.
   iii. Grade is calculated as
      a) If % of marks >=90, then grade A
      b) If % >=80 and <90, then grade B
      c) If % >=70 and <80, then grade C
      d) If % >=60 and <70, then grade D
      e) If % < 60, then grade F
2. Create a Spreadsheet having employee details suitably and then do following.
   a) Use functions to calculate Net Pay and Gross Pay.
   b) Perform conditional formatting and validation.
   c) Create a chart for these details
3. Create a purchase order list for a company.
   a) Prepare a purchased item list with price
   b) Prepare a flow chart for the price wise item.
4. Create a macro

Presentation

1. Create a presentation showing various activities of your department and apply Slide transition and background designs
2. Create a presentation showing various activities of your college. Apply animations and insert audio in this presentation
3. Create a presentation using design templates and then perform the following one:

a) Include Table and Pictures
b) Set time duration for each slide

4. Include Hyperlink within slides and link other documents

Database

1. Create a Student Database having Name, Reg no, Tamil, English, Maths, Total, and Average. Calculate Total and Average and apply validation
2. Create an Inventory database having Item Name, Item no, Quantity and Price Perform query operation to retrieve data
3. Create a form to enter the details of the Book database
4. Create a report for the Book database

Note:- Questions for Internal and External examination will be based on concepts learnt.

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Recall various options of Office Applications
CO2: Identify the icons to work with document, presentation, spreadsheet and database
CO3: Simplify the process of creating reports to solve the problems of manual report handling
CO4: Compare the options of different Office Applications to use appropriately
CO5: Create Presentations, Advertisements, Reports etc for enterprises

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	3	9	3	9	**45**
CO2	9	9	3	9	9	9	9	**57**
CO3	9	9	3	9	9	9	9	**57**
CO4	9	3	3	3	9	3	9	**39**
CO5	9	9	3	3	9	3	9	**45**
Total	**45**	**39**	**15**	**27**	**45**	**27**	**45**	**243**

Low-1 Medium-3 High-9

OEC –PC Assembly Lab

(For students admitted from 2022-23)

Semester: IV **Hours/week: 2**
Subject Code: IBOE4ITP **Credit: 2**

Course Objectives:

1. To understand the concept of assembling PC
2. To gain knowledge in identifying hardware elements

Lab Exercises

1. Identifying front panel indicators & switches and front side & rear side connectors
2. Identification of Hardware elements
3. Identifying the computer system Layout: Positions of SMPS, Motherboard, FDD, HDD, CD, DVDand add on cards

4. Assemble a system with add on cards and check the working condition of the system and install OS
5. Format, Create and Configure Disk Drivers
6. Configure Dual OS Installation
7. Printer Installation and Servicing and troubleshooting
8. Install and configure Scanner, Web cam, Cell phone and bio-metric device with system and troubleshoot the problems
9. Understanding Control Panel Settings
10. Working with Anti-Virus Software

Note: - Questions for the Internal/External examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Identify Indicators, Switches, Connectors and Layout of the system
CO2: Demonstrate the configuration of BIOS setup and OS installation
CO3: Illustrate control panel settings
CO4: Determine device installation
CO5: Build the assembling and disassembling of Laptop

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	9	9	**45**
CO2	9	9	3	3	9	9	9	**51**
CO3	9	9	9	3	9	9	9	**57**
CO4	9	3	3	3	9	9	9	**45**
CO5	9	1	9	3	9	9	9	**49**
Total	**45**	**25**	**27**	**15**	**45**	**45**	**45**	**247**

Low-1 Medium-3 High-9

B A Arabic

(For Students Admitted From 2022-2023)

PREAMBLE

The Board of Studies of Computer Science revamped the curriculum with the following changes

1. The course ‘Web Designing Lab’ is replaced with ‘Designing Lab’

PROGRAMME STRUCTURE

Sem	Subject Code	Course	Subject Title	Hours / week	Credit	CIA	ESE	Total Marks
III	IBARS34P	SEC	PC Package Lab	2	2	-	50	50

IV	IBARS44P	SEC	Designing Lab	2	2	-	50	50

SEC III - PC Package Lab

(For Students Admitted From 2022-23)

Semester: III **Hours/week: 2**
Subject Code: IBARS34P **Credit: 2**

Course Objectives:

1. To acquire knowledge about word processing, spread sheet, Data base creation and slide preparation
2. To improve creative thinking in presentations

Lab Exercises

Word Processing

1. Create a word processing document consists of two pages in a Book named "XX" and then do the following:
   a. Formatting Text, Alignment and Font Style
   b. Perform Find and Replace
   c. Add Header and Footer option to specify name of the Book Chapter Heading and page number in all pages
2. Create a word processing document having details of our college courses using bulleted and numbered lists. Type the title using Word Art.
3. Design an invitation to invite seniors for a farewell party and use Font Setting/Page Borders/Word Art/Clip Art/Symbols in it
4. Create a Newsletter Article (using Columns, Drop cap)
5. Create your class time table (using Table)
6. Use Mail Merge to create many letters to send it to more recipients
7. Create your resume in a word document

Spread Sheet

8. Create an Spreadsheet consists of Student details and then do the following:
   a. Calculate student wise total and subject wise total
   b. Find maximum and minimum marks of the subject
   c. Grade is calculated as
      i. If % of marks >=90, then grade A
      ii. If % >=80 and <90, then grade B
      iii. If % >=70 and <80, then grade C
      iv. If % >=60 and <70, then grade D
      v. If % < 60, then grade F
9. Create a Spreadsheet having employee details suitably and then do following
   a. Use functions to calculate Net Pay and Gross Pay
   b. Perform conditional formatting and validation
   c. Create a chart for these detail
10. Create a purchase order list for a company
    a. Prepare a purchased item list with price
    b. Prepare a flow chart for the price wise item

Presentation

11. Create a presentation showing various activities of your department and apply Slide transition and background designs
12. Create a presentation showing various activities of your college. Apply animations and insert Audio in this presentation
13. Create a presentation using design templates and then perform the following one:
    a. Include Table and Pictures
    b. Set time duration for each slide
14. Include Hyperlink within slides and link other documents

Database

15. Create a Student Database having Name, Reg no, Tamil, English, Maths, Total, and Average. Calculate Total and Average and apply validation
16. Create an Inventory database having Item Name, Item no, Quantity and Price. Perform query operation to retrieve data

Note:- Questions for Internal and External examination will be based on concepts learnt.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Recall various options of Office Applications
CO2: Identify the icons to work with document, presentation, spreadsheet and database
CO3: Simplify the process of creating reports to solve the problems of manual report handling
CO4: Compare the options of different Office Applications to use appropriately
CO5: Create Presentations, Advertisements, Reports etc for enterprises

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	3	9	3	9	**45**
CO2	9	9	3	9	9	9	9	**57**
CO3	9	9	3	9	9	9	9	**57**
CO4	9	3	3	3	9	3	9	**39**
CO5	9	9	3	3	9	3	9	**45**
Total	**45**	**39**	**15**	**27**	**45**	**27**	**45**	**243**

Low-1 Medium-3 High-9

SEC IV- Designing Lab

(For students admitted from 2022-23)

Semester: IV **Hours/week: 2**
Subject Code: IBARS44P **Credit: 2**

Course Objectives:

1. To understand the basic concepts of GIMP
2. To gain knowledge about various tools of GIMP

GIMP

1. Design a Business card
2. Create a logo
3. Convert an image into pencil drawing
4. Design a scenery using various brushes
5. Design a greeting card
6. Create clipping mask – place an image inside text
7. Create passport size photo
8. Animate a still photo
9. Create a shadow effect for an object
10. Create a mirror effect for an image
11. Apply the following tools in an image:
    i) Smudge ii) Blur/Sharpen iii) Dodge/Burn
12. Create a mosaic photo collage

Note: Questions For the External Examinations shall be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Recognize the uses of various tools and effects in Photoshop

CO2: Identify the steps to start designing with images

CO3: Simplify the process of designing, editing, masking, morphing to solve the difficulties of designers

CO4: Support studios to create passport size photo

CO5: Design Visiting card, ID card, Birthday card, logo etc.

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	9	9	1	**43**
CO2	9	1	9	9	3	9	3	**43**
CO3	9	3	9	9	3	9	9	**51**
CO4	9	1	3	9	3	9	3	**37**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**17**	**39**	**39**	**27**	**45**	**25**	**237**

Low-1 Medium-3 High-9

Discipline Specific Elective (DSE) for M. Com

Sem	Subject Code	Course	Subject Title	Hours / week	Credit	CIA	ESE	Total Marks
II	IMCOE2B	DSE	Web Designing	6 (T-4, P-2)	4	40 (T-20 P-20)	60	100
III	IMCOE3AP	DSE	Statistics through R Tool Lab	6 (P- 5, Libary-1)	4	40	60	100

DSE - Web Designing

(For Students Admitted From 2022-23)

Semester: II **Hours/week: 6 (T: 4 P: 2)**
Subject Code: IMCOE2B **Credit: 4**

Course Objectives:

1. To understand the uses of various HTML elements
2. To gain knowledge in designing web pages using CSS & Java Script

Unit I **(12 hours)**

Learning the basics of HTML: Structuring your HTML: The <html> Tag – The <head> Tag – The <body> Tag – The Title – Headings – Paragraphs – Comments. **Organizing information with lists:** Lists: An Overview – Numbered Lists – Unordered Lists – Definition Lists – Nesting of Lists – Otheruses of Lists.

Unit II **(12 hours)**

Working with Links: Creating Links – Linking local pages using relative and absolute path names – Links to other documents on the web – Linking to specific places within documents. Formatting Text with HTML and CSS: Character Level Elements – Character formatting using CSS – Preformatted Text– Horizontal Rules – Line Break – Addresses – Quotations – Special Characters – Fonts and Font Sizes.

Unit III **(12 hours)**

Using CSS to style a site: Including Style Sheets in a page – Selectors – Units of measure – Using Color– Links – The Box Model. **Using CSS to position elements on the page:**Positioning schemes- Abso lute positioning – Fixed Positioning-Controlling Stacking – Creating Drop Down Menus. **Using images on your web pages: Inline Images in HTML:** The <img> Tag –Images and Text – Images and Links – Image Background -Image Map.

Unit IV **(12 hours)**

Building Tables: Creating Tables – Table Parts – Sizing tables, borders and cells – Table and cell color-Aligning your table content – Spanning multiple rows or columns. **Designing forms:** Using the<form> tag – Using the <label> tag – Creating form controls with the <input> tag – Using other form controls. **Integrating Multimedia: Video and Sound:** Embedding video the simple way – hosting yourown video – Embedding video using <video>.

Unit V **(12 hours)**

Introducing JavaScript: The <script> tag – The JavaScript Language -Events. **Working with Frames and Linked Windows:** What are frames? – Working with Linked Windows – Inline Frames – Opening Linked Windows with JavaScript. **Using javascript in your pages:** Validating forms with java script- Hiding and showing content-Adding new content to a page.

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Explain the uses of various HTML tags
CO2: Solve the problems of website users by using CSS for effective designing
CO3: Associate web developers to include frames, forms, tables while designing web pages
CO4: Discover different kinds of web pages using Java script
CO 5: Create websites for enterprises, educational institutions etc

Text Book:
1. Laura Lemay, Rafe Colburn, Jennifer Kyrnin, *SamsTeach Yourself HTML, CSS & JavaScript Web Publishing in one hour a day*, Pearson Education, Seventh Edition, 2016.

Reference Books:
1. Wendy Willard, *HTML: A Beginner's Guide*, McGraw-Hill Education, Fifth edition, 2013.
2. John Docket, *HTML and CSS: Design and Build Websites*, John Wiley & Sons, First Edition,2011.
3. Marijn Haverbeke, *Eloquent JavaScript: A modern introduction to Programming*, No StarchPress, Second Edition, 2014.

E - Resources:
1. https://dpmishra.com/study-materials/web-design-notes-pdf-for-bca/
2. https://www.tutorialspoint.com/internet_technologies/website_designing.htm
3. https://www.udemy.com/topic/html/

Web Designing (Lab)

Hours/week: 2

Lab Exercises
1. Creation of Lists in HTML
2. Creation of hyperlinks and frames in HTML
3. Create mark sheet preparation using table in Html
4. Linking documents and images
5. Create TBAK college website using HTML tags
6. Create style sheets with the style elements
7. Demonstration of dialog boxes using JavaScript
8. Perform arithmetic operations using JavaScript
9. Create rollover buttons
10. Create login format using JavaScript

Note: - Questions for the internal examination will be based on the concepts learnt

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	9	9	**45**
CO2	9	9	9	3	9	9	3	**51**
CO3	9	1	9	9	9	9	9	**55**
CO4	9	1	9	3	9	9	9	**49**
CO5	9	1	9	9	9	9	9	**55**

Total	**45**	**15**	**39**	**27**	**45**	**45**	**39**	**255**

Low-1 Medium-3 High-9

DSE – Statistics through R Tool Lab

(For Students Admitted From 2022-23)

Semester: III **Hours/week: 6 (P -5: Lib-1)**
Subject Code: IMCOE3AP **Credit: 4**

Course Objectives:

1. To navigate and optimize the R integrated development environment (IDE) R Studio and install andload add-in packages
2. To import external data into R for data processing and statistical analysis, learn the R datastructures and compute basic summary statistics

Programs

1. Develop a Program to implement correlation analysis
2. Develop a Program to implement regression analysis
3. Develop a Program to implement t-test
4. Develop a Program to implement z-test
5. Develop a Program to implement f-test
6. Develop a Program to implement chi-square test
7. Develop a Program to implement kruskal-wallis test
8. Develop a Program to implement likert scaling techniques
9. Develop a Program to implement analysis of variance (ANOVA)
10. Develop a Program to implement factor analysis
11. Develop a Program to implement cluster analysis

Note: - Questions for Internal and External examination will be based on concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Demonstrate the basics in R programming in terms of constructs, control statements and functions
CO2: Apply data analytics software
CO3: Enhance problem solving, programming and debugging skills
CO4: Plan the R programming from a statistical perspective
CO5: Analyze and implement the various data structures of R

Course Outcomes	**Programme Outcomes**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	9	3	1	9	9	3	**43**
CO2	9	3	9	3	9	9	9	**51**
CO3	3	9	1	1	3	1	9	**27**
CO4	9	3	9	1	9	9	3	**43**
CO5	9	1	9	3	9	9	3	**43**
Total	**39**	**25**	**31**	**9**	**39**	**37**	**27**	**207**

Low-1 Medium-3 High-9

Skill Enhancement Course For Chemistry Department

(For Students Admitted From 2022 – 23)

Sem	Subject Code	Course	Subject Title	Hours / week	Credit	CIA	ESE	Total Marks
IV	IBCHS45	SEC	Computer Fundamentals and C Programming	2	2	40	60	100

SEC IV - Computer Fundamentals and C Programming

(For Students Admitted from 2022-23)

Semester: IV **Hours/week: 2**
Subject Code: IBCHS45 **Credit: 2**

Course Objectives:

1. Demonstrate a basic understanding of computer hardware and software
2. Apply logical skills to programming in a variety of languages

Unit I **(6 hours)**

Introduction to Computer: Introduction-Types of Computer-Characteristics of Computer-Input Devices-Output Devices **Networking Fundamentals:** introduction to Computer network – Network component.

Unit II **(6 hours)**

Introduction to C Programming: C Character Set – Writing first program of C – Identifiers and Keywords – A more useful C Program – Entering the program into the computer – Data types – Constants – Variables and Arrays – Declarations – Expressions – Statements – Symbolic constants

Operators and Expressions: Arithmetic Operators – Unary Operators – Relational and logical Operators – Assignment Operators – The conditional Operators – Library functions.

Unit III **(6 hours)**

Data Input and Output: Preliminaries – The getchar function – The putchar function – The scanf function – The printf function – gets and puts function

Control Statements: Preliminaries – Branching: The If-else Statement - Looping – while statement – do-while statement –for statement – nested control structures – switch statement – break statement – continue statement.

Unit IV **(6 hours)**

Functions: A brief overview **–** Defining a function – Accessing a function - Function prototypes – Passing arguments to a function - Recursion

Program Structure: Storage classes **–** Automatic variables – External variables – Static variables**:** Defining an Array – Processing an Array – Passing arrays to Functions.

Unit V **(6 hours)**

Strings: Defining a String – NULL Character – Initialization of Strings – Reading and writing a string – Processing strings – Character arithmetic – Searching and sorting of strings –**Pointers:** Fundamentals – Pointer Declarations – Operations on pointers.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Summarize the concept of Computer System, Network components, c programming functions

CO 2: Describe the basic programming knowledge of C and list operators and expressions

CO 3: Demonstrate data input and output and illustrate control statements & functions

CO 4: Analyse unary operators, program structure and categorize arrays

CO 5: Evaluate strings and operations on pointers

Text Books:

1. Anita Goel, *Computer Fundamentals***,** Pearson Education Published by Dorling Kindersley.
2. Pradeep pkohriyal, *Computer Networking*, published by S.B Nangia APH Publishing Corporation.
3. Byron Gottfried, *Programming with C*, Tata McGraw Hill Education, Fourth Edition, 2018.

Reference Books:

1. Andrew S Tanenboum, *Computer Networks*, Prentice Hall of India ,Fourth Edition, 2007.

2. Byron Gottfried, *Programming with C*, Tata McGraw Hill Education, Third Edition, 2011.

E - Resources:

1. https://www.coursera.org/courses?query=computer%20fundamentals
2. https://onlinecourses.swayam2.ac.in/ugc19_cs10/preview\
3. https://onlinecourses.nptel.ac.in/noc19_cs42/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	9	3	1	1	**23**
CO2	9	1	9	9	3	3	3	**37**
CO3	9	3	9	3	3	9	9	**45**
CO4	9	3	3	9	3	3	3	**33**
CO5	9	3	3	9	3	9	3	**39**
Total	**39**	**13**	**27**	**39**	**15**	**25**	**19**	**177**

Low-1 Medium-3 High-9

B Com Honours

(For Students Admitted From 2022-2023)

PROGRAMME STRUCTURE – PROGRAMME CODE: UHO

Sem	Subject Code	Course	Subject Title	Hours / week	Credit	CIA	ESE	Total Marks
IV	IBHOC44	Core	Business Intelligence using Excel and Access	5 (T-3, P-2)	3	40	60	100
V	IBHOC54	Core	Business & Technology	4	3	40	60	100

Business Intelligence Using Excel And Access

(For Students Admitted from 2022-23)

Semester: IV **Hours/week: 5 (T-3: P-2)**
Subject Code: IBHOC44 **Credit: 3**

Course Objectives:

1. Demonstrate a basic understanding of computer Excel and Access.
2. To enable the learner to describe and use query, form, and reports

Unit I **(9 Hours)**

Understanding Formula Basics: Introducing Formula and Functions, Working with Dates and Times, Creating Formula that Count and Sum, Creating Formula that Look Up Values, **Creating Formulas for financial applications**: Present Value, Future Value, Payment, Interest Rate, Period, Term.

Unit II **(9 Hours)**

Creating Chart and Graph: Introduction, Working with Chart, Understanding Chart Type, Chart Customization, Visualizing Data Using Conditional Formatting.

Unit III **(9 Hours)**

Analyzing Data With Excel: Introduction of Pivot table; Analyzing Data with Pivot Table: Working with Non-Numeric Data, Grouping Pivot Table Items, Creating Frequency Distribution, Creating Calculated Field or calculated item, Creating Pivot Chart, Producing a Report with Pivot Table.

Unit IV **(9 Hours)**

Introduction to Data Base: Database, Table, Record and Fields Values, Concept of Relational Database; Access Database Objects and Views: Ribbon, Datasheets, Queries, Data-entry and display forms, Reports, Creating Access Table: Table design and process, Using the Design ribbon tab, Working with fields, Creating contacts table

Unit V **(9 Hours)**

Selecting Data with Queries: About the Query, Types of Queries; Creating Query: Using Query Window, Using Query Design window and ribbon, Selecting Fields, Providing an alias for the field name, Introduction of forms in Access, Preparation of Access Report.

Text Books:

1 Michael Alexander, Richard Kusleika, "*Access 2019 Bible"*, Wiley, USA, 2018
2 John Walkenbach, *"Access 2016 Bible"*, Wiley, USA, 2015

Reference Books:

1 Lokesh Lalwani, 'Excel 2019 All-in-One', BPB Publications; 1st edition (1 January 2019), India
2 Joan Preppernau, M. Lambert, Steve Lambert, 'Windows Vista Step by Step Deluxe Edition (Step By Step)', Microsoft Press US; 1st edition, USA, 2007
3 "Access video training - Access - support.microsoft.com." https://support.microsoft.com/en-us/office/access-video-training-a5ffb1ef-4cc4-4d79-a862-e2dda6ef38e6.
4 "Excel video training - Office Support - support.microsoft.com." https://support.microsoft.com/en-us/office/excel-video-training-9bc05390-e94c-46af-a5b3-d7c22f6990bb.

MS-Excel List of Programs **Hours/week: 2**

1. Prepare a bar chart using chart wizard representing rainfall for the last 5 years in MS-EXCEL. Assume the rainfall indices
2. Prepare student's mark list and calculate total, average, result, rank and grade.
3. Prepare the electricity bill.
4. Illustrate the numeric functions
5. Illustrate the character functions
6. Calculate Mean, Median, and Mode.
7. Prepare Sales details.
8. Prepare employees to pay bills and order them according to their salaries.

MS-Access List of Programs

1. Create a table on student Marks details and query the table to list students who are getting greater than 90 marks in Mathematics.
2. Create a table on player details and prepare report.
3. Create a table on Employee details and query the table using wizard to list employees who are getting salary more than Rs. 10,000.
4. Create a table on Employee details and prepare report using wizard.
5. Create a table on Employee details and update the salary using a form using wizard.

Course Outcomes:
On successful completion of this course, students will be able to
CO 1: Summarize the concept of excel formulas, tables, and queries
CO 2: Demonstrate the data in chart and graph. and report
CO 3: Utilize the data analysis tools and techniques to convert the data into information.
CO 4: Evaluate on pivot table, queries, working with fields, and the queries
CO 5: Develop the query, form, and report in Excel and Access.

Course Outcomes	**Programme Outcomes**							
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	9	3	1	1	23
CO2	9	1	9	9	3	3	3	37
CO3	9	3	9	3	3	9	9	45
CO4	9	3	3	9	3	3	3	33

CO5	9	3	3	9	3	9	3	39
Total	39	13	27	39	15	25	19	177

Low-1 Medium-3 High-9

Core - XVI Business &Technology

(For Students Admitted from 2022-23)

Semester: V **Hours/week: 4**
Subject Code: IBHOC54 **Credit: 4**

Course Objectives:

1.To have an in-depth understanding of the relationships existing among the key global financial systems

2.To demonstrate and advanced knowledge of key theoretical finance and economic concepts under pinning financial markets

Unit I **(12 hours)**

Introduction: Introduction of Fintech industry-Areas of Fintech-History of Fintech- Fintech importance-**New Entrants to Banking:** New banking entrants in a flash-The traditional banking Landscape-New Operating Models for Banking-Banking as a service and Open APIs-Neo-banks, Challenger banks and I Banks

Rethinking payments and remittances: Payments adremittancesinaflash-Traditionalremittances-sizeoftheremittances market-upcoming trends in remittances–Innovative ways of sending money.

Unit II **(12 hours)**

Digital Lending innovation: Digital Lending innovation in a flash- short history of lending-peer-to-peerlending-P2Pmarket place lending business model-consumer lending-digital lending for students-digital lending for SMEs-digital mortgages

Commercial banking transactions: Commercial banking transactions in a flash- Working Nature of commercial banking-SME market size –the impact of Fintech on business banking-the impact of Fintech on corporate banking Online accounting for SMEs and integration with business banking-Tools for SMEs

Next Generation Commerce: Next Generation Commerce in a flash- changes in customer shopping behaviour -point of sales(POS)evolution-mPOS Business Model-Tablet based cash registers-Online acquiring

(12 hours)

Unit III

Crowd funding and Crowd investing: Crowd funding and Crowd investing in flash –Businesses traditionally fund – Crowd funding business model-market size-key crowd funding platforms-top crowd funding campaigns-crowd investing

Innovative wealth management: Innovative wealth management in flash-Wealth management works-changes in customer expectations-changes in advisors-changes in data analytics-changes in access to products-social investing-Personal finance management.

Unit IV **(12 hours)**

The power of big data: The power of big data in a flash- History of Data- Big Data Working principles- Uses Big Data Innovatively-Big Data in the Financial Services Industry.
The Internet of Things: The Internet of Things in a Flash- Growth of IoT- The Impact of IoT on Businesses- The IoT in Categories- Combining IoT and Block chain- The IoT in Financial Services-O2O and IoT in FinTech- Challenges Faced by the IoT.
Block chain and Distributed Ledgers Block chain and DistributedLedgersinaFlash-AboutDistributedLedgers-Blockchain-TheComponentsofBlockchain-TopCryptocurrencies- Impacts of Financial Services-Investment in Block chain-Use Cases for Block chain.

(12 hours)

Unit V
The Rise of Insurtech: The Rise of Insurtech in a Flash- Insurance Working principle- Market Size-Drivers ofDisruption-Peer-to-PeerInsurance-BlockchainedInsuranceandMachineLearning-WearablesinInsurance- Working Principle of Traditional Insurance Firms-Interesting Insurtech Ideas
Identification, Cyber security, and Regtech: Identification, Cyber security, and Regtechina Flash-Traditional Ways of Using Identification-Unique Identification System in India-Identification for the Unbanked-Using Biometrics as Identification- Using Biometrics in Bank Transactions- Using a Distributed Ledger forIdentification-TheUNIdentityAspiration-CybercrimeandItsHistory-TheCybersecuritySector-Typesof Cybercrime-Cyber security Categories and Players-Regulation Technology(Regtech).

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Definethefinancial technology
CO2: Apply the digital lending innovation and IoT
CO3: Analyze the cyber security and block chain
CO4: Evaluate the crowd funding and crowd investing funding models
CO5: Create the distributed ledgers

Text Book:
1. Agustin Rubini, *Fintech in a Flash: Financial Technology Made Easy,* Walter de Gruyter Publisher, Third Edition, 2018.

Reference Books:
1. Susanne Chishti and Janos Barberis, *The FINTECH Book: The Financial Technology Handbook for Investors, Entrepreneurs and Visionaries,* JohnWiley Publisher, First Edition, 2016.
2. The oLynn, JohnG. Mooney, Pierangelo Rosati,Mark Cummins, *Disrupting Finance: FinTech and Strategy inthe21st Century,* Palgrave, First Edition,2018.
3. Abdul Rafay, *FinTech, as a Disruptive Technology for Financial Institutions,* IGIGlobal, 2019.
4. Bernardo Nicoletti, *The Future of FinTech: Integrating Finance and Technology in Financial Services,* Palgrave Macmillan, 2018.

E-Resources:
1. https://www.coursera.org/courses?query=fintech
2. https://www.edx.org/course/introduction-to-fintech

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total

CO1	9	9	9	3	3	9	9	**51**
CO2	9	9	9	9	9	9	9	**63**
CO3	9	3	9	3	9	9	9	**51**
CO4	9	9	9	3	9	9	9	**57**
CO5	9	3	9	9	9	9	9	**57**
Total	**45**	**33**	**45**	**27**	**39**	**45**	**45**	**279**

Low-1 Medium-3 High-9

Certificate Programme in Web Designing

One Year Programme

(For Students Admitted From 2022-23)

Programme Specific Outcomes:

PSO1: Demonstrate the fundamental technical skills to build and implement a web site
PSO2: Develop basic programming skills using Java Script to create interactive webpage
PSO3: Understand techniques to embed text/image/video content into web pages
PSO4: Design and Develop dynamic websites using CSS

PREAMBLE

The Board of Studies of Computer Science revamped the curriculum with the following changes

1. Syllabus modified for the course web designing
2. Course "PC Assembly" is introduced

Programme Structure

Course	Subject Code	Subject Title	Credit	Contact Hours	External Marks
Core I	ECWD1	Web Designing	5	30	100

Core II	ECWD2P	Web Designing Lab	5	50	100
		Total	**10**	**80**	**200**

CORE I - WEB DESIGNING

(For Students Admitted From 2022-23)

Subject Code: ECWD1 **Hours: 30**

Course Objectives:

1. To understand the use of basic HTML elements to build web pages
2. To apply the knowledge of CSS and JavaScript to develop dynamic web pages

Unit I **(6 hours)**

Introduction to Computer: Introduction - Characteristics of Computers - Classification of Computers - **Input Devices** - **Output Devices** - **Learning the basics of HTML: Structuring your HTML:** The <html> Tag – The <head> Tag – The <body> Tag – The Title – Headings – Paragraphs – Comments.

Unit II **(6 hours)**

Organizing information with lists: Lists: An Overview – Numbered Lists – Unordered Lists – Definition Lists – Nesting of Lists – Other uses of Lists **- Working with Links:** Creating Links — Links to other documents on the web – Linking to specific places within documents.

Unit III **(6 hours)**

Formatting Text with HTML and CSS: Character Level Elements – Character formatting using CSS – Horizontal Rules – Line Break – Addresses – Quotations – Special Characters – Fonts and Font Sizes - **Using CSS to style a site:** Including Style Sheets in a page – Using Color – Links – The Box Model.

Unit IV **(6 hours)**

Using images on your web pages: Inline Images in HTML: The <img> Tag – Images and Text – Images and Links – Image Background – What is an Image Map? - **Building Tables:** Creating Tables – Table Parts – Sizing tables, borders and cells – Table and cell color – Aligning your table content – Spanning multiple rows or columns.

Unit V **(6 hours)**

Designing Forms: Using the <form> tag – Using the <label> tag – Creating form controls with the <input> tag – Using other form controls - **Working with Frames and Linked Windows:** What are frames? – Inline Frames - **Introducing JavaScript:** The <script> tag – The JavaScript Language –Events.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand the fundamentals of computer and all HTML tags

CO2: Use the concepts of tables, list, frames and hyperlinks in designing interactive page

CO3: Analyze the different types of style sheets and its uses
CO4: Evaluate the concept of validation and form action using Java Script
CO5: Design a dynamic webpages implementing all the features

Text Books:

1. Alex Leon, Mathews Leon, *Fundamentals of Information Technology,* Tata McGraw Hill Education, Second Edition, 1999.
2. Laura Lemay, Rafe Colburn, Jennifer Kyrnin, *Sams Teach Yourself HTML, CSS & JavaScript Web Publishing in one hour a day*, Pearson Education, Seventh Edition, 2016.

Reference Books:

1. Wendy Willard, *HTML: A Beginner's Guide*, McGraw-Hill Education, Fifth Edition, 2013.
2. John Docket, *HTML and CSS: Design and Build Websites*, John Wiley & Sons ,First Edition, 2011.

E-Resources:

1. HTML, https://onlinecourses.swayam2.ac.in/aic20_sp11/preview
2. Learn HTML, https://www.codecademy.com/learn/learn-html

Core II - Web Designing Lab

(For Students Admitted From 2022-23)

Subject Code: ECWD2P **Hours: 50**

Course Objectives:

1. To build web pages using basic HTML elements, CSS and JavaScript
2. To make use of frames, forms, hyperlink to design an interactive web pages

HTML

1. Create a HTML page to illustrate all basic tags
2. Create a HTML page to display study time table for end semester examination
3. Create a HTML page to display a menu list for bakery
4. Create a HTML page to use all style sheets
5. Create a HTML page to demonstrate frame
6. Create a HTML page to use hyperlink for both text and image
7. Create a HTML page to demonstrate forms

JAVA SCRIPT

8. Write a JavaScript program to display the current day and time
9. Write a JavaScript program to check leap year
10. Write a JavaScript program to convert temperature from Fahrenheit to Celsius

11. Create a HTML page to create login form
12. Create a HTML page to demonstrate validation for Gmail registration
13. Build website for online shopping

Note: - Questions for the Internal/External examination will be based on the concepts learnt

Course Outcomes:
After successful completion of this course, student will be able to
CO 1: Understand the basics of all HTML tags to create the static web page
CO 2: Apply the concepts of table and list
CO 3: Examine the use of style sheets, frames and hyperlinks
CO 4: Evaluate the concept of validation using Java Script
CO 5: Create a dynamic website

Certificate Programme in PC Assembly

(One Year Programme)
(For Students Admitted From 2022-23)

Programme Specific Outcomes:
PSO 1: Identify the basic hardware components of desktop/ laptop
PSO 2: Evaluate an installation and partitioning techniques of external devices and drivers
PSO 3: Analyze the performance and maintenance of system through troubleshooting
PSO 4: Design and develop basic skills to assemble/ disassemble of system

Programme Structure

Course	Subject Code	Subject Title	Credit	Contact Hours	External Marks
Core I	ICPA1	PC Assembly	5	30	100
Core II	ICPA2P	PC Assembly Lab	5	50	100
		Total	**10**	**80**	**200**

Core I - PC Assembly

(For Students Admitted From 2022-23)

Subject Code: ICPA1 **Hours: 30**

Course Objectives:

1. To understand the basic architecture of computer hardware
2. To perform assembling/ disassembling and configure the components of computer hardware

Unit I **(6 hours)**

Introduction to Computer: Introduction - Characteristics of Computers - Classification of Computers - **Input Devices** - **Output Devices** - **Disassembling Computers**: Front Panel View - Rear Panel View - Internal Arrangements - Disassembling the Computer.

Unit II **(6 hours)**

Motherboards: Features of Motherboards - Components of Motherboard - BIOS - IDE and SATA Connectors - Power Supply Connectors - External Devices Interfaces - Audio System - LAN System - Buses and Expansion Slots - Speaker and Battery - Front Panel Headers - System Board Jumpers and LED - I/O Addresses and Interrupts - Selection of Motherboards - Using Modem Cards - Using Graphics Cards - External Interfaces and Connectors - Troubleshooting and Maintenance of Motherboards - Motherboard: Common Problems and Solutions.

Unit III **(6 hours)**

Assembling and Configuring Computers: Caution and Safety - Setting up the Cabinet - Installing Power Supply Unit - Installing CPU - Installing Heat Sink and Cooling Fan - Installing Memory Module - Mounting Motherboard - Installing Hard Disk - Installing Optical Drive - Connecting Motherboard Power Supply Cables - Connecting to Front Panel - Connecting Mouse, Keyboard and Monitor -Switching on the Computer - Configuring BIOS - Installing Operating System - Installing Device Drivers - Installing Add-on Cards - Computer System: Common Problems and Solutions.

Unit IV **(6 hours)**

Troubleshooting and Maintenance: Safety Precautions - Configuring Using BIOS Parameters - Devices and Drivers - Working with Windows Registry - Performance Improving Steps - Overclocking the System - Diagnosing General Problems - Computer System: Common Problems and Solutions - Preventive Maintenance - Replacing CMOS Battery - Clearing BIOS Password.

Unit V **(6 hours)**

Computer Printers: - Types of Printers - Installing Dot Matrix Printer, Inkjet Printer and Laser Printer – Maintenance and Troubleshooting: Dot Matrix Printer, Inkjet Printer and Laser Printer - **Scanners and Speakers:** Working of Scanners and Speakers - Installing Scanner - Adding Speakers and Audio Cards - Maintenance of Scanner - Speaker: Common

Problems and Solutions - **Laptops—Troubleshooting and Maintenance:** Replacing Laptop Battery - Dismantling Laptops - Replacing Hard Disk Drive, Memory and Optical Drive - Laptop: Common Problems and Solutions - Troubleshooting and Maintenance of Laptops.

Course Outcomes:
After successful completion of this course, student will be able to
CO 1: Understand and identify the fundamentals of computer & Front, Rear Panel Indicators
CO 2: Demonstrate and layout the components of Motherboard
CO 3: Examine an assembling and configuration of computers
CO 4: Discover the troubleshooting and maintenance to improving system performance
CO 5: Build the laptops with proper installation of external devices

Text Books:
1. Alex Leon, Mathews Leon, *Fundamentals of Information Technology*, Tata McGraw Hill Education, Second Edition, 1999.
2. K.L. James, *Computer Hardware: Installation, Interfacing, Troubleshooting and Maintenance*, PHI Learning Private Limited, 2013.

Reference Books:
1. Ron Gilster, *PC Hardware: A Beginner's Guide,* McGraw-Hill Company, 2001.
2. John Rourke, Craig Zacker, *PC Hardware: The Complete Reference*, McGraw-Hill Company, 2001.

E-Resources:
1. Computer Architecture and Organization, https://nptel.ac.in/courses/106/105/106105163/
2. Assemble a Computer, https://openclassrooms.com/en/courses/7132546-assemble-a-computer

Core II - PC Assembly Lab

(For Students Admitted From 2022-23)

Subject Code: ICPA2P **Hours: 50**

Course Objectives:
1. To identify and understand the architecture of hardware components of computer
2. To perform assembling/ disassembling, troubleshoot, configure and maintain the computer hardware components

List of Programs
1. Identifying front panel indicators & switches and front side & rear side connectors
2. Identification of Hardware elements
3. Identifying the computer system Layout: Positions of SMPS, Motherboard, FDD, HDD, CD, DVD and add on cards
4. Configure BIOS setup program and troubleshoot the typical problems using BIOS utility
5. Assemble a system with add on cards and check the working condition of the system and install OS
6. Format, Create and Configure Disk Drivers
7. Configure Dual OS Installation

8. Printer Installation and Servicing and troubleshooting
9. Install and configure Scanner, Web cam, Cell phone and bio-metric device with system and troubleshoot the problems
10. Install and Configure a CD/DVD/PenDrive Writer and a Blu-ray Disc writer and recording DVD and Blu-ray disk.
11. Understanding Control Panel Settings
12. Working with Anti-Virus Software
13. Assembling and Disassembling of Laptop to identify the parts and to install OS and configure it

Note: - Questions for the Internal/External examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Identify Indicators, Switches, Connectors and Layout of the system
CO 2: Demonstrate the configuration of BIOS setup and OS installation
CO 3: Illustrate control panel settings
CO 4: Determine device installation
CO 5: Build the assembling and disassembling of Laptop

SUMMER CRASH COURSES

(For Students Admitted From 2022-23)

Objective

- To impart knowledge on Computer Applications and make them skilled to implement applications

Eligibility

- SSLC

Duration of the Course

- 60 Hours

Programme Structure

Course	Subject Code	Course Name	Credit	Contact Hours	ESE Marks
Special Course I	SCCOAP	Office Automation Lab	5	60	100
Special Course II	SCCWDP	Web Designing Lab	5	60	100

Special Course III	SCCPAP	PC Assembly and Installation Lab	5	60	100
		TOTAL	**15**	**180**	**300**

OFFICE AUTOMATION LAB

(For Students Admitted From 2022-23)

Subject Code: SCCOAP **Total Hours: 60**
Credit: 5

Course Objectives:

1. To acquire knowledge about word processing, spread sheet, Data base creation and slide preparation
2. To improve creative thinking in word processing and presentations

Word Processing

1. Working with Files-Creating & opening documents, saving documents, renaming documents, working on multiple documents. Working with Text – Formatting, Moving, copying and pasting text
2. Lists – Bulleted and numbered lists, Nested lists, Formatting lists
3. Table Manipulations
4. Graphics – Adding clip Art, Add an image from a file, Editing a graphic
5. Spelling and Grammar, AutoCorrect
6. Page formatting-Page margins, page size and orientation, Header and Footers, Page numbers
7. Mail Merge and Hyperlinks

SPREADSHEET

1. Modifying a Worksheet – Moving through cells, Adding worksheets, rows and columns, Resizing rows and columns, Selecting cells, Moving and copying cells, Freezing panes
2. Formatting cells-Formatting toolbar, Dates and times, Auto formatting
3. Formula and Functions
4. Sorting and Filling –Basic ascending and descending sorted, Complex sorts, Alternating text and numbers with Auto fill, Auto filling functions
5. Graphics – Adding clip art, add an image from a file
6. Charts – Using chart Wizard, Copy a chart to Word document

Presentation

1. Create a Presentation from a template
2. Working with Slides-Insert a new slide, Applying a design template, Changing slide layouts, Reordering slides, Hide slides
3. Adding Content –Resizing a text box, Text box properties, Delete a text box
4. Video and Audio effects
5. Color Schemes & Backgrounds

Database Management

1. Using Access database wizard, pages and projects

2. Open an existing database, converting to new Access database
3. Crate a Student Database having Name, Regno, Tamil, English, Maths, Total, and Average to find total and average and check data entered
4. Create an Inventory database having Item Name, Item no. Quantity and Price. Perform query operation to retrieve data
5. Create a form to enter the details of Book database.
6. Create report for the Book database

Note: - Questions for the Internal/External examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand the basics of create, edit and save file
CO2: Apply the fundamental techniques to manipulate the tables
CO3: Analyse to create presentation using image/ video content
CO4: Evaluate forms, queries and reports in database
CO5: Develop basic skills in office application

WEB DESIGNING LAB

(For Students Admitted From 2022-23)

Subject Code: SCCWDP **Total Hours: 60**
Credits: 5

Course Objectives:

1. To understand the use of basic HTML elements
2. To apply the knowledge of CSS to buid dynamic web pages

Lab Cycle

1. Create a HTML/CSS page for displaying the personal information by using various tags such as background color, heading tag, font tag.
2. Create a HTML/CSS page, which includes images and audio for any application.
3. Create a HTML/CSS page for displaying the Tender notice which is given to you.
4. To create a Time Table of your class using HTML & CSS.
5. To create a HTML Page using List and Hyperlinks
6. Create a HTML/CSS Page to advertise the courses offered by our college using various frames.
7. Create a HTML/CSS page for displaying your Curriculum Vita
8. To create a simple web page for a company using Inline Style Sheet, which includes the following details:
    - History
    - LOGO
    - Departments
    - Year wise report

- Monthly report
- Day to Day reports of the sales of the company

9. To create a simple web site for our college using frame tag & Embedded Style Sheet which includes the following details:
    - History of the college
    - Courses offered for both UG and PG
    - Individual department details
    - Fee particulars for the courses
10. Create your own personal web page using External Style Sheet

Note: - Questions for the Internal/External examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Understand the basic tags in HTML

CO 2: Apply the concepts of table and list

CO 3: Illustrate the use of audio/ video content in web page

CO 4: Evalute the concept of hyperlink and frames

CO 5: Build interactive web page using CSS

PC Assembly and Installation Lab

(For Students Admitted From 2022-23)

Subject Code: SCCPAP **Total Hours: 60**

Credits: 5

Course Objectives:

1. To identify and understand the architecture of hardware components
2. To perform assembling/ disassembling, configure and maintain the computer hardware components

Lab Cycle

1. Identifying front panel indicators & switches and front side & rear side connectors
2. Identifying the computer system Layout: Positions of SMPS, Motherboard, FDD, HDD, CD, DVD and add on cards
3. Configure BIOS setup program and troubleshoot the typical problems using BIOS utility
4. Install Hard Disk and configure to the Pc's
5. Install and Configure a DVD Writer and a Blu-ray Disc writer and recording DVD and Blu-ray disk

6. Printer Installation and Servicing and troubleshooting
7. Install and configure Scanner, Web cam, Cell phone and bio-metric device with system and troubleshoot the problems
8. Assemble a system with add on cards and check the working condition of the system and install OS
9. Install and Configure Dual OS Installation
10. Assembling and Disassembling of Laptop to identify the parts and to install OS and configure it

Note: - Questions for the Internal/External examination will be based on the concepts learnt

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Understand the Front and Rear Panel Indicators, Switches and Connectors
CO 2: Identify the layout of the system components
CO 3: Analyze the configuration of BIOS setup programs
CO 4: Evaluate the installation of Operating System, Disk Driver and various devices
CO 5: Design an assembling and disassembling of Laptop to identify the parts