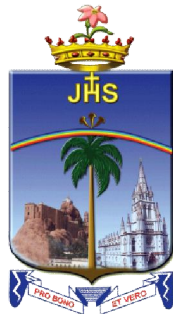


M.C.A.

LOCF SYLLABUS – 2021

SCHOOLS OF EXCELLENCE

WITH CHOICE BASED CREDIT SYSTEM (CBCS)



DEPARTMENT OF COMPUTER SCIENCE

SCHOOL OF COMPUTING SCIENCES

ST. JOSEPH'S COLLEGE (AUTONOMOUS)

Special Heritage Status Awarded by UGC,
Accredited at A⁺⁺ Grade (IV Cycle) by NAAC
College with Potential for Excellence by UGC,
DBT-STAR & DST-FIST Sponsored College
Tiruchirappalli - 620 002, Tamil Nadu, India

**For PG - MCA Programme
DEPARTMENT OF COMPUTER SCIENCE
St Joseph's College (Autonomous)
Tiruchirappalli – 620 002**

VISION

Forming globally competent, committed, compassionate and holistic persons, to be men and women for others, promoting a just society.

MISSION

- Fostering learning environment to students of diverse background, developing their inherent skills and competencies through reflection, creation of knowledge and service.
- Nurturing comprehensive learning and best practices through innovative and value-driven pedagogy.
- Contributing significantly to Higher Education through Teaching, Learning, Research and Extension.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

- Graduates will be able to accomplish professional standards in the global environment.
- Graduates will be able to uphold integrity and human values.
- Graduates will be able to appreciate and promote pluralism and multiculturalism in working environment.

PROGRAMME OUTCOMES (POs) PG

1. Graduates will be able to apply assimilated knowledge to evolve tangible solution to emerging problems.
2. Graduates will be able to analyze and interpret data to create and design new knowledge.
3. Graduates will be able to engage in innovative and socially relevant research and effectively communicate the findings.
4. Graduates will become ethically committed professional and entrepreneurs upholding human values.
5. Graduates imbued with ethical values and social concern will be able to understand and appreciate cultural diversity, social harmony and ensure sustainable environment.

PSOs for PG Programme (MCA)	
After completing the MCA Programme, the graduates will be able to	
PSO1	implement the logic for solving the real life problems by using the knowledge gained
PSO2	understand, analyze, design, develop, test, implement and document software systems
PSO3	use their creative skill to evolve new ideas, defend their findings at the peer level and able to manage IT and ITES organizations.
PSO4	work in public and private sectors satisfying social and environmental obligations with multiple cultures
PSO5	act as socially responsible IT professionals or service minded entrepreneurs

Department of Computer Science (2021-2022)					
COURSE STRUCTURE FOR PG PROGRAMME (MCA)					
Sem.	Specification	No. of Courses	No. of Hours	Credits	Total Credits
I-IV	Core Courses: Theory	9	42	33	33
I-IV	Core Courses: Practical	6	17	17	17
II	Self-paced learning	1	-	2	2
IV	Comprehensive Examination	1	-	2	2
IV	Project work & Viva Voce	1	25	24	24
I- IV	Discipline Specific Elective	4	20	16	16
I	Ability Enhancement Course	1	4	3	3
II	Skill Enhancement Course (Soft Skills)	1	4	3	3
III	Generic Elective IDC (WS)	1	4	3	3
IV	Generic Elective IDC (BS)	1	4	3	3
II - IV	Online Courses (MOOC)	3	-	(6)	(6)
I-IV	Outreach Programme	-	-	4	4
	Total		120		110(6)

PG – MCA - PROGRAMME PATTERN							
Course Details					Scheme of Exams		
Sem	Course Code	Course Title	Hrs	Cr	CIA	SE	Final
I	21PCA1CC01	Database Systems	5	4	100	100	100
	21PCA1CC02	Operations Research	5	4	100	100	100
	21PCA1CC03	Programming in Java	5	4	100	100	100
	21PCA1CP01	Software Lab – 1: Java	3	3	100	100	100
	21PCA1CP02	Software Lab – 2: RDBMS	3	3	100	100	100
	21PCA1ES1A	DSE-1: Digital Computer Architecture	5	4	100	100	100
	21PCA1ES1B	DSE -1 : Graph and Automata Theory					
	21PCA1AE01	AEC : Organizational Behaviour	4	3	50	50	50
Total			30	25			
II	21PCA2CC04	Programming Smart Devices	4	3	100	100	100
	21PCA2CC05	Software Engineering	4	3	100	100	100
	21PCA2CC06	Data Analysis using Python	4	3	100	100	100
	21PCA2CP03	Software Lab – 3: Programming Smart Devices	3	3	100	100	100
	21PCA2CP04	Software Lab – 4: Python	2	2	100	100	100
	21PCA2SP01	Self-Paced Learning: XML	-	2	50	50	50
	21SCS2ES2A	DSE -2: (Common Core) Design and Analysis of Algorithms	5	4	100	100	100
	21PSS2SE01	SEC: Soft skills	4	3	100	-	100
	21PCA2EG1A	GE-1(WS): Applied Statistics using R	4	3	100	100	100
	21PMA2EG1B	GE-1(WS): Mathematical Foundations					
		Extra Credit Courses (MOOC)-1	-	(2)			
Total			30	26(2)			
III	21PCA3CC07	Distributed Technologies	5	4	100	100	100
	21PCA3CC08	Computer Networks and Security	5	4	100	100	100
	21PCA3CC09	Accounting and Financial Management	5	4	100	100	100
	21PCA3CP05	Software Lab -5: Distributed Technologies	3	3	100	100	100
	21PCA3CP06	Case Study based Application Development	3	3	100	100	100
	21PCA3ES3A	DSE -3: MEAN Stack WebApp Development	5	4	100	100	100
	21PCA3ES3B	DSE -3: PHP Programming					
	21PCA3EG02	GE-2 (BS): Web Design	4	3	100	100	100
	21PCA3CE01	Comprehensive Examination	-	2	50	50	50
		Extra Credit Courses (MOOC)-2		(2)			
Total			30	27(2)			
IV	21PCA4ES4A	DSE -4: Recent trends in Computer Science#	5	4	100	100	100
	21PCA4ES4B	DSE -4: Big Data Analytics #					
	21PCA4PW01	Project Work & Viva-Voce	25	24	100	100	100
	---	Extra Credit Courses (MOOC)-3	-	(2)			
Total			30	28(2)			
I-IV	21PCW4OR01	Outreach programme (SHEPHERD)		4			
Total (Four Semesters)			120	110(6)			

Mandatory Bridge Courses for Non-Computer Science Stream Students
(Courses are fully internal & for 100 marks)

Sem	Course Code	Course	Course Title	Hrs	Cr	CIA	SE	Final
I	21PCA1BCC1	ADDL. Core I	C Programming	-	5	100	-	100
	21PCA1BCC2	ADDL. Core II	C Programming Lab	-	5	100	-	100
Total				-	10			
II	21PCA2BCC3	ADDL. Core III	Web Design (HTML5, Java Script & CSS)	-	5	100	-	100
	21PCA2BCC4	ADDL. Core IV	Web Design (HTML5, Java Script & CSS) Lab	-	5	100	-	100
Total				-	10			
III	21PCA3BCC5	ADDL. Core V	Web Graphics	-	5	100	-	100
	21PCA3BCC6	ADDL. Core VI	Web Graphics Lab	-	5	100	-	100
Total					10			

PG GENERIC ELECTIVE -2: 3rd Semester Between school (BS)- Offered to students in the Departments belong to other Schools (Except the school offering the course)							
Course Details					Scheme of Exams		
Offering School	Course Code	Course Title	Hrs	Cr	CIA	SEM	Final
SBS	21PBI3EG02	First Aid Management	4	3	100	100	100
	21PBT3EG02	Food Technology	4	3	100	100	100
	21PBO3EG02	Horticulture and Landscaping	4	3	100	100	100
SCS	21PCA3EG02	Web Design	4	3	100	100	100
	21PMA3EG02	Operations Research	4	3	100	100	100
	21PCS3EG02	Advances in Computer Science	4	3	100	100	100
	21PDS3EG02	Deep Learning	4	3	100	100	100
SLAC	21PEN3EG02	English for Effective Communication	4	3	100	100	100
SMS	21PCO3EG02	Basis of Taxation	4	3	100	100	100
	21PEC3EG02	Managerial Economics	4	3	100	100	100
	21PHR3EG02	Counselling and Guidance	4	3	100	100	100
	21PCC3EG02	Dynamics of Human Behaviour in Business	4	3	100	100	100
SPS	21PCH3EG02	Health Science	4	3	100	100	100
	21PPH3EG2A	Physics for Competitive Exam	4	3	100	100	100
	21PPH3EG2B	Nano Science	4	3	100	100	100

Semester	Course Code	Title of the Course	Hours	Credits
I	21PCA1CC01	CORE-1: DATABASE SYSTEMS	5	4

CO No.	CO- Statements	Cognitive Level (K- level)
On completion of the course, the student will be able to		
CO-1	Explain the basic concepts of relational database management system and design ER models	K1,K2
CO-2	Formulate and execute SQL queries to interact with the database	K1, K6
CO-3	Apply the normalization procedure learnt to design a suitable structure for a given situation	K3, K6
CO-4	Implement processing logic in the form of PL/SQL routines like functions, procedures, packages, triggers and PL/SQL blocks	K3, K4
CO-5	Identify, evaluate and alleviate the issues connected with transaction processing, concurrency control and distributed databases.	K5

Unit-I (15 hours)

Introduction to DBS: Basic Concepts and Definitions - Data Dictionary - Database System - DBA - Database Languages - Database System Architecture: Schemas, Sub-schemas and Instances - Three-level Architecture - Data Independence - Mappings -Data Models - Types-Relational Algebra and Calculus: Structure - Relational Algebra - Relational Calculus - ER Model - Specialization and Generalization.

Unit-II (15 hours)

Relational Query Languages: Introduction - Codd's Rules-Information System Based Language - Structured Query Language (SQL)-Embedded SQL

Unit-III (15 hours)

Normalization: Introduction to Database Design - Functional Dependency and Decomposition - Normalization - Normal Forms - BCNF - Multi-valued and Join Dependencies

Unit-IV (15 hours)

PL/SQL: A Programming Language: History - Fundamentals -Data types - Operators. Control Structures: Control Structures - Nested Blocks - SQL in PL/SQL - Data Manipulation - Transaction Control statements. PL/SQL Cursors and Exceptions - Named Blocks: Procedures - Functions-Packages -Triggers

Unit-V (15 hours)

Transaction Processing and Concurrency Control - Database Recovery System - Database Security - Object Oriented Databases: Introduction - Object Oriented Data Model (OODM) – Concepts of Object Oriented Database (OODB) - Object Oriented DBMS (OODBMS) - Object Data Management Group (OMDG) and Object Oriented Languages - Parallel Database Systems: Introduction to Parallel databases - Architecture - Key Elements of Parallel Database Processing -Distributed Databases - Architecture - Distributed Database design.

Books for Study:

1. S K Singh, “Database Systems Concepts, Design and Applications”, Pearson Education, India, 2006.

Unit-I

Chapter 1 (Sec:1.2, 1.2, 1.3, 1.5,1.7, 1.10),

Chapter 2 (Sec:2.1, 2.2, 2.3, 2.4, 2.5, 2.7, 2.8)

Chapter 4 (Sec:4.1, 4.3, 4.4, 4.5)

Chapter 6 (Sec: 6.1, 6.2, 6.3, 6.4, 6.5)

Chapter 7 (Sec:7.1, 7.3)

Unit-II

Chapter 5 (Sec:5.1, 5.2, 5.3, 5.5, 5.6)

Unit-III

Chapter 10 (Sec:10.1, 10.2, 10.3, 10.4, 10.5, 10.6),

Unit – V

Chapter 12 (Sec:12.1, 12.2, 12.3)

Chapter 13 (Sec:13.1, 13.2, 13.3, 13.4, 13.5, 13.6)

Chapter 14 (Sec:14.1, 14.2, 14.3, 14.4, 14.5, 14.6, 14.7)

Chapter 15 (Sec:15.1, 15.2, 15.3, 15.4, 15.5)

Chapter 17 (Sec:17.1, 17.2, 17.3, 17.4)

Chapter 18 (Sec:18.1, 18.2, 18.3, 18.4)

2. Nilesh Shah, “Database Systems using ORACLE”, Second Edition, Pearson India Education Services, 2016.

Unit – IV

Chapter 10 (Pages: 225 to 241),

Chapter 11 (Pages: 244 to 264),

Chapter 12 (Pages: 267 to 289),

Chapter 14 (Pages: 313 to 334)

Books for Reference

1. Abraham Silberschatz, “Database Systems”, McGraw Hill International, New York, 1997.
2. CJ Date, “An Introduction to Database Systems”, 6th Edition, Addison Wesley Publishing Company, New York, 1995.
3. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom, “Database Systems: The Complete Book”, Pearson, USA, 2009

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
I	21PCA1CC01	CORE-1: DATABASE SYSTEMS									5	4
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	1	3	1	2	2	3	3	2	2	2.2	
CO-2	3	3	2	1	1	3	2	3	2	2	2.2	
CO-3	3	3	3	1	1	3	3	3	1	2	2.3	
CO-4	2	3	2	1	3	1	3	2	3	3	2.3	
CO-5	3	2	3	2	1	2	3	3	1	2	2.2	
Mean Overall Score											2.24	
Result											# High	

Semester	Course Code	Title of the Course	Hours	Credits
I	21PCA1CC02	CORE-2: OPERATIONS RESEARCH	5	4

CO No.	CO- Statements	Cognitive Level (K- level)
On completion of the course, the student will be able to		
CO-1	formulate real life Problems as LP Model and finding an optimized solution, different methods of Solving LP Model	K6
CO-2	analyze the concept of solving Transportation Problems and Assignment Problem with Business Solutions	K5
CO-3	identify the activities, schedule the Project and finding time of completion	K4
CO-4	know the importance of Queue and its applications to various real-life examples, identifying the critical elements in the Queuing Theory	K1,K2
CO-5	understand the usage of inventory theory for Solving Business Problems	K3

Unit – I (15 hours)

Linear Programming: Formulations and Graphical solution to L.P. Problem- Simplex method- Degeneracy, Unbounded and infeasible solution- Two Phase Method.

Unit – II (15 hours)

Linear Programming (contd): Duality-Primal and Dual Computations –Dual Simplex Method - Transportation problem and its solution – Assignment problem and its solution by Hungarian method.

Unit – III (15 hours)

Project scheduling by PERT - CPM : Phases of project scheduling –Arrow Diagram - Critical Path Method - Probability Considerations in Project Scheduling.

Unit – IV (15 hours)

Queueing Theory: Queueing System - Characteristics of Queueing system - classification of queues - Poisson Queues - M/M/1 and M/M/C Queueing Models.

Unit – V (15 hours)

Inventory Management: Inventory Control - ABC analysis - Economic Lot size Problems - EOQ with uniform Demand and shortages - Limitations of inventories - Buffer stock - Determination of Buffer stocks.

Note: Stress to be on solving Numerical Problems only.

Book for Study

1. Kanti Swarup, P K Guptha and Man Mohan, “Operations Research”, Sultan Chand & Sons, New Delhi, 2013.

Unit-I Chapter 1 (Sec: 1.1-1:6, 1:10), Chapter 2, Chapter 3 (Sec: 3:1-3:5), Chapter 4 (Sec: 4:1, 4:3, 4:4 (only Two-Phase Method), 4:5),

Unit-II Chapter 5 (Sec: 5:1-5:5, 5:7, 5:9), Chapter 10 (Sec: 10:1, 10:5-10:6, 10:8-10:10, 10:12-10:13, 10:15)

Unit-III Chapter 25 (Sec 25:1-25:7)

Unit – IV Chapter 21 (Sec: 21:1-21:9)

Unit – V Chapter 19 (Sec: 19:1-19:2, 19:6-19:10(case1&2 only), 19:15)

Books for Reference

1. Hamdy A. Taha, “Operations Research-An Introduction”, Macmillan Publishing Co, 5th Edition, 1987.
2. P.K. Gupta, Man Mohan, “Operations Research and Quantitative Analysis”, Sultan Chand & Sons, New Delhi First Edition, 1987.
3. S. Kalavathy, ”Operations Research”, Vikas Publishing House Pvt Ltd, Noida India-2013

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
I	21PCA1CC02	CORE-2: OPERATIONS RESEARCH									5	4
Course Outcomes ↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs	
	PO 1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	2	3	2	3	2	3	3	2	2	2	2.4	
CO-2	2	3	2	2	2	3	3	2	2	3	2.4	
CO-3	3	3	2	2	3	2	2	3	3	2	2.5	
CO-4	2	3	2	3	3	2	2	3	3	2	2.5	
CO-5	3	3	2	3	3	3	3	2	2	3	2.7	
Mean Overall Score											2.5	
Result											# High	

Semester	Course Code	Title of the Course	Hours	Credits
I	21PCA1CC03	CORE-3: PROGRAMMING IN JAVA	5	4

CO No.	CO – Statements	Cognitive Level (K- level)
On completion of the course the student will be able to		
CO-1	enumerate the fundamentals of object oriented programming concepts and to use the Java programming language on various platforms	K-1, K-2
CO-2	apply the object oriented programming concepts to create simple Java applications	K-3
CO-3	translate the user interface into GUI based applications over traditional command line interface	K-5
CO-4	discuss and compare the applications of various Java libraries	K-4
CO-5	design a two tier model by connecting a database with a Java application and perform various IO operations	K-6

Unit - I (12 hours)

CLASSES AND OBJECTS: Class Fundamentals – Declaring Objects – Assigning Object Reference Variables – Introducing Methods – Constructors – ‘this’ Keyword – Garbage Collection. **METHODS AND CLASSES:** Overloading Methods – Objects as Parameters – Returning Objects – Access Control – Static and Final – Nested and Inner Classes – Exploring the String Class – Command Line Arguments.

Unit - II (15 hours)

INHERITANCE: Inheritance Basics – Using Super – Creating Multilevel Hierarchy – Method Overriding – Dynamic Method Dispatch – Abstract Classes – Final with Inheritance. **PACKAGES AND INTERFACES:** Packages – Packages and Member Access – Importing Packages – Interfaces. **EXCEPTION HANDLING:** Fundamentals – Exception Types – Using try and catch – Multiple catch Clauses – Nested try Statements – throw, throws, finally – Java’s Built-in Exceptions.

Unit - III (15 hours)

MULTITHREADED PROGRAMMING: Java Thread Model – Main Thread – Creating a Thread and Multiple Threads – Using is Alive () and join () – Thread Priorities – Synchronization – Interthread Communication -Suspending, Resuming and Stopping Threads. **EVENT HANDLING:** Two Event Handling Mechanisms – Delegation Event Model – Event Classes – Key Event Class – Sources of Events – Event Listener Interfaces. **SWING:** Two Swing Features – Components and Containers – Swing Packages – Exploring Swing.

Unit - IV (15 hours)

STRING HANDLING CLASSES: String Constructors – Special String operations – Character extraction – String comparison – searching strings – modifying strings. String Buffer. **EXPLORING JAVA LANG:** Primitive type wrappers. **JAVA.UTIL COLLECTIONS FRAMEWORK:** Collections overview – Collection interfaces: Collection interface - Queue interface. The Collection classes: Array List – LinkedList – Tree set- Enumset. Arrays -The Legacy classes and interfaces: Enumeration interface- Vector-Stack.

Unit - V (15 hours)

UTILITY CLASSES: String Tokenizer– Date-Calendar-Gregorian Calendar Formatter: Formatting basics – strings and characters – numbers. **EXPLORING JAVA.IO:** IO Exceptions-Stream Classes-Byte Streams-Character Streams. **JDBC:** Establishing a Connection - Creation of Data Tables - Entering Data into The Tables - Table Updating – Prepared Statement.

Books for Study

- Herbert Schildt, “Java The Complete Reference”, Tata McGraw Hill, 11th Ed., 2019
 - Unit-I** - Chapter 6 & 7
 - Unit-II** - Chapter 8, 9 & 10
 - Unit-III** - Chapter 11, 24, 31 & 32
 - Unit-IV** - Chapter 17, 18 & 19
 - Unit-V** - Chapter 20 & 21
- C. Muthu, “Programming with JAVA”, Vijay Nicole Imprints Private Limited, 2nd Ed, Chennai, 2018
 - Unit-V** - Chapter 18

Books for Reference

- Sagayaraj, Denis, Karthik and Gajalakshmi, “Java Programming-for Core and Advanced Users”, Universities Press, Hyderabad, 2017
- P. Radhakrishna, “Object Oriented Programming through JAVA”, Universities Press, 2016
- K. Rajkumar, Java Programming, Pearson India, 2013

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code					Title of the Course					Hours	Credits
I	21PCA1CC03					CORE-3: PROGRAMMING IN JAVA					5	4
Course Outcomes ↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)						Mean Scores of Cos
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5		
CO-1	2	3	2	1	1	3	3	3	2	1		2.1
CO-2	3	3	2	2	1	3	2	3	2	1		2.2
CO-3	3	3	3	2	2	3	3	2	2	1		2.4
CO-4	3	2	2	2	1	3	3	2	2	2		2.2
CO-5	3	3	3	2	2	3	3	3	2	3		2.7
Mean Overall Score												2.32
Result												# High

Semester	Course Code	Title of the Course	Hours	Credits
I	21PCA1CP01	Software Lab-1: JAVA	3	3

CO No.	CO – Statements	Cognitive Level (K- level)
On completion of the course, the student will be able to		
CO-1	recall and apply the core OOP concepts to develop simple java applications	K1, K3
CO-2	demonstrate the purpose of various predefined Java Libraries	K2
CO-3	utilize a program level interface for communicating with database using java programming.	K3
CO-4	analyse and choose an integrated development environment to write, compile, run, and test simple object-oriented Java programs	K4, K5
CO-5	develop a simple project for real time environment using two tier model	K6

List of Exercises

1. Classes & Objects
2. Inheritance & Polymorphism
3. Packages & Interfaces
4. Exception Handling
5. Multithreading
6. Swing
7. String Handling Classes
8. java.util and java.lang Classes
9. I/O Streams
10. JDBC

Web Links

Virtual Lab

<http://vlabs.iitb.ac.in/vlabs-dev/labs/java-iitd/experiments/java-intro-iitd/>

Online Java Compiler

https://www.onlinegdb.com/online_java_compiler

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
I	21PCA1CP01	Software Lab-1: JAVA									3	3
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	3	2	1	3	2	2	2	2	2.3	
CO-2	3	3	2	2	1	3	3	3	2	2	2.4	
CO-3	3	3	2	2	1	3	3	2	3	2	2.4	
CO-4	3	3	3	2	1	3	3	3	3	2	2.6	
CO-5	3	3	3	2	1	3	3	3	3	2	2.6	
Mean Overall Score											2.46	
Result											# High	

Semester	Course Code	Title of the Course	Hours	Credits
I	21PCA1CP02	Software Lab- 2: RDBMS	3	3

CO No.	CO- Statements	Cognitive Level (K- level)
On completion of the course, the student will be able to		
CO-1	Create database tables with all integrity constraints	K1, K6
CO-2	Formulate and execute SQL queries to interact with the database	K5
CO-3	Apply the SQL Plus commands to generate reports.	K2, K3
CO-4	Implement processing logic in the form of PL/SQL routines like functions, procedures, packages, triggers and PL/SQL blocks.	K3, K4
CO-5	Design forms with event handling feature to interact with database.	K5, K6

SQL - Simple queries using DDL, DML, and DCL:

- SQL functions
 - Creation of Tables (along with Primary and Foreign keys),
 - Altering Tables and Dropping Tables
 - Practicing DML commands- Insert, Select, Update, Delete
- SET operations
- View and Snapshots
- Practicing Sub queries (Nested, Correlated) and Joins (Inner, Outer and Equi).

PL/SQL:

- PL/SQL Block
- Cursors – Declaring, Opening & closing Cursor, Fetching the data
- Database triggers - creation of trigger, Insertion, Deletion, Updating using trigger.
- Subprograms and packages.

Forms and Reports:

- Designing forms with menus, buttons and List of values
- Master-Detail form design.
- Developing reports (Tabular, Master/detail, Matrix and Mailing label)

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credits
I	21PCA1CP02	Software Lab- 2: RDBMS									3	3
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	3	1	2	3	2	2	2	3	2.4	
CO-2	2	2	3	2	3	3	3	3	1	2	2.4	
CO-3	3	3	2	2	3	3	3	2	2	3	2.6	
CO-4	2	2	3	1	2	2	2	2	2	3	2.1	
CO-5	3	3	2	2	3	3	2	1	1	3	2.3	
Mean Overall Score											2.36	
Result											# High	

Semester	Course Code	Title of the Course	Hours	Credits
I	21PCA1ES1A	DSE- 1: DIGITAL COMPUTER ARCHITECTURE	5	4

CO No.	CO- Statements	Cognitive Level (K- level)
On completion of the course, the student will be able to		
CO-1	Recall and implement the basic concepts of logic gates and simplify the Boolean functions using K-MAP	K1, K3
CO-2	Differentiate and formulate the functions of Multiplexer and De-multiplexer, Encoder and Decoder, and perform conversion among different number systems used in Digital Computer	K2, K4
CO-3	Realize and apply the functions of Adder/Subtractor and the logic designs of Flip- Flops	K1, K3, K4
CO-4	Comprehend and implement the different Instructions, uses of computer registers and narrate the design of Accumulator with its functionalities	K2, K3
CO-5	Identify, Compare and evaluate the instruction formats, structure of registers, addressing modes and envision the working process of RISC	K4, K5, K6

Unit-I (15 hours)

Digital Logic: The Basic Gates-NOT, OR, AND - Universal Logic Gates: NOR, NAND - AND-OR-Invert Gates. Combinational Logic Circuits: Boolean Laws and Theorems - Sum-of-Products Method - Truth Table to Karnaugh Map - Pairs, Quads, and Octets - Karnaugh Simplifications - Don't-care Conditions - Product-of-sums Method - Product-of-sums Simplification

Unit-II (15 hours)

Data-Processing Circuits: Multiplexers - Demultiplexers - 1-of-16 Decoder - BCD-to-decimal Decoders - Seven-segment Decoders - Encoders – Exclusive-OR Gates. Number Systems and Codes: Binary Number System - Binary-to-decimal Conversion - Decimal-to-binary Conversion- Octal Numbers - Hexadecimal Numbers - The ASCII Code-The Excess-3 Code - The Gray Code

Unit-III (15 hours)

Arithmetic Circuits: Binary Addition - Binary Subtraction - Unsigned Binary Numbers - Sign-magnitude Numbers - 2's Complement Representation - 2's Complement Arithmetic-Arithmetic Building Blocks - The Adder-subtractor - Arithmetic Logic Unit - Binary Multiplication and Division. Flip-Flops: RS FLIP-FLOPs - Gated FLIP-FLOPs - Edge-triggered RS FLIP-FLOPs – Edge-triggered D FLIP-FLOPs - Edge-triggered JK FLIP-FLOPs - JK Master-slave FLIP-FLOPs

Unit-IV (15 hours)

Basic Computer Organisation and Design: Instruction codes - Computer Registers - Computer Instructions - Timing and Control - Instruction Cycle - Memory Reference Instructions -

Input/output & Interrupt – Complete Computer Description - Design of Basic Computer - Design of Accumulator Logic

Unit-V (15 hours)

CPU: General Register Organisation - Stack Organisation - Instruction Formats - Addressing Modes - Data Transfer and Manipulation - Program Control - RISC

Books for Study

Unit I, II and III

1. Donald P. Leach and Albert Paul Malvino, “Digital Principles and Application”, Seventh Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2011.

Unit-I Chapter 1 (Sec: 2.1 to 2.3), Chapter 3 (Sec: 3.1 to 3.9)

Unit-II Chapter 4 (Sec: 4.1 to 4.7), Chapter 5 (Sec: 5.1 to 5.8)

Unit-III Chapter 6 (Sec: 6.1 – 6.11), Chapter 8 (Sec: 8.1 – 8.5, 8.8)

Unit IV and V

2. M. Morris Mano, “Computer System Architecture”, Third Edition, Prentice Hall of India, New Delhi, 2003.

Unit-IV Chapter 5 (Sec: 5.1 – 5.10)

Unit-V Chapter 8 (Sec: 8.1 – 8.8)

Books for Reference

1. Morris Mano and Michael D Ciletti, “Digital Design”, 4th Edition, Pearson publications, 2008.
2. Rafiquzzaman “Microprocessors Theory and Applications” Revised Edition, PHI Learning Pvt. Ltd, New Delhi, 2012.
3. Smruti Ranjan Sarangi, “Computer Organisation and Architecture”, TMH, New Delhi, 2014.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
I	21PCA1ES1A	DSE- 1: DIGITAL COMPUTER ARCHITECTURE									5	4
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	2	2	2	3	2	3	2	2	2.2	
CO-2	3	3	3	2	1	3	3	3	2	2	2.5	
CO-3	2	3	3	2	1	2	3	3	2	2	2.3	
CO-4	3	3	3	2	1	3	3	3	2	2	2.5	
CO-5	3	3	3	1	1	2	3	3	2	2	2.3	
Mean Overall Score											2.4	
Result											# High	

Semester	Course Code	Title of the Course	Hours	Credits
I	21PCA1ES1B	DSE- 1: GRAPH AND AUTOMATA THEORY	5	4

CO No.	CO- Statements	Cognitive Level (K-Level)
On completion of the course, the student will be able to		
CO-1	Impart the knowledge in the area of graph theory.	K1
CO-2	Understand the fundamentals and properties of Trees.	K2
CO-3	Apply the concepts of automata theory in real world problems.	K3
CO-4	Analyze the various grammars and classification of languages.	K4, K5
CO-5	Create applications in Automata	K3, K6

Unit-I (15 hours)

Graph Introduction: Paths and Circuits - Isomorphism, Connected & Disconnected Graphs - Walk –Path -Euler graphs - Operations on Graphs-Hamiltonian Paths & Circuits- Travelling Sales Man Problem.

Unit-II (15 hours)

Trees and Matrix Representations: Definition and Properties of Trees, Rooted and Binary Trees, Spanning trees. Matrix representation of Graphs: Incidence Matrix, Adjacency Matrix - Algorithms: Shortest Path from a Specified Vertex to another Specified Vertex – Shortest Path between All Pairs of Vertices.

Unit-III (15 hours)

Theory of Automata: Definition of an Automaton – Description of a Finite Automaton (FA) – Transition Systems – Properties of Transition Functions – acceptability of a string by a FA – Non Deterministic Finite State Machines – Regular Expressions - Identities for Regular Expressions.

Unit-IV (15 hours)

Formal Languages: Basic Definition and Examples - Definition of a Grammar – Derivations and the Language generated by a Grammar - Chomsky classification of Languages – Context Free Languages (CFL's) and Derivation Trees – Ambiguity in CFG - Chomsky Normal Form - Pumping Lemma for CFL's.

Unit-V (15 hours)

Applications of Automata and Formal Languages: Lexical Analysis: The Role of the Lexical Analyzer - From Regular Expressions to Automata: Conversion of an NFA to DFA– Simulation of an NFA- Construction of an NFA from Regular Expression. Optimization of DFA: Minimizing the Number of states of DFA. Syntax Analysis: The role of parser – Representative Grammars- Syntax Error Handling –Bottom-Up Parsing: Reductions – Handling Pruning –Shift Reduce Parsing.

(Note: Stress can be given to problem solving instead of proof of theorems in Units III, IV and V)

Books for Study

1. Narsingh Deo, "Graph Theory with applications to Engineering and Computer Science", Dover Publications, First Edition, 2016). (Units I and II)
Chapter-1: (Sec.: 1.1 to 1.5) Chapter-2: (Sec.: 2.1, 2.2, 2.4 to 2.10)
Chapter 3: (Sec.: 3.1 to 3.7) Chapter-7: (Sec.: 7:7.1, 7.9)
Chapter-11: (Sec.: 11.5)
2. Mishra K L P, Chandrasekaran N, "Theory of Computer Science Automata, Languages and Computation", Third Edition, PHI Learning private limited, 2019. (Units III, IV)
Chapter-3: (Sec.: 3.1 – 3.6) Chapter-4: (Sec.: 4.1, 4.2)
Chapter-5: (Sec.: 5.1) Chapter-6: (Sec.: 6.1, 6.2, 6.4.1, 6.5)
3. Alfred V.Aho, Ravi Sethi, Jeffrey D. Ullman, "Compilers Principles, Techniques and Tools", Pearson Education, Inc. Publishing as Addison-Wesley Higher Education, Second Edition, 2011. (Unit V)
Chapter- 3: (Sec.:3.1, 3.7.1, 3.7.2, 3.7.4, 3.9.6)
Chapter-4: (Sec.:4.1.1, 4.1.2, 4.1.3, 4.5.1, 4.5.2, 4.5.3)

Books for References

1. Douglas B. West, "Introduction to Graph Theory", Pearson Education, India 2nd edition, 2015.
2. John E. Hopcroft & Jeffery D. Ullman, "Introduction to Automata Theory, Languages and Computation", Narosa Publishing House, New Delhi, 2002.
3. Peter Linz, "An Introduction to Formal Languages and Automata", Bartlett Publication, 2011.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code		Title of the Course								Hours	Credit
I	21PCA1ES1B		DSE- 1: GRAPH AND AUTOMATA THEORY								5	4
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	2	2	2	1	3	3	3	2	1	2.2	
CO-2	3	2	2	2	1	3	3	3	1	1	2.1	
CO-3	3	3	2	2	1	3	3	3	1	2	2.3	
CO-4	3	3	3	1	1	3	3	3	1	1	2.2	
CO-5	3	3	3	2	2	3	3	3	2	2	2.6	
Mean Overall Score											2.28	
Result											#High	

Semester	Course Code	Title of the Course	Hours	Credits
I	21PCA1AE01	AEC: ORGANISATIONAL BEHAVIOUR	4	3

CO No.	CO-Statements	Cognitive Level (K-level)
On completion of the course, the student will be able to		
CO-1	Understand the basic concepts of organization.	K1, K2
CO-2	Develop the Attitudes and Formulate factors for attitude change	K2, K3
CO-3	Analyse Build the Perceptual Interpretation and Motivation	K3
CO-4	Impart Leadership skills through various activities	K3, K4
CO-5	Create new organizational structure and projects	K5, K6

Unit – I (12 hours)

NATURE OF ORGANIZATION – features – types – goals. NATURE OF ORGANIZATIONAL BEHAVIOR – Nature of OB – Role of OB – Foundations of OB.

Unit – II (12 hours)

NATURE OF HUMAN BEHAVIOR: Nature and causes of individual differences – models of man. PERCEPTION: concept – process – perceptual selectivity and distortion – Developing perceptual skills. ATTITUDES: Concept – Theories – Formation factors – measurements – Attitude change.

Unit – III (12 hours)

PERSONALITY: Concept – theories – determinants of personality- Personality and behaviour - MOTIVATION: Definition – Motivation & Behavior – Theories – approaches – incentives. INTERPERSONAL BEHAVIOR: Transactional analysis – Ego states – life scripts – life positions – transactions – stroking – Psychological games – Benefits of TA.

Unit – IV (12 hours)

GROUP DYNAMICS: Concepts & features of group – types of groups – group behavior – group decision making – committee – task group – inter group behavior. LEADERSHIP: Definitions – types – importance theories – styles. COMMUNICATION: Basics of communication – Communication network – Factors affecting communication – Business writing – Office management – Presentation strategies.

Unit – V (12 hours)

ORGANIZATION THEORY: Classical organizational theory – neoclassical organization theory – DESIGNING OF ORGANIZATIONAL STRUCTURE: need – planning and process – Departmentation Span of management – delegation of authorities – centralization & decentralization – FORMS OF ORGANIZATIONAL STRUCTURES: line and staff – functional – divisional – project – matrix – free form.

Book for study

1. Prasad LM, “Organisational Behavior”, Sultan Chand and Sons, New Delhi, 2014.

Unit-I: chapters: 1, 2
Unit-II: chapters: 3, 4, 7
Unit-III: chapters: 8, 11
Unit-IV: chapters: 12, 14, 15
Unit-V: chapters: 18, 20, 21

Books for Reference

1. S. S. Khanka, "Organisational Behavior", S. Chand Ltd., New Delhi, 2001
2. K. Aswathappa, "Organisational Behavior", Himalaya Publishing house, New Delhi, 2001

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
I	21PCA1AE01	AEC: ORGANISATIONAL BEHAVIOUR									4	3
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	3	3	2	2	2	2	2	3	2.5	
CO-2	3	3	2	3	3	2	2	3	3	3	2.7	
CO-3	3	3	2	3	2	2	2	2	2	3	2.4	
CO-4	3	2	3	2	2	2	2	3	3	3	2.5	
CO-5	3	2	3	2	2	2	3	3	3	3	2.6	
Mean Over all Score											2.54	
Result											#High	

Semester	Course Code	Title of the Course	Hours	Credits
II	21PCA2CC04	CORE-4: PROGRAMMING SMART DEVICES	4	3

CO No.	CO- Statements	Cognitive Level (K- level)
On completion of the course, the student will be able to		
CO-1	Develop simple applications for smart devices using React.	K1, K6
CO-2	Use React components to build powerful and stylish mobile applications	K2, K3, K6
CO-3	Apply APIs and Cross-Platform Native Modules in React	K3, K4
CO-4	Debug and use Developer Tools to build native mobile applications in React JS	K5, K6
CO-5	Deploy applications on iOS App Store and Android Play Store	K3

Unit-I (12 hours)
 React Native - Advantages of React Native- Working with React Native- React Native Work- Rendering Lifecycle- Creating Components in React Native- Working with Views- Using JSX- Styling Native Components- Host Platform APIs. - Building Your First Application: Setting Up Your Environment - Creating a New Application- Exploring the Sample Code - Building a Weather App.

Unit-II (12 hours)
 Components for Mobile - Analogies Between HTML Elements and Native Components - The Text Component- The Image Component- Working with Touch and Gestures- Using Touchable Highlight- The Gesture Responder System- Pan Responder- Working with Organizational Components - Using List View- Using Navigators- Other Organizational Components - Platform-Specific Components. **Styles:** - Declaring and Manipulating Styles- Organization and Inheritance- Positioning and Designing Layouts.

Unit-III (12 hours)
 Platform APIs: Using Geolocation- Accessing the User's Images and Camera- Storing Persistent Data with AsyncStore- The Smarter Weather Application. **Modules:** Installing JavaScript Libraries with npm- Native Modules for iOS- Native Modules for Android- Cross-Platform Native Modules.

Unit-IV (12 hours)
 Debugging and Developer Tools: JavaScript Debugging Practices, Translated- React Native Debugging Tools - Debugging Beyond JavaScript- Testing Your Code- Putting It All Together: The Flashcard Application- Modeling and Storing Data - Using the Navigator- A Look at Third-Party Dependencies - Responsive Design and Font Sizes.

Unit-V (12 hours)
 Deploying to the iOS App Store: Preparing Your Xcode Project- Uploading Your Application- Beta Testing with TestFlight- Submitting the Application for Review - Deploying Android Applications: Setting Application Icon- Building the APK for Release - Distributing via Email or Other Links - Submitting Your Application to the Play Store.

Books for Study

1. *Bonnie Eisenman*, “Learning React Native” - Building Mobile Applications with JavaScript, O’Reilly Media, USA, 2016

Unit-I Chapter 1 (Pages 1 to 6), Chapter 2 (Pages 7 to 14),
Chapter 3 (Pages 15 to 31)

Unit-II Chapter 4 (Pages 47 to 81), Chapter 5 (Pages 83 to 100),

Unit-III Chapter 6 (Pages 101 to 130), Chapter 7 (Pages 131 to 153),

Unit – IV Chapter 8 (Pages 155 to 175), Chapter 9 (Pages 177 to 200),

Unit – V Chapter 10 (Pages 203 to 222), Chapter 11 (Pages 225 to 236)

Books for Reference

1. *Jakob Iversen, Michael Eierman*, “Learning Mobile App Development” -A Hands-on Guide to Building Apps with iOS and Android, Addison-Wesley, USA, 2014.
2. *Nader Dabit*, “React Native in Action”- Developing iOS and Android apps with JavaScript, Manning Publications Co. USA, 2019
3. *Dotan Nahum*, “Programming React Native”, Leanpub, Canada, 2016.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
II	21PCA2CC04	CORE-4: PROGRAMMING SMART DEVICES									4	3
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	2	2	1	3	3	2	2	3	2.4	
CO-2	2	3	3	2	3	3	3	3	3	3	2.8	
CO-3	3	3	3	2	2	2	2	3	2	2	2.4	
CO-4	3	3	1	3	2	3	1	2	2	3	2.3	
CO-5	3	3	1	3	2	2	3	2	2	2	2.3	
Mean Overall Score											2.44	
Result											# High	

Semester	Course Code	Title of the Course	Hours	Credits
II	21PCA2CC05	CORE-5: Software Engineering	4	3

CO No.	CO- Statements	Cognitive Level (K- level)
CO-1	Remember the basic concepts of Software Engineering and design process models.	K1, K3
CO-2	Understand Software Requirements, analyse and model them.	K2, K4
CO-3	Apply Software Design process and create software structures for real life problems.	K4, K6
CO-4	Have the knowledge on Testing concepts and apply them to develop error free software.	K1, K3
CO-5	Evaluate the risk and quality issues in project management and create solutions.	K5, K6

Unit-I: (12 hours)
The Nature of Software – The Changing Nature of Software – **Software Engineering:** Defining the Discipline – The Software Process – Software Engineering Process – Software Development Myths. **Process Models:** Prescriptive Process Models – Specialized Process Models – The Unified Process – Personal and Team Process Models – Process Technology – Product and Process. **Agile Development:** Meaning of Agility and Cost of Change – Agile Process – Extreme Programming – Other Agile Process Models – A Tool Set for the Agile Process. **Humans Aspects of Software Engineering:** Characteristics of a Software Engineer – The Psychology of Software Engineering – The Software Team – Team Structure – Agile teams – The Impact of Social Media – Software Engineering using the Cloud – Collaboration Tools – Global Teams.

Unit-II (12 hours)
Understanding Requirements: Requirements Engineering – Establishing Groundwork – Eliciting Requirements – Developing Use Cases – Building the analysis Model – Negotiating Requirements – Requirements Monitoring – Validating Requirements – Avoiding common mistakes. **Scenario-Based Methods:** Requirements Analysis – Scenario-Based Modeling – UML models that supplement the use cases. **Class-Based Methods:** Identifying Analysis Classes – Specifying Attributes – Defining Operations – Class-Responsibility – Collaborator Modeling – Associations and Dependencies – Analysis Packages.

Unit-III (12 hours)
Design Concepts: The Design Process – Design Concepts – The Design Model. **Architectural Design:** Software Architecture – Architectural Genres – Architectural Styles – Architectural Considerations – Architectural Decisions – Architectural Design – Assessing Alternative Architectural Design. **User Interface Design:** The Golden Rules – User Interface Analysis and Design – Interface Analysis – Interface Design Steps – WebApp and Mobile Interface Design – Design Evaluation.

Unit-IV (12 hours)
Software Testing Strategies: A Strategic Approach to Software Testing – Test Strategies for Conventional Software – Test Strategies for Object-Oriented Software – Test Strategies for

WebApp – Test Strategies for Mobile App – Validation Testing – System Testing – The Art of Debugging. **Testing Conventional Applications:** Software Testing Fundamentals – Internal and External Views of Testing – White-Box Testing – Basis Path Testing – Control Structure Testing – Black-Box Testing – Model Based Testing – Testing Documentation and help facilities – Testing for Real Time Systems – Pattern for Software Testing. **Testing Web Applications:** Testing concepts for WebApps – The Testing Process – Content Testing – User Interface Testing – Component-Level Testing – Navigation Testing – Configuration Testing – Security Testing – Performance Testing

Unit-V

(12 hours)

Project Management Concepts: The Management Spectrum – People – The Product – The Process – The Project – W5H Principle – Critical Process. **Process and Project Metrics:** Metric in the Process and Project Domains – Software Measurement – Metrics for Software Quality – Integrating Metrics within the Software Process – Metrics for small Organizations – Establishing a Software Metrics Program. **Risk Management:** Software Risks – Risk Identification – Risk Projection – Risk Refinement – Risk Mitigation, Monitoring, and Management – RMMM Plan.

Book for Study

1. Roger S. Pressman and Bruce Maxim, “Software Engineering”, McGraw Hill, International 8th Edition, 2019.

Unit-1: Chapters 1 - 6

Unit-2: Chapters 8 - 10

Unit-3: Chapters 12, 13 & 15

Unit-4: Chapters 22, 23 & 25

Unit-5: Chapters 31, 32 & 35

Book for References

1. Roger S. Pressman, “Software Engineering”, McGraw Hill, International 9th Edition, New York, 2019.
2. Lan Sommerville, “Software Engineering” Pearson India, 10th Edition 2018.
3. Richard Fairley, “Software Engineering Concepts”, McGraw Hill, International Edition 2017.
4. Rajib Mall, “Fundamentals of Software Engineering”, e-book - PHI, New Delhi, 2020.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
II	21PCA2CC05	CORE-5: Software Engineering									4	3
Course Outcomes ↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs	
	PO1	PO 2	PO 3	PO4	PO5	PSO 1	PSO 2	PSO 3	PSO 4	PSO5		
CO-1	3	3	2	2	2	3	3	2	2	2	2.4	
CO-2	3	3	3	2	1	3	3	3	2	2	2.5	
CO-3	2	3	3	2	2	2	3	3	2	2	2.4	
CO-4	3	3	3	1	2	3	3	3	1	2	2.4	
CO-5	2	3	3	2	2	2	3	3	2	2	2.5	
Mean Overall Score											2.37	
Result											# High	

Semester	Course Code	Title of the Course	Hours	Credits
II	21PCA2CC06	CORE-6: DATA ANALYSIS USING PYTHON	4	3

CO No.	CO – Statements	Cognitive Level (K- level)
On completion of the course, the student will be able to		
CO-1	describe the basic python commands and write simple python programs using various data structures like List, Tuple, Set and Dictionary	K1, K3
CO-2	develop modules and packages for reusability in Python Programs	K2
CO-3	apply the concepts of Object Oriented Programming to develop Python applications and connect to a database for performing database related operations in Python	K3, K4
CO-4	evaluate and express the purpose of different libraries for performing data analysis	K5
CO-5	construct charts and graphs for visualising the outcome of data analysis	K6

Unit - I

(12 hours)

INTRODUCTION TO PYTHON: Features of Python - How to Run Python **DATA TYPES AND OPERATIONS:** Numbers-Strings-List-Tuple-Set-Dictionary. **FUNCTIONS:** Function Definition-Function Calling - Function Arguments - Anonymous Functions. **MODULES AND PACKAGES:** Built-in Modules - Creating Modules - import Statement - Locating Modules - Namespaces and Scope - dir() function - reload() function - Packages in Python - Date and Time Modules.

Unit - II

(12 hours)

OBJECT ORIENTED PROGRAMMING: Class Definition - Creating Objects - Built-in Attribute Methods - Built-in Class Attributes - Destructors in Python-Encapsulation - Data Hiding-Inheritance - Method Overriding-Polymorphism. **REGULAR EXPRESSIONS:** match() function - search() function - Search and Replace - Regular Expression Modifiers: Option Flags - Regular Expression Patterns - findall() method - compile() method. **DATABASE PROGRAMMING:** Connecting to a Database – Creating Tables – Insert, Update, Delete and Read Operation – Disconnecting from a Database

Unit - III

(12 hours)

INTRODUCTION TO NUMPY: Introduction to Numpy - Basics of NumPy Array – Computation on NumPy Array – Aggregations – Broadcasting – Comparisons, Masks and Boolean Logic – Sorting Arrays – NumPy Structured Array.

Unit - IV

(12 hours)

DATA MANIPULATION WITH PANDAS: Introducing Panda Objects – Data Indexing and Selection - Operating Data on Pandas – Handling Missing Data – Hierarchical Indexing – Combining DataSets – Vectorized String Operations – Working with Time Series.

Unit - V**(12 hours)**

VISUALIZATION WITH MATPLOTLIB: Simple Line Plots – Simple Scatter Plots – Density and Contour Plots – Histograms, Binnings and Density – Customizing Plot Legends – Customising Colorbars – Multiple Subplots – Text and Annotation – Three Dimension Plotting in Matplotlib – Geographic Data with BaseMap – Visualization with Seaborn

Books for Study

- Jeeva Jose and P. Sojan Lal, “Introduction to Computing and Problem Solving with PYTHON”, Khanna Book Publishing Co. (P) Ltd., 2016.
Unit-I - Chapter 3 (3.1,3.2), Chapter 4(4.1-4.6), Chapter 6 (5.1-5.4), Chapter 7 (7.1-7.9)
Unit-II - Chapter 9 (9.1 -9.10), Chapter 11 (11.1-11.5, 11.9,11.10), Chapter 12(12.1-12.6, 12.8)
- Jake Vander Plas, “Python Data Science Handbook: Essential Tools for Working with Data”, 1st Edition, O'Reilly Media, 2016
Unit-III - Chapter 2
Unit-IV - Chapter 3
Unit-V - Chapter 4

Books for Reference

- Wesley J. Chun, “Core Python Programming”, Second Edition, Prentice Hall Publication, 2006.
- Timothy A Budd, “Exploring Python”, Tata McGraw Hill, New Delhi, 2011
- Alberto Boschetti and Luca Massaron, “Python Data Science Essentials”, Packt publishing, 3rd Edition, 2018

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code		Title of the Course								Hours	Credit
II	21PCA2CC06		CORE-6: DATA ANALYSIS USING PYTHON								4	3
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	2	2	1	3	3	2	2	2	2.3	
CO-2	3	3	2	2	1	3	3	3	2	3	2.5	
CO-3	3	3	2	2	1	3	3	2	2	3	2.4	
CO-4	3	3	3	2	1	3	3	3	2	3	2.6	
CO-5	3	3	3	2	1	3	3	3	2	3	2.6	
Mean Overall Score											2.48	
Result											# High	

Semester	Course Code	Title of the Course	Hours	Credits
II	21PCA2CP03	Software Lab-3: PROGRAMMING SMART DEVICES	3	3

Course Outcomes

CO No.	CO- Statements	Cognitive Level (K- level)
On completion of the course, the student will be able to		
CO-1	use the React Native and its features	K1, K2
CO-2	create effective mobile app with components, views, state and properties	K3, K6
CO-3	handle styling and layout for the mobile app	K3
CO-4	develop applications that interact with an external API	K3, K4
CO-5	develop a geolocation awareness applications	K3, K5, K6

ReactJS:

1. Create an application that uses GUI components, Font and Colors.
2. Develop an application that uses Layout Managers and Event Listeners
3. Create a native calculator application.
4. Develop an application that draws basic Graphical Primitives on the screen.
5. Develop a native application that uses GPS location information.
6. Implement an application that writes data to the SD card
7. Implement an application that creates an alert upon receiving a message.
8. Mobile application with alarm clock.
9. Develop a photo gallery with search option.
10. Database Programming for mobile applications.
11. Develop the Tablet Programming.
12. Create Media Player.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
II	21PCA2CP03	Software Lab-3: PROGRAMMING SMART DEVICES									3	3
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	2	2	1	3	3	2	1	3	2.3	
CO-2	2	2	3	2	3	3	3	3	2	3	2.6	
CO-3	2	3	3	2	2	3	2	3	2	3	2.5	
CO-4	3	3	1	3	2	3	1	2	2	3	2.3	
CO-5	3	2	3	3	1	2	3	2	1	2	2.2	
Mean Overall Score											2.38	
Result											# High	

Semester	Course Code	Title of the Course	Hours	Credits
II	21PCA2CP04	Software Lab-4: PYTHON	2	2

CO No.	CO – Statements	Cognitive Level (K- level)
On completion of the course the student will be able to		
CO-1	recall, understand and demonstrate basic Python programs using python data structures	K1, K-2
CO-2	construct simple python applications by interpreting the core concepts used in python	K-3
CO-3	apply the methods used in python packages to perform effective data analysis	K-3
CO-4	test the outcome of data analysis by visualizing through plots and charts	K-5
CO-5	correlate the advantage of python with other data analysis tools and design a simple data analysis application in python	K-4, K-6

List of Exercises

Basic Python Programs

- Flow controls, Functions and String Manipulation
- Operations on Tuples and Lists
- Operations on Sets and Dictionary
- Simple OOP – Constructors, Method Overloading, Inheritance
- Regular Expressions
- Database Operations

Data Analysis - NumPy

- NumPy Arrays,
- Sorting and Searching on Arrays

Data Analysis - Pandas

- Data Series
- Data Frame
- Combining and Merging Data Sets
- Handling Missing Values, Filter, Grouping and Aggregation

Visualization – Matplotlib & Seaborn

- Matplotlib – Line Chart, Scatter Plot, Histogram
- Seaborn – Boxplot, HeatMap

Web Links

Virtual Lab

<http://vlabs.iitb.ac.in/vlabs-dev/labs/python-basics/index.html>

Online Python Compiler

<https://www.programiz.com/python-programming/online-compiler/>

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
II	21PCA2CP04	Software Lab-4: PYTHON									2	2
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	3	3	1	3	2	2	2	2	2.4	
CO-2	3	3	2	2	1	3	3	3	2	3	2.5	
CO-3	2	3	2	2	2	3	3	2	2	3	2.4	
CO-4	3	3	3	2	1	3	3	3	3	3	2.7	
CO-5	3	3	3	2	1	3	3	3	3	3	2.7	
Mean Overall Score											2.54	
Result											# High	

Semester	Course Code	Title of the Course	Hours	Credits
II	21PCA2SP01	Self-Paced Learning: XML	-	2

CO No.	CO- Statements	Cognitive Level (K- level)
On completion of the course, the student will be able to		
CO-1	recall and understand the fundamental concepts of XML Document	K1, K2
CO-2	learn to develop a well-formed XML Document	K2,K3
CO-3	develop web contents using CSS and XSL	K2,K3, K6
CO-4	apply related technologies for validation and linking documents	K3,K6
CO-5	evaluate and implement the concepts for XML based application development	K4, K5, K6

Unit-I

Introducing XML: An Eagle's Eye View of XML – XML Applications – Your First XML Document – Structuring Data – Attributes, Empty – Element Tags, and XSL – Well – formedness.

Unit-II

Document Type Definitions: Validity – Element Declarations – Attribute Declarations – EntityDeclarations – Namespaces.

Unit-III

Style Languages: CSS Style Sheets – CSS Layouts – CSS Text Styles – XSL Transformations - XSL Formatting Objects.

Unit-IV:

Supplemental Technologies: XLinks – Xpointers – Xinclude – Schemas.

Unit-V

XML Applications: Mathematical Markup Language – Chemical Markup Languages – Music XML – Voice XML.

Books for Study

1. Elliotte Rusty Harold, "XML Bible", John Wiley & Sons, 3rd Edition, 2004.

Unit-I Chapter 1,3,4,5,6

Unit-II Chapter 7,8,9,10,11

Unit-III Chapter 12,13,14,15,16

Unit-IV Chapter 17,18,19,20

Unit-V Chapter 2

Books for Reference

1. Thomas A Powell, “The complete reference XML”, The McGraw – Hill Companies 5th Edition, 2010.
2. Erik T. R Ray Learning XML, “O” Reilly Media, Third Edition 2003.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code		Title of the Course								Hours	Credit
II	21PCA2SP01		Self-Paced Learning: XML								-	2
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	2	3	2	2	3	2	2	3	2	2.4	
CO-2	2	3	2	1	3	2	3	2	3	2	2.3	
CO-3	2	3	3	2	3	2	3	3	2	2	2.5	
CO-4	3	2	2	3	2	3	2	3	2	2	2.4	
CO-5	2	3	3	2	2	2	3	3	2	2	2.4	
Mean Overall Score											2.4	
Result											# High	

Semester	Course Code	Title of the Course	Hours	Credit
II	21SCS2ES2A	DSE-2: DESIGN AND ANALYSIS OF ALGORITHMS	5	4

CO.No.	CO- Statements	Cognitive Level (K- level)
	On completion of the course, the student will be able to	
CO-1	Acquire the knowledge of data structures, design and analysis of algorithms	K1
CO-2	Be able to understand the data structures, design of computer algorithms with their complexity.	K2
CO-3	Identify the complexity of algorithms and apply searching and sorting methods.	K3
CO-4	Analyze the basic results of time complexity and space complexity in different types of algorithms.	K4
CO-5	Evaluate the interpolation problems and create algorithms for data structures and computer algorithms using divide and conquer method, interpolation and sorting methods.	K5 &K6

Unit-I (15 hours)
Introduction-Algorithm-Algorithm specification: Pseudocode Conventions, Recursive algorithms-Performance analysis: Space Complexity, Time Complexity, Asymptotic Notation.

Unit II (15 hours)
Ordered lists –Polynomial addition- Representation of Arrays – Stack – Queue – Circular queue – Evaluation of Expressions – Infix to Postfix – Evaluation of Postfix.

Unit III (15 hours)
Singly linked list –Linked stacks and queues –The storage pool – More on linked list. Doubly linked list(insertion and deletion only)- Tree- Binary tree representation – Binary tree traversals – Application of tree – Eight coins Decision tree.

Unit-IV (15 hours)
Divide and conquer – General method – Binary search- Finding the maximum and minimum in a set of items-Merge sort-Quick sort.

Unit-V (15 hours)
The Greedy Method – The General Method –Knapsack Problem – Job Sequencing with Deadlines - Backtracking-The 8-Queens problem-Algebraic problems-The general method-Evaluation and interpolation-Horner's rule-Lagrange interpolation – Newtonian interpolation.

Books for Study

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer algorithms, Galgotia Publications Pvt.Ltd., 2004.

UNIT I : Chapter 1.(Sections:1.1,1.2,1.3.1 to 1.3.3)

UNIT IV: Chapter 3.(Sections:3.1to3.5)

UNIT V: Chapter 4 (Sections:4.1,4.2,4.4) Chapter 7 (Sec:7.2) Chapter 9 (Sec:9.2)

2. Ellis Horowitz, Sartaj Sahni, Fundamentals of Data Structures, Galgotia Book Source, 1981.

UNIT II: Chapter 2.(Sections:2.2,2.4) Chapter 3.(Sections:3.1,3.3)

UNIT III: Chapter 4.(Sec: 4.1,4.2,4.3,4.5,4.8) Chapter 5.(Sec: 5.1,5.2,5.3,5.4,5.8.2)

Books for Reference

1. A.V.Aho, J.E. Hopcroft, J.D. Ullman, The Design and Analysis of Computer Algorithms, Addison-Wesley Publ. Comp., 1974.
2. Seymour E. Goodman and S.T. Hedetniemi, Introduction to the design and analysis of algorithms, McGrawHill International Edition, 2002.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
II	21SCS2ES2A	DSE-2: DESIGN AND ANALYSIS OF ALGORITHMS									5	4
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	2	2	2	1	3	3	2	2	3	2.3	
CO-2	2	3	2	1	2	3	3	2	2	3	2.3	
CO-3	2	2	3	2	3	2	3	2	3	2	2.3	
CO-4	2	2	2	3	2	2	3	2	2	3	2.4	
CO-5	2	2	2	2	3	1	3	2	2	3	2.2	
Mean Overall Score											2.3	
Result											# High	

Semester	Course Code	Title of the Course	Hours	Credits
II	21PSS2SE01	SEC: SOFT SKILLS	4	3

Course outcomes (COS)

Upon completion of this course, students will:

- be exposed and trained in various nuances of Soft Skills in a Professional manner responding to the requirements of national and international market
- be able to synthesize the knowledge and practical skills learnt to be personal effective in any managerial positions
- be equipped to construct plans and strategies to work for better human society
- be able to illustrate the problems at work and home and design solutions and maintain a balance of work and home
- be able to connect on a continuum and maintain growth and sustainability and creativity in employment that increases in productivity, profit for individuals and the society.

Module 1: Effective Communication & Professional communication

Effective communication: Definition of communication, Process of Communication, Barriers of Communication, Non-verbal Communication. JOHARI Window as a tool of effective communication.

Professional Communication: The Art of Listening, The passage, Kinesthetic, Production of Speech, Speech writing , Organization of Speech, Modes of delivery, Conversation Techniques, Good manners and Etiquettes, Different kinds of Etiquettes, Politeness markers.

Module II. Resume Writing & Interview Skills

Resume Writing: Meaning and Purpose. Resume Formats. Types of s Resume. Functional and Mixed Resume, Steps in preparation of Resume, Model resumes for an IT professional Chronological, Types of interviews, Creative resumes using online platforms

Interview Skills: Common interview questions, Dos and Don'ts for an interview, Attitude, Emotions, Measurement, Body Language, Facial expressions, Different types of interviews, Telephonic interviews, Behavioral interviews and Mock interviews (Centralized).

Module III: Group Discussion & Team Building

Group Discussion: Group Discussion Basics, GD as the first criterion for selecting software testers, Essentials of GD, Factors that matter in GD, GD parameters for evaluation, Points for GD Topics, GD Topics for Practice, Tips for GD participation. Video shooting of GD presentation & Evaluation (Centralized)

Team Building: Characteristics of a team, Guidelines for effective team membership, Pedagogy of team building, Team building skills. Team Vs Group – synergy, Types of

synergy, Synergy relates to leadership ,Stages of Team Formation, Broken Square-Exercise, Leadership, Leadership styles, Conflict styles, Conflict management strategies & Exercises

Module IV: Personal Effectiveness

Personal Effectiveness: Self Discovery: Personality, Characteristics of personality, kinds of self, Personality inventory table, measuring personality, intelligence and Exercises

Self Esteem: Types -High & Low self esteem, Ways of proving self esteem, Hypersensitive to criticism, activities. Goal setting: Goal setting process, Decision making process & Exercises.

Stress Management: Identifying stress, Symptoms of stress, Responding to Stress, Sources of stress, Coping with stress and Managing stress.

Module V: Numerical Ability

Average, Percentage, Profit and Loss, Problems of ages, Simple Interest, Compound Interest, , Area, Volume and Surface Area, Illustration, Time and Work, Pipes and Cisterns, Time and Distance, Problems on Trains, Illustrations, Boats and Streams, Calendars and Clocks.

Module VI: Test of Reasoning

Verbal Reasoning: Number series, letter series, coding and decoding, logical sequence of words, Assertion and Reasoning, Data Sufficiency, Analogy, Kinds of relationships.

Non-Verbal Reasoning: Completion of Series, Classification, analogical, Pattern comparison, Deduction of figures out of series, Mirror Reflection Pattern, Hidden figures, Rotation pattern, Pattern completion and comparison, Sense of direction, Blood relations.

Text cum Exercise book

Melchias G, Balaiah John, John Love Joy (Eds), 2018. *Winners in the Making: A primer on soft skills*. SJC, Trichy.

References

- * Aggarwal, R.S. *Quantitative Aptitude*, S.Chand & Sons
- *.Aggarwal, R.S. (2010). *A Modern Approach to Verbal and Non Verbal Reasoning*. S.Chand & CO, Revised Edition.
- * Covey, Stephen. (2004). *7 Habits of Highly effective people*, Free Press.
- * Egan, Gerard. (1994). *The Skilled Helper* (5th Ed). Pacific Grove, Brooks/Cole.
- * Khera ,Shiv (2003). *You Can Win*. Macmillan Books , Revised Edition.

Other Text Books

- * Murphy, Raymond. (1998). *Essential English Grammar*. 2nd ed., Cambridge University Press.
- * Prasad, L. M. (2000). *Organizational Behaviour*, S.Chand & Sons.

- * Sankaran, K., & Kumar, M. *Group Discussion and Public Speaking* . M.I. Pub, Agra, 5th ed., Adams Media.
- * Schuller, Robert. (2010) . *Positive Attitudes*. Jaico Books.
- * Trishna's (2006). *How to do well in GDs & Interviews*, Trishna Knowledge Systems.
- ** Yate, Martin. (2005). *Hiring the Best: A Manager's Guide to Effective Interviewing and Recruiting**

Semester	Course Code	Title of the Course	Hours	Credits
II	21PCA2EG1A	Generic Elective – I (WS): APPLIED STATISTICS USING R	4	3

CO No.	CO – Statements	Cognitive Level (K- level)
On completion of the course, the student will be able to		
CO-1	recall the basic concepts used in R Programming structure	K-1
CO-2	compare different data structures in R like Vectors, Matrices and Lists	K-2
CO-3	apply fundamental statistical techniques in R tool and evaluate R commands using an Integrated Development Environment	K-3, K-4
CO-4	compare R tool with other statistical tools in market	K-5
CO-5	produce effective data analysis on real time datasets	K-6

Unit - I (12 hours)

INTRODUCTION TO R PROGRAMMING: Overview of R – Installation of R - Loading R Packages – R Basic Syntax – Data Types and Objects – Variables – Constants – Comments – Debuting in R. **DATA DEFINITION AND CATEGORISATION:** Overview of Data – Sources of Data – Big Data – Data Categorisation – Data Cube. **CONTROL STATEMENTS AND FUNCTIONS:** if Statement – for statement – while loop – repeat and break Statements – next Statement – switch Statement – Functions.

Unit - II (12 hours)

VECTORS: Overview of Vector – Creating a Vector – Accessing Elements of a Vector – Vector Manipulation and Vector Arithmetic – Deleting a Vector – Vector Element Sorting **MATRICES:** Creating a Matrix –Matrix Sub setting – Matrix Operations – Combining Matrices – Special Matrices – Eigen Vectors and Eigen Values - Arrays **LISTS:** Introduction to Lists – Creating a List – General List Operations – Accessing and Manipulating Elements of a List – Merging Lists – Applying Functions to a List – Sorting and Searching.

Unit - III (12 hours)

DATA FRAMES: Introduction to Data Frames – Creating a Data Frame – General Operations on Data Frames – Extending a Data Frame – Applying Functions to Data Frame. **FACTORS AND TABLES:** Introduction to Factors – Creating a Factor – Factor Levels – Summarising a Factor – Ordered Factors – Converting Factors – Common Functions used with Factors – Introduction to Tables and Creating Tables – Table Related Functions – Cross Tabulation. **GRAPHICS IN R:** Creating Graphs – Histograms – Bar Plot – Line Chart – Pie Chart – Box Plot _ Scatter Plot – Saving Graphs to a File

Unit - IV (12 hours)

DESCRIPTIVE STATISTICS USING R: Introduction to Statistical Analysis in R – Measures of Central Tendency or Location – Measures of Dispersion – Measures of Shape. **PROBABILITY:** Introduction to Probability – Probability and Statistics – Random Variables – Probability Distribution.

Unit - V (12 hours)

CORRELATION AND REGRESSION ANALYSIS: Correlation Analysis – Regression Analysis. **STATISTICAL INFERENCE:** Introduction to Statistical Inference – Hypothesis Testing.

ANALYSIS OF VARIANCE: Introduction to Analysis of Variance – Implementing Analysis of Variance - ANNOVA in R.

Books for Study

1. Sandhya Arora and Latesh Malik, “R Programming for Beginners”, Universities Press India (P) Ltd., 2020.

Unit-I	-	<i>Chapter 1 , 2 & 4</i>
Unit- II	-	<i>Chapter 6, 7 & 8</i>
Unit-III	-	<i>Chapter 9, 10 & 14</i>
Unit-IV	-	<i>Chapter 17 & 18</i>
Unit-V	-	<i>Chapter 20, 21 & 22</i>

Books for Reference:

1. Norman Matloff, “The Art of R Programming: A Tour of Statistical Software Design”, No Starch Press, 2011.
2. Mark Gardener, “Beginning R – The Statistical Programming Language”, Wiley, 2013
3. AK Verma, “R Programming”, Cengage Learning, 2017

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code		Title of the Course								Hours	Credit
II	21PCA2EG1A		Generic Elective – I (WS): APPLIED STATISTICS USING R								4	3
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	2	2	1	3	3	2	2	2	2.3	
CO-2	3	3	2	2	1	3	3	3	2	3	2.5	
CO-3	3	3	2	2	1	3	3	2	2	3	2.4	
CO-4	2	3	3	2	2	3	3	3	2	3	2.6	
CO-5	3	3	3	2	1	3	3	3	2	3	2.6	
Mean Overall Score											2.48	
Result											# High	

Semester	Course Code	Title of the Course	Hours	Credits
II	21PMA2EG1A	GENERIC ELECTIVE - I (WS): MATHEMATICAL FOUNDATION	4	3

Course Outcomes

CO.No.	CO- Statements	Cognitive Levels (K- levels)
	On successful completion of this course, students will be able to	
CO-1	have knowledge of relations, functions, mathematical logic, lattices and numerical methods.	K1
CO-2	understand the types of functions, conditional statements and tautology in mathematical logic, properties of lattices, Boolean algebra, numerical techniques to find the roots and interpolation methods.	K2
CO-3	apply mathematical induction, composition of functions, logical notation to write an argument, suitable method to solve linear equations and numerical integration, interpolation.	K3
CO-4	analyze various types of function, statements using truth tables, use Boolean algebra to design and simplify logic circuits, numerical methods to find solutions of linear equations and system of equations using different methods.	K4
CO-5	justify relations and functions, to construct mathematical arguments using logical connectives and quantifiers, lattices. Evaluate solutions of system of linear equations and numerical integration.	K5 &K6

Unit-I (12 Hours)

Relations – Equivalence Relation – Functions and Operators – One-to-one, Onto Functions – Special Types of Functions – Invertible Functions – Composition of Function – Mathematical Induction.

Unit –II (12 Hours)

Logic: Introduction – TF – Statements – Connectives – Conjunction – Disjunction – Negation – Conditional Statements – Biconditional Statements – The Truth Table of a Formula – Tautology.

Unit- III (12 Hours)

Lattices – Some Properties of Lattices - New Lattices – Lattice Homomorphisms – Product Lattices of Two Lattices– Modular and Distributive Lattices – Boolean Algebra.

Unit-IV (12 Hours)

Iterative Methods: Birge – Vieta – Graeffe’s Root squaring methods. System of linear algebraic equations: Gauss Elimination, Jacobi iteration method - Gauss-Seidel iteration method.

Unit- V**(12 Hours)**

Interpolation: Lagrange interpolation – Newton’s Forward Difference Interpolation–Newton’s Backward Difference Interpolation – Trapezoidal Rule - Simpson Rule - Romberg integration.

Note: Stress on solving Numerical problems in Units IV and V. No Derivations.

Books for Study

1. Dr. M.K. Venkataraman, Dr. N. Sridharan, N. Chandrasekaran., “**Discrete Mathematics**”, The National Publishing Company, Chennai. 2006.

Unit-I Chapter II (Sec: 2, 5), Chapter III (Sec: 1, 2, 3, 4, 5),
Chapter IV (Sec: 2 Theorems are excluded).

Unit-II Chapter IX (Sec: 1, 2, 3, 6, 7).

Unit-III Chapter X (Sec: 1, 2, 3, 4, 5) (Definition and example only for Sec 5)

2. M.K. Jain, S.R.K. Iyengar, R.K. Jain., “**Numerical Methods for Scientific and Engineering Computation**”, 4th Edition, New Age International (P) Limited, Publishers, 2003.

Unit-IV Chapter 2 (Sec: 2.9.), Chapter 3 (Sec 3.2, 3.4).

Unit-V Chapter 4 (Sec: 4.2, 4.4), Chapter 5 (Sec 5.9, 5.10).

Books for Reference

1. J.P. Trumblay, R. Manohar. “**Discrete Mathematical Structures with Applications to Computer Sciences**”, McGraw-Hill International Edition, 1987.
2. S.S. Sastry, “**Introductory Methods of Numerical Analysis**”, PHI Learning Private Limited, 4th Edition, New Delhi 2009
3. P. Kandasamy, K.Thilagavathy, K.Gunavathi, “**Numerical methods**”, S. Chand & company Ltd-2008.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code		Title of the Course								Hours	Credits
II	21PMA2EG1A		GENERIC ELECTIVE- I (WS): MATHEMATICAL FOUNDATION								4	3
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	2	2	1	3	3	2	2	3	2.4	
CO-2	3	3	2	1	2	3	3	2	2	2	2.3	
CO-3	3	2	3	2	1	2	3	2	3	2	2.3	
CO-4	3	2	3	1	2	3	2	3	2	2	2.3	
CO-5	3	3	3	2	1	2	3	3	2	2	2.4	
Mean Overall Score											2.34	(High)

Semester	Course Code	Title of the Course	Hours	Credits
III	21PCA3CC07	CORE-7: DISTRIBUTED TECHNOLOGIES	5	4

CO No.	CO- Statement	Cognitive Level (K- level)
On completion of the course, the student will be able to		
CO-1	understand the architectures of distributed systems.	K1, K2
CO-2	evaluate and compare the technologies associated with presentation and interaction services.	K4, K5
CO-3	acquire the knowledge in component model of Session and Entity Beans.	K1, K6
CO-4	provide the better understanding of ASP.NET programming with web server controls.	K2
CO-5	create applications with rich web controls and data access technology in ADO.NET.	K3, K6

Unit-I (15 hours)

Client server computing- classification of client server system- client server advantages and disadvantages. J2EE architecture - MVC architecture - .NET Framework.

Unit-II (15 hours)

Presentation services: Servlet - JSP - Javamail - Interaction services: RMI - CORBA – XML- XSL –AJAX.

Unit-III (15 hours)

Component model: EJB: Session Beans: Stateless and Stateful - Entity Beans- CMP and BMP - Message Driven Beans.

Unit-IV (15 hours)

Getting Started with ASP.NET: Introducing the .NET Framework - Creating an ASP.NET Application- Deploying an ASP.NET Web Application. Building Forms with Web Controls: Introducing ASP.NET Web Forms- Creating Web Forms Application Projects- Using Web Controls- Working with Events.

Unit-V (15 hours)

Using Rich Web Controls: Using the AdRotator Control- Using the Calendar Control- Using the Tree View Control- ASP.NET Database Programming: Introducing ADO.NET- ADO.NET Basics- ADO.NET Object Model- Managed Providers- Dataset class.

Books for Study

1. Chandra Yadav Subhash , “An Introduction to Client Server Computing”, New Age International (p) Limited, New Delhi, India, 2009.

Unit-I Chapter1 (Sec: 1.1, 1.2, 1.3)

2. Justin Couch, Daniel H.Steinberg, “J2EE Bible”, Wiley India(P) Ltd, New Delhi, India, 2002.
Unit-I Chapter1 (Pages3 to 10),
Unit-II Chapter 3 (Pages 36 to 46), Chapter 4 (Pages 47 to 68),
Chapter 5 (Pages 69 to 93), Chapter 15 (Pages 309 to 327),
Chapter 18 (Pages 431 to 461), Chapter 10 (Pages 191 to 208),
Chapter 14 (Pages 269 to 276),
Unit-III Chapter 16 (Sec: 328 to 378)
3. MridulaParihar, “ASP.NET Bible”, Hungry Minds, Third Avenue, New York, 2002
4.
Unit-I Chapter1
Unit-IV Chapter 2, Chapter 3,
Unit-V Chapter 4, Chapter 8,

Books for Reference

1. Rajesh, Eswarakumar and Balasubramanian, “Computer Networks, Fundamentals and Applications”, Vikas Publishing House Pvt. Ltd, New Delhi, India, 2002.
2. Stephanie Bodoff, Dale Green, Eric Jendrock, “The J2EE tutorial”, Addison-Wesley, New York, 2002.
3. Paul Tremblett, “Instant Enterprise Java y - Beans”, Tata McGraw Hill Publishing company, New Delhi, India, 2001.
4. Hitesh Seth, “Microsoft .NET: kick start”, Sams Publishing, USA, 2004.
5. Stephen Walther, “ASP.NET 2.0 Unleashed”, Sams Publications, USA, 2006,

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code		Title of the Course								Hours	Credit
III	21PCA3CC07		CORE-7: DISTRIBUTED TECHNOLOGIES								5	4
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	2	2	3	1	2	2	3	3	1	3	2.2	
CO-2	3	3	3	2	3	2	3	1	2	3	2.5	
CO-3	2	1	3	3	2	2	3	3	1	2	2.2	
CO-4	3	2	1	1	3	2	3	3	1	2	2.1	
CO-5	2	3	1	2	3	3	2	3	1	2	2.2	
Mean Overall Score											2.24	
Result											# High	

Semester	Course Code	Title of the Course	Hours	Credits
III	21PCA3CC08	CORE-8: COMPUTER NETWORKS AND SECURITY	5	4

On completion of the course, the students will be able to

CO No.	CO-Statements	Cognitive Level (K-level)
CO-1	impart fundamental knowledge in computer network communication and OSI Reference model	K1, K2
CO-2	understand the technical aspects of Data Link layer	K2, K3
CO-3	perceive the issues in the Network layer and to adapt appropriate solution	K2,K4
CO-4	analyse the technical factors of Transport Layer and Application layer	K3, K4
CO-5	evaluate the network security issues and to propose appropriate security solution	K5, K6

Unit-I (15 hours)

Introduction: Definition of Computer Networks - Uses of Networks - Network Architecture- Protocol hierarchies - Service Primitives - OSI Reference Model - ARPANET - Internet - Physical Layer Transmission Media - Telephone Systems.

Unit-II (15 hours)

Data link layer: Data link layer - Design Issues - Error Detection and Correction Data Link Protocols - Sliding Window Protocols - Finite state Machine Model - Petri Networks-PPP- Polling - FDM.

-

Unit-III (15 hours)

Network Layer: Design Issues - Routing Algorithms - Congestion Control Algorithms - Inter Network Routing - Fragmentation.

Unit-IV (15 hours)

Transport Layer - Design Issues - Elements of Transport Protocols - The Internet - Transport Protocol (TCP &UDP) - Application Layer: Design Issues.

Unit-V (15 hours)

Network Security: Security Requirements and Attacks - Confidentiality with Symmetric Encryption - Message Authentication and Hash Functions – Public -key Encryption and Digital Signatures - Secure Socket Layer and Transport Layer Security - IPv4 and IPv6 Security.

Books for Study

Units I - IV

1. Andrew S Tanenbaum, “Computer Networks”, Prentice Hall of India, New Delhi, 1999.

Unit I – Chapters I, II

Unit II – Chapters III, IV

Unit III – Chapter V

Unit IV – Chapter VI

Unit V

2. William Stallings, “Data and Computer Communications”, Pearson, Prentice Hall, Eighth Edition, 2007.

Unit V – Chapter 21

Books for Reference

1. Vijay Ahuja, “Design and Analysis of Computer Communication Networks”, McGraw Hill, New York, 1985.
2. Behrouz A Fourouzan, “Data Communications and Networking”, McGraw Hill, Fourth Edition, 2006.
3. Andrew S Tanenbaum, David J. Wetherall “Computer Networks”, Prentice Hall, 2011.
4. Gregory B. White, Eric A. Fisch Udo W. Pooch, “Computer System and Network + .Security”, CRC Press, 2017

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
III	21PCA3CC08	CORE-8: COMPUTER NETWORKS AND SECURITY									5	4
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	2	3	2	2	1	2	2	2	2	1	1.9	
CO-2	3	2	3	2	1	3	2	2	2	1	2.1	
CO-3	3	2	3	2	1	3	3	2	2	1	2.2	
CO-4	3	3	3	3	2	3	3	3	2	2	2.7	
CO-5	3	3	3	2	1	3	3	3	3	1	2.5	
Mean Overall Score											2.28	
Result											#High	

Semester	Course Code	Title of the Course	Hours	Credits
III	21PCA3CC09	CORE-9: Accounting and Financial Management	5	4

CO No.	CO- Statements	Cognitive Level (K- level)
	On completion of the course, the students will be able to	
CO-1	Remember the basic concepts of accounting and apply them for the preparing financial Statements.	K1, K3
CO-2	Understand the errors in accounting and rectifying them problems and provide solutions	K2, K4
CO-3	Understand the need for depreciation and apply the accounting software packages.	K2. K3
CO-4	Evaluate the business operations based on cost analysis	K5
CO-5	Synthesis budgets and help in decision making related to capital expenditure	K6

Unit – I (15 hours)
Basic Accounting Terms – Accounting Equation – Accounting Procedures – Rules of Debit and Credit – Transactions – Journals –Ledgers – Trial Balance.

Unit – II (15 hours)
Trading account- Rectifications of Errors – Financial Statements – Adjustments – Profit and Loss Account – Balance Sheet.

Unit – III (15 hours)
Depreciation; Meaning - need - methods of charging depreciation. Accounting Packages: General Framework - Accounting Applications. (Tally.ERP 9, QuickBooks India, Zoho Books, Busy Accounting)

Unit – IV (15 hours)
Marginal Costing - Break Even Analysis - Standard Costing: Analysis of Variance.

Unit – V (15 hours)
Budgeting: Characteristics - Advantages - Classification - Preparation of Budgets. Capital Budgeting: Meaning - Methods of Capital Investment Decision making.

Books for Study

1. TS Grewal's "Double Entry Book Keeping-Solutions for Accountancy-Financial Accounting", Sultan Chand Sons, 2021
Unit-I: Chapters (1-6 & 10)
Unit-II: Chapters (14-16)
Unit- III Chapter (11)
2. R Ramachandran & R Srinivasan, "Management Accounting" (Theories, Problems & Solutions), Sriram Publications, 6th Revised Edition, 2017.
Unit-IV: Chapters 6&9
Unit-V: Chapters 7&8

Books for References

1. SN Maheswari "Cost& Management Accounting", Sultan Chand Sons, New Delhi, 2015.
2. Tally ERP9 Training Guide – 4th Revised & Updated Edition, 2018
3. MC Shukla, TS Grewal and SC Gupta "Advanced Accounting", S Chand and Company (Pvt.) Ltd., Ram Nagar, New Delhi, 2016.
4. RSN Pillai & Bagavathi "Management Accounting", Sultan Chand Sons, New Delhi, 2017.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
III	21PCA3CC09	CORE-9: ACCOUNTING AND FINANCIAL MANAGEMENT									5	4
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	2	1	2	3	3	2	1	2	2.2	
CO-2	3	3	3	2	1	3	3	3	2	2	2.5	
CO-3	2	3	3	2	2	2	3	3	2	2	2.4	
CO-4	3	3	3	1	2	3	3	3	1	2	2.4	
CO-5	2	3	3	1	2	2	3	3	2	1	2.3	
Mean Overall Score											2.35	
Result											#High	

Semester	Course Code	Title of the Course	Hours	Credits
III	21PCA3CP05	Software Lab – 5: DISTRIBUTED TECHNOLOGIES	3	3

CO No.	CO- Statements	Cognitive Level (K- level)
On completion of the course, the student will be able to		
CO-1	acquire the knowledge of RMI concepts	K1
CO-2	create web applications using Servlet and database interaction	K3, K4, K6
CO-3	present web contents by creating web pages with JSP	K3, K6
CO-4	understand session and entity beans and access them	K2
CO-5	design appropriate ASP.NET web applications with disconnected data access technology in ADO.NET.	K3, K5, K6

Exercises:

1. RMI - Invocation of server side methods.
2. Servlets - Returning Information received from the client.
3. Servlets and JDBC - Constructing a response by accessing a database.
4. JSP - use of script let.
5. JSP - use of java beans.
6. EJB - Session Bean.
7. EJB - Entity Bean.
8. ASP.NET - Server & Client side controls.
9. Database Access - ADO.NET
10. Components Creation and Usage
11. ASP.NET: Data bind Controls.
12. File Accessing
13. Creating Web Services and Access.
14. DOM usage on the server side.
15. AJAX: Dynamic client - server interaction.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
III	21PCA3CP05	Software Lab – 5: DISTRIBUTED TECHNOLOGIES									3	3
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	2	2	3	3	2	3	1	2	2.4	
CO-2	2	3	3	2	2	3	2	3	1	3	2.4	
CO-3	3	2	3	1	1	2	3	3	2	3	2.3	
CO-4	3	3	3	1	2	1	2	3	2	3	2.3	
CO-5	3	2	2	2	3	3	3	1	1	1	2.1	
Mean Overall Score											2.3	
Result											#High	

Semester	Course Code	Title of the Course	Hours	Credits
III	21PCA3CP06	CASE STUDY BASED APPLICATION DEVELOPMENT	3	3

CO No.	CO – Statements	Cognitive Level (K- level)
On completion of the course, the student will be able to		
CO-1	recall and examine specific functional domains like Marketing, Finance, HR, SCM etc	K-1, K2
CO-2	gain practical insights in the selected domain	K-3
CO-3	connect their chosen domain into actual work environment in an organization	K-4
CO-4	assess the outcome of the project with industry standards	K-5
CO-5	prepare themselves for career opportunities in a specific domain	K-6

Procedure

- Each student will be assigned to a faculty, and the faculty will act as guide and monitor the progress of the work of the assigned student.
- The staff member will assess the work via submission of a report and viva-voce.
- Every student is expected to choose one of the following IT Sector domains

List of Industry Sectors / Specific Domains

Agriculture Industry	Engineering and Construction	Manufacturing Domain
Automotive Industry	Energy Industry	Retail Industry
Banking Domain	Education Domain	Textiles & Clothing
BFSI Industry	Finance Domain	Travel and Tourism Domain
Consumer / FMCG Industry	Hospitality Domain	Telecom Industry
Chemicals Industry	Healthcare Industry	Transport
Construction	Insurance Domain	Utilities (Water, Gas, Electricity)
Commerce / E-Commerce	Media & Entertainment	

- Students are expected to visit a local industry or institute for getting the problem statement / ideas of their case study and data collection.
- They will submit the Case Study Idea to their guide for approval.
- The ideas should be submitted to the respective guide in the beginning of the second week after the college reopens.
- Students can develop their application as Desktop based application/Web Application/ Mobile based application.
- They are also encouraged to develop Data Analytics Applications, or applications based on IoT or any other latest technologies based on the viability of software's and simulation tools available in the Computer Centre/Labs.
- Students can choose any one of the Language, Database, Tools and Techniques they have studied in the previous semesters for their application development.

Schedule

S. No.	Task	Tentative Timescale
1	Guide Allotment	Third Week of June
2	Submission of and Case Study and Title approval	Last Week of June
3	Interim Review	First Week after Mid Semester
4	Demonstration	Last Week of September
5	Draft Report Submission	First Week of October
6	Final Report Submission	Second Week of October
7	Viva-voce	Second Week of October

Evaluation Pattern

Component	Marks
Regularity in Reporting to guide	20
Interim Review	10
Documentation	20
Demonstration	25
Viva	25
Total	100

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
III	21PCA3CP06	CASE STUDY BASED APPLICATION DEVELOPMENT									3	3
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	3	2	1	3	3	3	3	2	2.6	
CO-2	3	3	3	2	1	3	3	3	3	2	2.6	
CO-3	3	3	3	2	1	3	3	3	3	2	2.6	
CO-4	3	3	3	2	1	3	3	3	3	2	2.6	
CO-5	3	3	3	2	1	3	3	3	3	2	2.6	
Mean Overall Score											2.6	
Result											#High	

Semester	Course Code	Title of the Course	Hours	Credits
III	21PCA3ES3A	DSE-3: MEAN STACK WEBAPP DEVELOPMENT	5	4

CO No.	CO – Statements	Cognitive Level (K- level)
On completion of the course, the student will be able to		
CO-1	enumerate the basic components of Full Stack Development and describe the MEAN Stack Architecture	K1, K2
CO-2	create and setup a MEAN Project with Node and Express	K2, K6
CO-3	design a Data Model with MongoDB by applying the concepts of REST API	K3, K4, K6
CO-4	summarize on how to consume REST API on different applications	K2
CO-5	develop simple web applications using Angular	K5, K6

Unit - I (15 hours)

INTRODUCING FULL STACK DEVELOPMENT: Brief History of Web Development – Towards Full Stack Development – Benefits of Full Stack Development –MEAN Stack – Node.js: The Web Server/Platform – Express: The Framework – MongoDB: The Database – AngularJS: The Front End Framework. **DESIGNING A MEAN STACK ARCHITECTURE:** Common MEAN Stack Architecture – Designing a Flexible MEAN Architecture

Unit - II (15 hours)

CREATING AND SETTING UP MEAN PROJECT: Creating an Express Project – Modifying Express for MVC – Import Bootstrap for Responsive Layouts. **STATIC SITE WITH NODE AND EXPRESS:** Defining Routes in Express – Building Basic Controllers – Creating Some Views – Adding Rest of Views – Take Data out of Views and Make Smarter

Unit - III (15 hours)

DATA MODEL with MONGODB: Connecting Express Application to MongoDB using Mongoose – Model the Data – Simple Mongoose Schema – MongoDB Shell to create MongoDB Database **REST API: EXPOSE MONGODB DATABASE TO APPLICATION:** Setting up API in Express – GET Methods: Reading Data from Mongo DB – POST Methods: Adding Data to MongoDB. PUT Methods: Updating Data in MongoDB. DELETE Method: Deleting Data from MongoDB

Unit - IV (15 hours)

CONSUMING A REST API: Call API from Express – List of Data from an API – Getting Single Document from API – Adding Data to Database via API. **ADDING ANGULAR COMPONENT TO AN EXPRESS APPLICATION:** Getting and Running Angular – Displaying and Filtering the Homepage List – Getting Data from API – Ensuring Forms work as Expected

Unit - V (15 hours)

SINGLE PAGE APPLICATION WITH ANGULAR: Groundwork for an Angular SPA – Switch from Express Routing to Angular Routing – Adding First Views, Controllers and Services. **BUILDING SPA WITH ANGULAR:** Full SPA – Adding Additional Pages and dynamically injecting HTML – Complex Views and Routing Parameters – Angular UI Components to create Modal Popup

Books for Study

1. Simon Holmes, “Getting MEAN with Mongo, Express, Angular, and Node”, Manning Publications, 2016

- Unit-I** - Chapter 1 (Sec 1,2)
Unit-II - Chapter 2 (Sec 3, 4)
Unit-III - Chapter 2 (Sec 5, 6)
Unit-IV - Chapter 2 (Sec 7), Chapter 3 (Sec 8)
Unit-V - Chapter 3 (Sec 9, 10)

Books for Reference

1. Jeff Dickey, “Write Modern Web Apps with the MEAN Stack: Mongo, Express, AngularJS, and Node.js”, Peachpit Press, 2015.
2. Brad Dayley, Brendan Dayley, “Node.js, MongoDB and Angular Web Development”, Addison Wesley, 2017.
3. Amos Q. Haviv, Adrian Mejia, “Web Application Development with MEAN “, Kindle, June 15, 2017

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
III	21PCA3ES3A	DSE-3: MEAN STACK WEBAPP DEVELOPMENT									5	4
Course Outcomes ↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO4	PSO 5		
CO-1	3	3	2	2	1	3	3	2	2	2	2.3	
CO-2	3	3	2	2	1	3	3	3	2	3	2.5	
CO-3	3	3	2	2	1	3	3	2	2	3	2.4	
CO-4	3	3	3	2	1	3	3	3	2	3	2.6	
CO-5	3	3	3	2	1	3	3	3	2	3	2.6	
Mean Overall Score											2.48	
Result											#High	

Semester	Course Code	Title of the Course	Hours	Credits
III	21PCA3ES3B	DSE-3:PHP Programming	5	4

CO No.	CO Statements	Cognitive Level (K- level)
On completion of the course, the student will be able to		
CO-1	Understand Basics of using HTML, Java scripts and CSS.	K1, K3
CO-2	Learn the syntax and semantics of PHP programs and Linux environment.	K2, K3
CO-3	Understand PHP built in-functions and working with MYSQL database.	K1, K3
CO-4	Learn the basic concepts of Laravel Frameworks and develop web applications.	K2, K5
CO-5	Develop websites using Laravel framework.	K4, K6

Unit I (15 hours)
HTML: Structuring Documents – Core Elements – Basic Formatting – Lists – Tables – Basic Table Elements – Nested Tables – Forms – Form Controls – Sending Form Data – CSS: Cascading Style Sheets – CSS Properties – Controlling Text – Text Formatting – Selectors – Links – Backgrounds – Lists – Java Script: – Variables – Operators – Functions – Conditional Statement – Looping - Form Validation.

Unit II (15 hours)
Linux: Introduction - Download and Install - Decisions, Decisions – Linux Partition Sizes - Accounts – Unix Commands - Apache Web server: Starting and Stopping and Restarting Apache - Configuration - Securing Apache - Create the Web Site - Apache Log Files - PHP: Embedding PHP into HTML - Configuration - Language Syntax: Variables - Data Types - Web variables - Operators - Flow Control Constructs- Writing PHP Functions.

Unit III (15 hours)
Built in PHP functions - Important Functions - Array Functions – String Functions - Other Functions - PHP and MySQL: MySQL Functions - My SQL: Commands - Database Independent Interface - Tables – Loading and Dumping Database.

Unit IV (15 hours)
Introduction: Laravel- Framework – History – System Requirements - Composer - Local Development Environments - Creating a New Laravel Project - Laravels Directory Structure - Configuration - Routing and Controllers – MVC - Views - Controllers - Route Model binding - Redirects - Custom Responses.

Unit V (15 hours)
Frontend components – Presets – Pagination – Message Bags – Collecting and Handling User Data - Request Object - Form Requests - Artisan commands - Writing artisan commands - Calling Artisan commands - Request Object - Response Object - Container – Binding Classes - Writing APIs: REST - Controller - Reading and Sending Headers - Sorting and Filtering - Transforming Results.

Books for Study

1. Jon Duckett, "Beginning HTML, XHTML, CSS, and JavaScript", Wiley Publishing, Indiana, 2010.
[Unit I: Ch.1, Ch. 4, Ch. 5, Ch. 7, Ch. 8, Ch. 11, Ch. 12: 535 – 554]
2. James Lee and Brent Lee "Open Source Development with LAMP Using Linux, Apache, MySQL, Perl and PHP", Pearson Education, 2009.
[Unit 2: Ch.2, Ch. 3, Ch. 12 : 12.1 – 12.5, Unit 3: Ch.12: 12.6 – 12.7, Ch.5]
3. Matt Stauffer, "LARAVEL Up and Running, A Framework for building modern PHP Apps", 2nd Edition, O'REILLY, 2019.
[Unit 4 - Ch.1:1.1, 1.2, Ch.2: 2.1 – 2.5, Ch.3: 3.1, 3.5, 3.6, 3.7, 3.11, 3.13, Unit 5 – Ch.6: 6.2- 6.4, Ch.7: 7.1, 7.4, Ch.8: 8.2, 8.3, 8.4, Ch10: 10.2, 10.3, Ch.11: 11.5, Ch.13:13.1, 13.2, 13.3, 13.5]

Books for Reference

1. John Dean, "Web Programming with HTML5, CSS and Javascript" Jones & Bartlett Learning, 2019.
2. Json Gerner, Elizabeth Naramore, Morgan Owens and Matt Warden, "Professional LAMP - Using Linux, Apache, My SQL and PHP5 Web development", Wiley Publisher, 2006.
3. Jack Vo, Learning Laravel: The Easiest Way, Learninglaravel.net, 2014.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code		Title of the Course								Hours	Credit
III	21PCA3ES3B		DSE-3: PHP Programming								5	4
Course Outcomes ↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5		
CO-1	3	3	2	2	2	3	3	2	1	2	2.3	
CO-2	3	3	3	2	1	3	3	3	2	1	2.4	
CO-3	2	3	3	2	2	2	3	3	2	2	2.4	
CO-4	3	3	3	2	2	3	3	3	1	2	2.5	
CO-5	2	3	3	2	2	2	3	3	2	2	2.4	
Mean Overall Score											2.4	
Result											#High	

Semester	Course Code	Title of the Course	Hours	Credits
III	21PCA3GE02	GENERIC ELECTIVE-2 (BS): WEB DESIGN	4	3

CO No.	CO-Statements	Cognitive Level (K-level)
CO-1	Understand the basic concepts of Internet and E-mail.	K1, K2
CO-2	Analyze and apply the various features of HTML tags like formatting, images and lists.	K3
CO-3	Design and develop the HTML tables, frames and forms.	K1,K3,K6
CO-4	Implement the basic concepts of JavaScript Programming	K2,K3
CO-5	Develop the programming skills using Markup and Scripting Languages and design simple web pages using HTML and JavaScript	K4,K5,K6

Unit-I (12 hours)

Accessing the World Wide Web- Internet – Protocols and other Jargon – Host machines and Host names - Internet Architecture and Packet Switching - The Client/Server Software Model - Bandwidth and Asynchronous Communication. Working with E-mail – Anatomy of an E-mail message – Viewing your Inbox – Viewing individual mail messages – Sending a new mail message – Replying to and Forwarding E-mail messages.

Unit-II (12 hours)

HTML Tags, Paired Tags, Singular Tags – Structure of a HTML program – Titles and Footers –Text Formatting – Emphasizing material in a web page – Text styles – Other Text Effects – Types of Lists – Adding Graphics to HTML documents.

Unit-III (12 hours)

Tables – Linking Documents – Links – Images as Hyperlinks – Frames – Forms – Text element – Password element – Button element – Checkbox element – Radio element – Text Area element – Select and Option elements.

Unit-IV (12 hours)

JavaScript: Introduction to JavaScript - JavaScript in web pages - writing JavaScript with HTML - Basic programming techniques - operators and expressions - conditional checking - loops - functions - user defined functions - dialog boxes.

Unit-V (12 hours)

JavaScript: JavaScript DOM: JSS DOM - understanding objects in HTML - browser objects - web page object hierarchy - Handling events.

Books for Study:

1. Wendy G. Lehnert, "Internet 101 - a beginners guide to the internet and the world wide web", addition Wesley, 1999.
Unit I – Chapters 1, 2, 3
2. Ivan N. Bayross, "Web enabled Commercial Application Development using HTML, JavaScript, DHTML and PHP", 4th Revised Edition, BPB Publications, New Delhi, 2010.
Unit II – Chapters 2, 3, 4
Unit III – Chapters 5, 6, 7, 10
Unit IV – Chapter 8
Unit V – Chapter 9

Books for Reference

1. Chuck Musciano & Bill Kennedy, "HTML - The Definitive Guide", Shroff Publishers & Distributors Pvt. Ltd., Calcutta - 1999.
2. Raj Kamal, "Internet and Web Technologies", TMH, New Delhi, 2002.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
III	21PCA3GE02	GENERIC ELECTIVE-2 (BS): WEB DESIGN									4	3
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	2	1	2	1	3	3	3	2	2	2.2	
CO-2	3	3	1	2	1	3	3	3	2	2	2.3	
CO-3	3	2	2	3	1	3	3	3	2	3	2.5	
CO-4	3	2	2	3	1	3	3	3	2	3	2.5	
CO-5	3	3	2	3	1	3	3	3	2	3	2.6	
Mean Overall Score											2.42	
Result											#High	

Semester	Course Code	Title of the Course	Hours	Credits
III	21PCA3CE01	COMPREHENSIVE EXAMINATION	--	2

CO No.	CO – Statements	Cognitive Level (K- level)
On completion of the course, the student will be able to		
CO-1	recall and summarize on the core concepts they have studied in their course of study	K-1, K-2
CO-2	relate the ideas during competitive exams	K-3
CO-3	connect the concepts with industry applications	K-4
CO-4	appraise themselves by answering core discipline questions during interviews	K-5
CO-5	synthesize and apply the information in their higher studies/research	K-6

Unit I: Data Management Systems

- Database System Concepts & Architecture
- Data Modelling
- SQL
- Normalization
- Transaction Processing and Concurrency Control
- Database Recovery Techniques
- Data warehousing and Data Mining
- Big Data and NoSQL

Unit II: Operations Research

- Linear Programming
- Simplex Method
- Two Phase Method
- Dual Simplex Method
- Transportation
- Assignment Problem
- Project Scheduling by PERT-CPM
- Queuing Theory

Unit III: Data Structures and Algorithms

- Array and its Applications
- Stack, Queue, Linked List
- Trees, Binary Tree
- Sets and Graphs
- Sorting and Searching Algorithms
- Algorithm Complexity
- Algorithm Design Techniques - Divide and Conquer; Dynamic Programming,
- Greedy Algorithms, Backtracking, Branch and Bound.

Unit IV: Software Engineering

- Software Process Models
- Software Requirements

- Software Design
- Software Quality
- Software Testing

Unit V: Computer Networks and Security

- Data Communication
- Network Models, OSI and TCP/IP Layers
- Mobile Communication
- Cloud Computing and IoT

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
III	21PCA3CE01	COMPREHENSIVE EXAMINATION									--	2
Course Outcomes ↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5		
CO-1	3	3	3	2	1	3	3	2	2	2	2.4	
CO-2	3	3	3	2	1	3	3	3	2	2	2.5	
CO-3	3	3	3	2	1	3	3	3	3	2	2.6	
CO-4	3	3	3	2	1	3	3	3	3	2	2.6	
CO-5	3	3	3	2	1	3	3	3	2	2	2.5	
Mean Overall Score											2.52	
Result											#High	

Semester	Course Code	Title of the Course	Hours	Credits
IV	21PCA4ES4A	DSE- 4: RECENT TRENDS IN COMPUTER SCIENCE	5	4

CO No.	CO-Statements	Cognitive Level (K-level)
CO-1	elucidate the basic concepts and technical aspects of cloud computing	K1, K2
CO-2	apply the knowledge acquainted to design new IoT application prototypes	K3, K6
CO-3	analyse the various Artificial Intelligence techniques to use them in appropriate applications	K3, K4
CO-4	employ the appropriate the machine learning techniques for the ML based applications	K4, K5
CO-5	make use of Block Chain technology along with other newer domains of Information Technology	K3

Unit - I (15 hours)

Evolution of Cloud Computing -Essential Characteristics of cloud computing - Operational models such as private, dedicated, virtual private, community, hybrid and public cloud - Service models such as IaaS, PaaS and SaaS - Governance and Change Management - Business drivers, metrics and typical use cases. Example cloud vendors - Google cloud platform, Amazon AWS, Microsoft Azure, Pivotal cloud foundry and Open Stack.

Unit - II (15 hours)

Fundamentals of Internet of Things : Introduction – Characteristics of IoT – The Physical design of IoT – IoT Architecture and components – Logical design of IoT – Communication models – IoT Communication APIs – Emerging Applications in IoT -IoT Architectures and Protocols :Introduction – Three Layer and five layer architecture of IoT – Cloud and fog based architecture-of IoT - Representative architecture – Near Field Communication (NFC) – Wireless Sensor Network (WSN) – IoT network protocol stack – IoT technology stack – Bluetooth, Zigbee and 6Lowpan

Unit – III (15 hours)

Introduction: Definitions of Artificial Intelligence – Artificial Intelligence Problems – Topics of Artificial Intelligence – Timelines of Artificial Intelligence – Production Systems – State Space Representation – Branches of Artificial Intelligence – Applications of Artificial Intelligence.

Unit – IV (15 hours)

Learning: Types of Learning – Machine Learning: Types in Machine Learning – History of Machine Learning – Aspects of Inputs to Training – Learning Systems – Machine Learning Applications- Quantification of Classification – Intelligent Agents

Unit – V (15 hours)

Fundamentals of Blockchain: Origin of Blockchain - Blockchain Solution - Components of Blockchain - Block in a Blockchain - The Technology and the Future. Blockchain Types and

Consensus Mechanism: Introduction - Decentralization and Distribution - Types of Blockchain - Consensus Protocol.

Books for Study

1. Buyya, Vecciola and Selvi, “Mastering Cloud Computing: Foundations and Applications Programming”, Tata McGraw Hill, 2013. Unit I – Chapter 1
2. Dr. Kamlesh Lakhwani, Dr. Hemant Kumar Gianey, Joseph Kofi Wireko, Kamal Kant Hiran, “Internet of Things (IoT), Principles, Paradigms and Applications of IoT”, BPB Publications, 2020, Unit II – Chapter 1, 2
3. Vinod Chandra S. S. and Anand Hareendran S. “Artificial Intelligence and Machine Learning”, PHI Learning Pvt Ltd, 2014. Unit III, IV – Chapter 1, 7
4. Chandramouli. S, Asha A George, Abhilash K A, and Meena Karthikeyan, “Blockchain Technology”, Universities Press (India) Private Limited, Hyderabad-500029, 2021. Unit V – Chapter 1

Books Reference

1. Joseph Ingeno , “Software Architect's Handbook”, PacktPublishing,2018.
2. Stuart J. Russell and Peter Norvit, “Artificial Intelligence A Modern Approach”, Third Edition, Pearson Education Limited 2016.
3. Tom M. Mitchell, “Machine Learning”, McGraw-Hill Education
4. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. “Bitcoin and cryptocurrency technologies: a comprehensive introduction”. Princeton University Press, 2016.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
IV	21PCA4ES4A	DSE- 4: RECENT TRENDS IN COMPUTER SCIENCE									4	4
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	2	2	2	3	3	3	2	2	2.5	
CO-2	3	3	3	2	2	2	3	3	3	2	2.6	
CO-3	3	3	2	3	2	3	3	3	2	2	2.6	
CO-4	3	2	3	2	1	2	2	3	2	2	2.2	
CO-5	3	2	3	2	1	2	3	3	3	1	2.3	
Mean Overall Score											2.44	
Result											#High	

Semester	Course Code	Title of the Course	Hours	Credits
IV	21PCA4ES4B	DSE- 4: BIG DATA ANALYTICS	5	4

S.No.	CO- Statements	Cognitive Level (K- level)
On completion of the course, the student will be able to		
CO-1	Acquire the knowledge on the basics of Big Data and its role in various Industries	K1, K3
CO-2	Understand the various techniques of Big Data Analytics.	K2
CO-3	Learn the cutting-edge tools and technologies to analyze Big Data.	K1, K4
CO-4	Appreciate the Big Data Processing concepts and Data Visualization techniques	K2, K3
CO-5	Analyze and propose the Big data storage techniques	K4, K5, K6

Unit-I (15 hours)
Introduction: Concepts and Terminology – Big Data Characteristics- Different Types of Data-case study Background- Business goals and Obstacles- Business Motivations and Drivers for Big Data Adoption-Marketplace Dynamic- Business Architecture- Business process Management- Information and Communication Technology-Data Analytics and Data Science-Digitization.

Unit-II (15 hours)
Big data Adoption and Planning Considerations-:Organization Prerequisites- Data Procurement - Privacy- Security- Provenance-Limited Realtime Support- Distinct Performance Challenges – Distinct Governance Requirements- Distinct Methodology- Clouds- Big Data Analytics-Data Identification- Data Acquisition and Filtering-Data Extraction- Data validation and cleansing-Data Aggregation and Representation- Data Analysis-Data Visualization-Utilization of Analysis Results.

Unit-III (15 hours)
Enterprise Technologies and Big Data Business Intelligence-: Online Transaction and Processing (OLTP)-Online Analytical Processing (OLAP)- Extract Transform Load (ETL)-Data Warehouses-Data Marts-Traditional BI-Big Data BI-Big Data Storage Concepts-Clusters- File System and Distributed Systems- No SQL-Sharding-Replication-ACID.

Unit-IV (15 hours)
Big Data Processing Concepts: Introduction -Parallel Data Processing-Distributed Data Processing- Hadoop-Processing Workloads-Cluster- Processing in Batch Mode-Map-Combine-Partition- Shuffle and Sort—Processing in Real Time Mode- Speed Consistency Volume (SCV)-Event Stream Processing- Complex Event Processing- Realtime Big data Processing and SCV-Realtime Big Data Processing and MapReduce.

Unit-V (15 hours)
Big Data Storage Technology: On-Disk Storage Devices-NoSQL Database- In-Memory Storage Device- Big Data Analytics Techniques-Quantitative Analysis- Qualitative Analysis-Data Mining- Statistical Analysis-A/B Testing-Correlation-Regression- Machin Learning-

Semantic Analysis- Visual Analysis-Heat Maps-Time Series Plots-Network Graphs-Spatial Data Mapping.

Book for Study

1. Paul Buhler, Wajid Khattak and Thomas Erl, “Big Data Fundamentals: Concepts, Drivers & Techniques”, Prentice Hall Publications, January 2016.
Unit 1: Chapter 1 and Chapter 2
Unit 2: Chapter 3
Unit 3: Chapter 4 and Chapter 5
Unit 4: Chapter 6
Unit 5: Chapter 7 and Chapter 8

Books for Reference

1. SoumendraMohanty, MadhuJagadeesh, and HarshaSrivatsa, “Big Data Imperatives: Enterprise Big Data Warehouse, BI Implementations and Analytics”, Published by Apress Media, 2013.
2. Tom White, “Hadoop: The Definitive Guide”, Third Edition, O’reilly Media, 2012.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
IV	21PCA4ES4B	DSE- 4: BIG DATA ANALYTICS									5	4
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	2	2	1	3	3	2	2	2	2.3	
CO-2	2	3	2	3	2	2	3	2	3	3	2.5	
CO-3	3	3	3	3	3	3	2	2	3	2	2.7	
CO-4	3	3	3	1	2	3	3	3	1	2	2.4	
CO-5	2	3	3	3	2	2	3	3	2	2	2.5	
Mean Overall Score											2.48	
Result											#High	

Semester	Course Code	Title of the Course	Hours	Credits
IV	21PCA4PW01	Project work & Viva-Voce	25	24

CO No.	CO – Statements	Cognitive Level (K- level)
On completion of the course, the student will be able to		
CO-1	identify and analyse real world problems on their selected project domain	K1, K4
CO-2	apply their skills and knowledge in design, coding and testing using appropriate technological tools and procedures	K3
CO-3	evaluate their work and results with proper documentation	K5
CO-4	demonstrate the developed application with appropriate personal, societal, and professional ethical standards.	K2
CO-5	Combine the knowledge gained through various phases of project life cycle and adapt themselves to the software industry needs to engage in lifelong learning	K6

PROJECT

The fourth semester is allotted to do a project work in an organization with sufficient infrastructure to carry out the MCA project work. The students would choose an organization and submit the details of the organization to the project guide and HoD. The students should send a requisition letter from the HoD to the organization and should get the letter of acceptance from the organization. The students can send only one such requisition letter at a time. Only after non-acceptance of the company the student can request another organization for doing the project work. The guide and HoD have to approve the company / organization and in case of any change suggested by the guide or HoD, the student should change the organization. The change would be suggested by the guide & HoD if they find the company not having sufficient infrastructure for computing and an external guide in the organization with required educational qualification such as MCA or ME / MTech who can be external guides in the organization. Only upon the receipt of the acceptance letter, the student will be relieved from the College to join the company. They should submit the acceptance letter from the organization for having accepted the student for pursuing his/her MCA project work. The marks awarded by the external guide in the organization carries a weightage of ten percent.

The students would join the organization in the first week of December and send their joining report on or before the fixed date as fixed by the Department. The students will be supplied with all the details of what are to be done before and after joining the company. They should appear for first review mid-way and they will report the progress of their project work in the presence of their classmates and guide.

The students should send emails to their guides every fifteen days of their progress after joining the organization. Failure to submit the joining report and failure to be present for the first review (except under exempted circumstances by the Department of Computer Science due to long distance) will result in non-acceptance of their project work and such students would repeat the same procedure in the next academic year with the approval of the Principal, Controller of Examinations and the Department of Computer Science after the payment of the fees of the particular semester.

The students appear for the second review during the end semester examinations in the college along with the manuscript of the project work. The manuscript should be prepared along the

guidelines supplied to them by the Department; students should submit three volumes to the Department before the date stipulated by the Department. The viva-voce of the project work would be conducted by both the internal and the external examiners along with semester examinations of the College.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code		Title of the Course								Hours	Credit
IV	21PCA4PW01		PROJECT WORK & VIVA-VOCE								25	24
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	3	3	1	3	3	3	3	3	2.8	
CO-2	3	3	3	2	1	3	3	3	3	3	2.8	
CO-3	3	3	3	2	1	3	3	3	3	3	2.8	
CO-4	3	3	3	3	3	3	3	3	3	3	3	
CO-5	3	3	3	3	2	3	3	3	3	3	2.9	
Mean Overall Score											2.86	
Result											# High	

Mandatory Bridge Course
(Non-computer Science Stream Students)

Semester	Course Code	Title of the Course	Hours	Credits
I	21PCA1BCC1	ADDL. Core I: C-PROGRAMMING	-	5

CO No.	CO- Statements	Cognitive Level (K- level)
On completion of the course, the student will be able to		
CO-1	Understand the concepts of Algorithm and Flow chart for problem solving	K2
CO-2	Acquire knowledge in writing programs using Arrays and control structures.	K1, K5
CO-3	apply the concept of Functions	K3
CO-4	Analyse and evaluate the use of Pointers, Structures and Union	K4, K5
CO-5	create projects in C	K6

Unit-I

Algorithms – Flow charts – Developing algorithms and flowcharts for solving simple problems using sequential, selection and iterative programming Structures.

Unit-II

History of C and its importance – Structure of a C program – Data Types – Constants and Variables – Operators and Expressions – Control structures – Looping structures.

Unit-III

Arrays – Character Arrays and Strings – User defined functions.

Unit-IV

Pointers: Introduction – Pointer Expressions – Chain of Pointers –Pointers and Arrays – Array of Pointers – Pointers as function arguments – Function returning Pointers – Pointers to Functions – Function pointer – Pointers and Structures.

Unit-V

Structures: Introduction – Defining a structure – Declaration of structure – Accessing Structures members – Array of Structures – Structures within structures – Structures and functions – Structures and Pointers – Union. **Files:** Opening and closing files – Operations on files.

Books for Study

1. S. Jaiswal, “Information Technology Today”, Galgotia Publications, New Delhi, Fourth Edition, 2009.

Unit-I Chapter 20 (Pages CL-3 – CL-26)

2. E.Balagurusamy, “Programming in ANSI C”, Tata McGraw Hill, New Delhi, Seventh Edition, 2016.

Unit-II Chapter 1 (Sec:1.1-1.2,1.8), Chapter 2 (Sec:2.5 –2.7), Chapter 3, Chapter 5,Chapter 6

Unit-III Chapter 7, Chapter 8 (Sec: 8.2 – 8.8), Chapter 9

Unit-IV Chapter 11

Unit-V Chapter 10, Chapter 12 (Sec: 12.1 – 12.4)

Books for Reference

1. Byron S. Gottfried, “Programming with C”, Schaum’s Outline Series, Tata-McGraw Hill Edition, New Delhi, 1991.
2. E. Karthikeyan, “A Textbook on C Fundamentals, Data Structures and Problem Solving”, Prentice-Hall of India Private Limited, New Delhi, 2008.
3. Yashavant Kanetkar, “Let us C”, BPB Publications, Tenth Edition, New Delhi: 2010.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
I	21PCA1BCC1	ADDL. Core I: C-PROGRAMMING									-	5
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	2	2	1	3	3	3	2	1	2.3	
CO-2	3	3	2	2	1	3	3	3	2	1	2.3	
CO-3	3	3	3	2	1	3	3	3	2	1	2.4	
CO-4	3	3	3	2	1	3	3	3	2	1	2.4	
CO-5	3	3	3	2	1	3	3	3	2	1	2.4	
Mean Overall Score											2.36	
Result											#High	

Semester	Course Code	Title of the Course	Hours	Credit
I	21PCA1BCC2	ADDL. Core II : C-PROGRAMMING LAB	-	5

CO No.	CO- Statements	Cognitive Level (K- level)
On completion of the course, the student will be able to		
CO-1	Read, understand and trace the execution of programs using control structures and branching structures	K1, K2
CO-2	Apply an arrays for solving problems with its algorithm and flowchart	K1,K3
CO-3	Analyse the usage of functions.	K4
CO-4	Apply and Solving problems using pointers, structures and unions	K6
CO-5	Implement and Evaluate files concept	K3,K5

1. Simple Programs using Operators
2. Branching structures
3. Looping structures
4. Arrays
5. Strings
6. Functions
7. Pointers
8. Structures
9. Union
10. Files

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
I	21PCA1BCC2	ADDL. Core II: C-PROGRAMMING LAB									-	5
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	3	2	1	3	3	3	3	1	2.5	
CO-2	3	3	3	2	1	3	3	3	2	1	2.4	
CO-3	3	3	3	2	1	3	3	3	2	1	2.4	
CO-4	3	3	3	2	1	3	3	3	2	1	2.4	
CO-5	3	3	3	3	1	3	3	3	2	1	2.5	
Mean Overall Score											2.44	
Result											#High	

Semester	Course Code	Title of the Course	Hours	Credits
II	21PCA2BCC3	ADDL. Core III: WEB DESIGN (HTML 5, Java Script & CSS)	-	5

CO No.	CO- Statements	Cognitive Level (K- level)
On completion of the course, the student will be able to		
CO-1	recall the knowledge on the features of HTML 5	K1
CO-2	understand the design of web pages using HTML tags and CSS	K1, K2
CO-3	acquire skill to implement JavaScript Programming within web pages	K3, K4
CO-4	Examine the events and set the cookies in Java Script	K5
CO-5	Identify objects in HTML design web pages using HTML and JavaScript	K1, K6

Unit-I

Introduction to HTML: HTML Tags - Structure of an HTML Program - Text Formatting-Emphasizing material - Text-Styles

Unit-II

HTML: Tables – Linking documents – Frames – Form and its elements.

Unit-III

Introduction to Cascading Style Sheets: CSS Basics-Style Inclusion Methods – CSS Strings and Keywords – CSS Selectors – Miscellaneous CSS Constructors.

Unit-IV

JavaScript: Introduction to JavaScript – JavaScript in web pages–writing JavaScript with HTML – Basic programming techniques – operators and expressions – conditional checking – loops – functions – user defined functions – dialog boxes.

Unit-V

JavaScript: JavaScript DOM: JSSS DOM – understanding objects in HTML – browser objects – web page object hierarchy – Handling events – The form object – Built-in objects – User defined objects –Cookies – Setting a cookie.

Books for Study:

- Wendy G.Lehnert, “Internet 101 - a beginners guide to the internet and the world wide web”, Addison Wesley, 1999.
Unit 1- Chapter 2, Chapter 3
Unit 2- Chapter 5, Chapter 6, Chapter 7, Chapter 10
- Powell and Thomas, “HTML & CSS: The Complete Reference”, McGraw Hill, 2010.
Unit 3- Chapter 4 (Sec.4.1.1)
- Ivan N. Bayross, “Web enabled Commercial Application Development using HTML, JavaScript, DHTML and PHP”, 4th Revised Edition, BPB Publications, New Delhi, 2010.
Unit 4- Chapter 8

Unit 5- Chapter 9, Chapter 10, Chapter 11

Books for Reference

1. Chuck Musciano& Bill Kennedy, “HTML - The Definitive Guide”, Shroff Publishers & Distributors Pvt. Ltd., Calcutta - 1999.
2. Raj Kamal, “Internet and Web Technologies”, TMH, New Delhi, 2017.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code		Title of the Course								Hours	Credit
II	21PCA2BCC3		ADDL. Core III: WEB DESIGN (HTML 5, Java Script &CSS)								-	5
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	2	2	2	3	3	3	2	2	3	2.5	
CO-2	2	3	3	2	2	3	3	3	3	3	2.7	
CO-3	1	2	3	3	3	3	3	2	3	2	2.5	
CO-4	2	2	2	3	1	2	3	2	2	3	2.2	
CO-5	2	3	2	3	3	1	3	3	3	3	2.6	
Mean Overall Score											2.5	
Result											#High	

Semester	Course Code	Title of the Course	Hours	Credits
II	21PCA2BCC4	ADDL. Core IV: WEB DESIGN (HTML 5, Java Script & CSS) Lab	-	5

CO No.	CO- Statements	Cognitive Level (K- level)
On completion of the course, the student will be able to		
CO-1	Have the ability to design simple web pages with basic HTML tags	K1, K2
CO-2	Be well-equipped to use CSS with web pages	K3
CO-3	Have the skill set to analyze and evaluate Java Script.	K4, K5
CO-4	Have mastered the art of event driven programming	K5
CO-5	Be in a state of designing web applications for any organization	K6

HTML

1. Web Page with Headings and Formatting Tags
2. Web Page with Ordered and Unordered Lists
3. HTML file to demonstrate Tables
4. HTML file to demonstrate Forms
5. HTML file to demonstrate Frames

CSS

6. CSS Background and Text Styles
7. CSS Id and Class

Java Script

8. Java Script Loops
9. Java Script Functions
10. Java Script Form Validation

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code					Title of the Course					Hours	Credit
II	21PCA2BCC4					ADDL. Core IV: WEB DESIGN (HTML 5, Java Script & CSS) Lab					-	5
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	2	2	2	1	3	3	2	2	3	2.3	
CO-2	2	3	3	2	2	3	3	3	3	3	2.7	
CO-3	2	2	3	3	3	3	3	2	3	2	2.6	
CO-4	2	2	2	3	2	2	3	2	2	2	2.2	
CO-5	2	3	3	3	1	2	3	3	3	3	2.6	
Mean Overall Score											2.48	
Result											# High	

Semester	Course Code	Title of the Course	Hours	Credits
III	21PCA3BCC5	ADDL. Core V: Web Graphics	-	5

CO No.	CO Statements	Cognitive Level (K- level)
On completion of the course, the student will be able to		
CO-1	Familiar with the existing Multimedia Products	K1, K2
CO-2	Able to work with GIMP	K2,K3
CO-3	Able to learn how to design using basic Synfig tools	K1,K2,K3
CO-4	To use advanced technologies in Synfig	K4,K6
CO-5	To develop presentation package using multimedia tool Inkscape	K3, K4, K6

Unit-I:

Introduction to Multimedia Definition – Components of Multimedia – Multimedia and Hypermedia – World Wide Web – Various overview of Multimedia software Tools - Multimedia Authoring and Tools: Multimedia Authoring – VRML – Popular File Formats.

Unit-II

GIMP environment – Layers and work path – Image editing – channels, masks and actions - filters – rollovers and animations.

Unit-III

Synfig: Introduction – drawing and coloring tools.

Unit-IV:

Synfig: Animation – tweening – interactive elements.

Unit-V

Inkscape: Interface – working with shapes – layers – blend, path and mask.

Books for Study

1. Ze-Nian Li and Mark S. Drew, “Fundamentals of Multimedia”, 2004 by Pearson Education, Inc.
2. Phillip Whitt “Beginning Photo Retouching & Restoration Using GIMP”, Apress/2014. SBN-13: 978-1-484204-04-7.
3. [Http://wiki.synfig.org/category](http://wiki.synfig.org/category) - Manual. 21-Jun-2016.
4. Bethany Hiitola, Packt Publishing Limited, “Inkscape Starter”, ISBN- 10.1849517568, ISBN-13.978-1849517560

Books for Reference

1. Fred Halsall, “Multimedia Communications: Applications, Networks, Protocols, and Standards”, by Pearson Education, Inc.2001.
2. Jason Van Gumster and Robert Shimonski, “GIMP Bible”, Wiley, 2010.
3. Jesse Russell, Ronald Cohn, “Synfig”, Book on Demand, 2012.
4. Bethany Hiitola, “Inkscape Beginner's Guide”, Packt Publishing, 2012.

Unit-I Chapter 1:(Page no. 3-23), Chapter 3:(page no. 69-80)

Unit-II Chapter 7,8,9,10,11

Unit-III, IV Manual

Unit-V Chapter 1,2,4,5,6

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
III	21PCA3BCC5	ADDL. Core V: Web Graphics									-	5
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	2	2	2	3	2	3	2	2	2.4	
CO-2	3	2	2	1	3	2	2	3	2	2	2.2	
CO-3	3	2	3	2	3	2	3	3	2	2	2.5	
CO-4	2	3	2	3	2	2	2	3	2	2	2.3	
CO-5	2	3	3	2	2	2	3	3	2	2	2.4	
Mean Overall Score											2.3	
Result											# High	

Semester	Course Code	Title of the Course	Hours	Credits
III	21PCA3BCC6	ADDL. Core VI: Web Graphics Lab	-	5

CO No.	Course Outcomes	Cognitive Level (K- level)
On completion of the course, the student will be able to		
CO-1	Knowledge about editing images	K1, K2,K3
CO-2	Familiarisation with the modern GIMP workspace	K2,K3
CO-3	Experience with image Resolution and Retouching	K3,K6
CO-4	Creativity to design a project	K2,K3,K6
CO-5	Skill in cutout animation using bitmap images	K2, K3, K4

Practical Exercises

1. Design ID card, Pamphlets and Advertisement using GIMP.
2. Design an invitation for a seminar or conference.
3. Design a greeting card
4. Create text effects using text tools
5. Apply various Layer Effects to Images.
6. Apply Filter effects on images.
7. Develop a slide show of Photos with transition.
8. Design brushed outlines for an image using Synfig
9. Create an Animation for bouncing ball.
10. Using Time line Adapt motion tweening Animation.
11. Creating logo using Inkscape.
12. Creating Calligraphic text effects using inkscape.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
III	21PCA3BCC6	ADDL. Core VI: Web Graphics Lab									-	5
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	2	2	2	3	2	2	3	2	2.4	
CO-2	3	2	2	1	3	2	2	3	2	2	2.2	
CO-3	3	2	3	2	3	2	3	3	2	2	2.5	
CO-4	2	2	3	3	2	3	2	2	2	2	2.3	
CO-5	2	3	3	2	2	2	3	3	2	2	2.4	
Mean Overall Score											2.3	
Result											# High	