PG SCHEME OF EXAMINATIONS 2024-25

P.K.R ARTS COLLEGE FOR WOMEN (Autonomous)
GOBICHETTIPALAYAM – 638476
MASTER OF COMPUTER APPLICATIONS
Programme Scheme and Scheme of Examinations

Scholastic Courses: ***(For students admitted from 2024-25 & onwards)***

Category (Part)	Component	Course Code	Course Title	Contact Hrs/ week	Exam Duration hrs.	Max.Marks			Credits
						CIA	ESE	Total	
SEMESTER – I									
Part III	Core: I	24CAP01	Python Programming	4	3	25	75	100	4
Part III	Core :II	24CAP02	Relational Database Management System	4	3	25	75	100	4
Part III	Core : III	24CAP03	Advanced Operating System	4	3	25	75	100	4
Part III	Core : IV	24CAP04	Operation Research	4	3	25	75	100	4
Part III	Core : V Practical I	24CAP05	Python Programming – Practical	4	3	40	60	100	2
Part III	Core : VI Practical II	24CAP06	Relational Database Management System– Practical	4	3	40	60	100	2
Part III	Core : VII Elective: I	24CAP07A / 24CAP07B	Basic Web Development(HTML, CSS and Javascript) / Data Mining	3	3	25	75	100	4
Part III	Core VIII Elective: I – Practical III	24CAP08A / 24CAP08B	Web Development Practical / Data Mining using R Practical	3	3	40	60	100	2
			TOTAL	**30**					**26**
SEMESTER – II									
Part III	Core :IX	24CAP09	Data Structures and Algorithms	4	3	25	75	100	4
Part III	Core : X	24CAP10	Big Data Analytics	4	3	25	75	100	4
Part III	Core : XI	24CAP11	Advanced Networks	4	3	25	75	100	4
Part III	Core : XII	24CAP12	Software Engineering	4	3	25	75	100	4
Part III	Core :XIII Practical IV	24CAP13	Data Structures and Algorithms – Practical	4	3	40	60	100	2
Part III	Core :XIV Practical V	24CAP14	Big Data Analytics – Practical	4	3	40	60	100	2
Part III	Core : XV Elective : II	24CAP15A/ 24CAP15B	Front End Development and REACT/ Machine Learning	3	3	25	75	100	4

Part III	Core XVI Elective: II – Practical VI	24CAP16A/ 24CAP16B	Front End Development practical / Machine Learning practical	3	3	40	60	100	2
Part IV	Ability Enhancement	24AEP01	Cyber Security	2	3	100	-	100	2
			TOTAL	**32**					**28**
SEMESTER – III									
Part III	Core : XVII	24CAP17	Advanced Java Programming	4	3	25	75	100	4
Part III	Core :XVIII	24CAP18	Data Science	4	3	25	75	100	4
Part III	Core : XIX	24CAP19	Research Methodology	4	3	25	75	100	4
Part III	Core : XX Practical VII	24CAP20	Advanced Java Programming – practical	4	3	40	60	100	2
Part III	Core : XXI Project I	24CAP21	Mini Project and Viva voce (Internship optional)	5	-	20	80	100	3
Part III	Core : XXII Elective III	24CAP22A /	Full Stack Development Tools/ Deep Learning	3	3	25	75	100	4
Part III	Core : XXIII Elective III – Practical VIII	24CAP23A/ 24CAP23B	Full Stack Development Tools- practical / Deep Learning – practical	3	3	40	60	100	2
Part III	Core :XXIV Open Elective	****	Offered for students of other programmes / departments	3	3	25	75	100	2
Part V	Proficiency Enhancement	24PECAP01	Intellectual Property Rights (Self Study)	-	3	-	-	100	2
			TOTAL	**30**					**27**
SEMESTER – IV									
Part III	Core :XXV Project II	24CAP24	Major Project and Viva-voce	-	-	100	100	200	10
Part V	Competency Enhancement	Online Course / Learning Object Repository (LOR)		SEMSTER I – IV					**2**
		Certificate Course		SEMESTER I - IV					**2**
Total Credits									**95**

*Credit Transfer for all courses from UGC SWAYAM / MOOC Courses.

Total Marks: 2800 **Total credits: 95**

Chair Person

Name, Designation
College Name – Full address

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART – III	**CORE: I**	24CAP01	**PYTHON PROGRAMMING**	**48**	**4**

Contact hours per semester: 48
Contact hours per week: 4

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
I	**I**	**25**	**75**	**100**

Preamble:

This course covers the basics, object oriented concepts and packages of Python. Also it highlights framework for creating web applications using Python.

Course Outcome:

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

CO Number	CO Statement	Knowledge Level
CO1	Recall basic programming concepts in python	K1
CO2	Comprehend constructs, packages and framework of python	K2
CO3	Demonstrate basic and object oriented concepts in Python	K3
CO4	Experiment python constructs and packages	K4
CO5	Validate the significance of appropriate constructs	K5
CO6	Develop applications to solve real time problems using Python	K6

K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO2	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO3	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO4	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO5	**9**	**9**	**9**	**9**	**3**	**9**	**1**
CO6	**9**	**9**	**9**	**9**	**3**	**9**	**1**
Total contribution of COs to POs	**54**	**54**	**54**	**54**	**18**	**54**	**14**
Weighted Percentage COs Contribution to POs	**4.2**	**4.2**	**4.2**	**4.2**	**3.0**	**4.6**	**3.5**

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT

UNIT I INTRODUCTION TO PYTHON (8 Hours)

Fundamental ideas of Computer Science - Strings, Assignment, and Comments- Numeric Data types and Character sets – Expressions – Loops and Selection Statements: Definite iteration: the for Loop - selection: if and if-else statements - Conditional iteration: the while Loop

UNIT II STRINGS, LISTS, DICTIONARIES AND FUNCTIONS (10 Hours)

Strings: Accessing Characters and substrings in strings - Data encryption- Strings and Number systems- String methods – Text file - Lists and Dictionaries: Lists – Dictionaries – Design with Functions: A Quick review - Problem Solving with top-Down Design - Design with recursive Functions - Managing a Program‘s namespace - Higher-Order Functions

UNIT III OBJECT ORIENTED AND GUI BASED CONCEPTS (10 Hours)

Design with Classes: Getting inside Objects and Classes – Data-Modeling Examples – Building a New Data Structure – The Two – Dimensional Grid - Structuring Classes with Inheritance and Polymorphism – Graphical User Interfaces - The Behavior of terminal-Based programs and GUI-Based programs - Coding Simple GUI-Based programs - Windows and Window Components - Command Buttons and responding to events

UNIT IV PACKAGES (10 Hours)

Working with Python Packages: NumPy Library-Ndarray – Basic Operations – Indexing, Slicing and Iteration – Array manipulation - Pandas –The Series – The DataFrame – The Index Objects – Data Visualization with Matplotlib – The Matplotlib Architecture – pyplot – The Plotting Window – Adding Elements to the Chart – Line Charts – Bar Charts – Pie charts

UNIT V DIJANGO (10 Hours)

Installing Django – Building an Application – Project Creation – Designing the Data Schema - Creating an administration site for models - Working with QuerySets and Managers – Retrieving Objects – Building List and Detail Views

REFERENCES

1. K.A. Lambert, ―Fundamentals of Python: first programs‖, Second Edition, Cengage Learning, 2018 (Unit - I, II and III)
2. Fabio Nelli, ―Python Data Analytics: With Pandas, NumPy, and Matplotlib‖, Second Edition, Kindle Edition, 2018 (Unit - IV)
3. Antonio Mele, ―Django 3 By Example‖, Third Edition, 2020 (Unit - V)
4. Zhang.Y, An Introduction to Python and Computer Programming, Springer Publications, 2017.
5. Wesely J.Chun, Core Python Application Programming, Prentice Hall, 3rd Edition, 2019.

WEB REFERENCES

1. https://docs.python.org/3/tutorial/

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART – III	**CORE: II**	24CAP02	**RELATIONAL DATABASE MANAGEMENT SYSTEM**	**48**	**4**

Contact hours per semester: 48
Contact hours per week: 4

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
I	**I**	**25**	**75**	**100**

Preamble:

This course covers the basic concepts of database management systems, relational database design, SQL, PL/ SQL and emphasize methods to organize, maintain and retrieve information efficiently and effectively.

Course Outcomes:

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic concepts of database system	K1
CO2	Learn about basics of relational algebra, relational calculus and normalization techniques	K2
CO3	Apply various normalization techniques in databases	K3
CO4	Explore relational database, SQL and PL/SQL programming concepts	K4
CO5	Illustrate the SQL and PL/SQL concepts using examples	K5
CO6	Formulate solutions to broad range of problems using relational database management system	K6

K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO2	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO3	**9**	**9**	**9**	**9**	**3**	**9**	**1**
CO4	**9**	**9**	**9**	**9**	**3**	**9**	**1**
CO5	**9**	**9**	**9**	**9**	**3**	**9**	**1**
CO6	**9**	**9**	**9**	**9**	**3**	**9**	**1**
Total contribution of COs to POs	**54**	**54**	**54**	**54**	**18**	**54**	**10**
Weighted Percentage COs Contribution to POs	**4.2**	**4.2**	**4.2**	**4.2**	**3.0**	**4.6**	**2.5**

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT

UNIT I INTRODUCTION TO DATABASE SYSTEM (10 hours)

Purpose of Database Systems – View of Data – Database Languages – Transaction Management – Database Architecture – Database Users and Administrators. Relational Model: Structure of Relational Databases – Database Design – ER Model – Overview of the Design Process – The Entity-Relationship Model – Constraints – Entity Relationship Diagrams.

UNIT II RELATIONAL ALGEBRA OPERATIONS –LANGUAGES (10 hours)

The Tuple Relational Calculus – The Domain Relational Calculus – SQL: Background – Data Definition – Basic Structure of SQL Queries – Set Operations – Aggregate Functions – Null Values – Nested Sub-Queries – Views – Modification of the Database.

UNIT III DATA NORMALIZATION (10 hours)

Pitfalls in Relational Database Design – Decomposition – Functional Dependencies – Normalization – First Normal Form – Second Normal Form – Third Normal Form – Boyce-Codd Normal Form – Fourth Normal Form – Fifth Normal Form – Denormalization – Database Security: Data Security Requirements – Protecting the Data within the Database – Granting and Revoking Privileges – Data Encryption.

UNIT IV PL/SQL (10 hours)

History – Fundamentals – Block Structure – Comments – Data Types – Other Data Types – Declaration – Assignment operation – Bind variables – Substitution Variables – Printing – Arithmetic Operators. Control Structures and Embedded SQL: Control Structures – Nested Blocks – SQL in PL/SQL – Data Manipulation – Transaction Control statements. PL/SQL Cursors and Exceptions: Cursors – Implicit & Explicit Cursors and Attributes –FOR Loops – SELECT…FOR UPDATE – WHERE CURRENT OF Clause – Cursor with Parameters – Cursor Variables – Exceptions – Types of Exceptions.

UNIT V PL/SQL COMPOSITE DATA TYPES (8 hours)

Records – Tables – Arrays. Named Blocks: Procedures – Functions – Packages –Triggers – Data Dictionary Views

REFERENCES

1. Abraham Silberschatz, Henry F.Korth, S.Sudarshan, Database System Concepts, 5th Edition, TMH **(UNIT - I, II,)**
2. Alexis Leon, Mathews Leon , Fundamentals of Database Management Systems, Vijay Nicole Imprints Private Limited. **(UNIT – III)**
3. Nilesh Shah, Database Systems Using Oracle‖, 2nd edition, PHI. **UNIT -IV: Chapters 10 & 11 UNIT -V: Chapters 12, 13 & 14)**
4. Majumdar & Bhattacharya, Database Management Systems, 4th Edition, TMH, 2007.

WEB REFERENCES:

1. https://www.geeksforgeeks.org/introduction-of-dbms-database-management-system-set-1/
2. https://www.guru99.com/relational-algebra-dbms.html
3. https://www.javatpoint.com/dbms-normalization
4. https://www.tutorialspoint.com/plsql/index.htm

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART – III	CORE: III	24CAP03	ADVANCED OPERATING SYSTEMS	48	4

Contact hours per semester: 48

Contact hours per week: 4

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
I	I	25	75	100

Preamble

This course aims to provide foundational concepts in distributed, multiprocessor, and database operating systems. It also focuses on deadlock detection, shared memory and security aspects of distributed systems.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Remember basic concepts of distributed, multiprocessor and database operating systems	K1
CO2	Understand basic concepts of distributed, multiprocessor and database operating systems and deadlock handling in distributed OS	K2
CO3	Implement deadlock detection algorithms in distributed operating systems.	K3
CO4	Apply DSM concepts, coherence protocols, scheduling algorithms, and fault tolerance mechanisms within Distributed Operating Systems.	K4
CO5	Evaluate concurrency control mechanisms and replication strategies for distributed database systems	K5
CO6	Innovate new architectures, algorithms, and strategies for maximizing performance, scalability, and reliability in multiprocessor systems and distributed databases.	K6

K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	9	3
CO2	9	9	9	9	3	9	3
CO3	9	9	9	9	3	9	3
CO4	9	9	9	9	3	9	3
CO5	9	9	9	9	3	9	3
CO6	9	9	9	9	3	9	3
Total contribution of COs to POs	54	54	54	54	18	54	18
Weighted Percentage COs Contribution to POs	4.2	4.2	4.2	4.2	3.0	4.6	4.5

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT

UNIT I DISTRIBUTED OPERATING SYSTEMS (10 Hours)

Architectures of Distributed Systems - System Architecture types - issues in distributed operating systems - communication networks – communication primitives. Theoretical Foundations - inherent limitations of a distributed system – lamp ports logical clocks – vector clocks –casual ordering of messages – global state – cuts of a distributed computation – termination detection. Distributed Mutual Exclusion – introduction – the classification of mutual exclusion and associated algorithms – a comparative performance analysis.

UNIT II DISTRIBUTED DEADLOCK DETECTION (10 Hours)

Introduction - deadlock handling strategies in distributed systems – issues in deadlock detection and resolution – control organizations for distributed deadlock detection – centralized and distributed deadlock detection algorithms –hierarchical deadlock detection algorithms. Agreement protocols – introduction-the system model, a classification of agreement problems, solutions to the Byzantine agreement problem, applications of agreement algorithms. Distributed resource management: introduction-architecture – mechanism for building distributed file systems – design issues – log structured file systems.

UNIT III DISTRIBUTED SHARED MEMORY (10 Hours)

Introduction-Architecture– algorithms for implementing DSM – memory coherence and protocols – design issues. Distributed Scheduling – introduction – issues in load distributing – components of a load distributing algorithm – stability – load distributing algorithm – performance comparison – selecting a suitable load sharing algorithm – requirements for load distributing -task migration and associated issues. Failure Recovery and Fault tolerance: introduction– basic concepts – classification of failures – backward and forward error recovery, backward error recovery- recovery in concurrent systems – consistent set of check points – synchronous and asynchronous check pointing and recovery – check pointing for distributed database systems- recovery in replicated distributed databases.

UNIT IV PROTECTION AND SECURITY (8 Hours)

Preliminaries, the access matrix model and its implementations.-safety in matrix model-advanced models of protection. Data security – cryptography: Model of cryptography, conventional cryptography- modern cryptography, private key cryptography, data encryption standard- public key cryptography – multiple encryption – authentication in distributed systems.

UNIT-V MULTIPROCESSOR AND DATABASE OPERATING SYSTEMS (10 Hours)

Multiprocessor Operating System: Introduction- basic multiprocessor system architectures – inter connection networks for multiprocessor systems – caching – hypercube architecture. Multiprocessor Operating System - structures of multiprocessor operating system, operating system design issues- threads- process synchronization and scheduling. Database Operating systems :Introduction- requirements of a database operating system Concurrency control : theoretical aspects – introduction, database systems – a concurrency control model of database systems- the problem of concurrency control – serializability theory-distributed database systems, concurrency control algorithms – introduction, basic synchronization primitives, lock based algorithms-timestamp based algorithms, optimistic algorithms – concurrency control algorithms, data replication.

REFERENCES

1. MukeshSinghal and Niranjan G. Shivaratri, “Advanced Concepts in Operating Systems – Distributed Database, and Multiprocessor Operating Systems”, Tata McGraw-Hill Publishers, 2011
2. Pradeep K. Sinha, "Distributed operating systems concepts and design" ,Prentice - Hall of India, Edition 2002.
3. Rajib Mall, “Real-Time Systems: Theory and Practice”, Pearson Education India Publishers, Second Edition, 2008.
4. Daniel.P.Bovet& Marco Cesati, ”Understanding the Linux kernel”, O‟ReillyPublishers , 3rd edition, 2005

WEB REFERENCES

1. https://www.google.co.in/books/edition/Understanding_the_Linux_Kernel/h0lltXyJ8aIC?hl=en&gbpv=1&dq=Daniel.P.Bovet%26+Marco+Cesati,+%E2%80%9DUnderstanding+the+Linux+kernel%E2%80%9D,+O%E2%80%9FReillyPublishers+,+3rd++edition,+2005+full+pdf&printsec=frontcover
2. https://egyankosh.ac.in/bitstream/123456789/72524/3/Unit-3.pdf
3. https://dducollegedu.ac.in/Datafiles/cms/ecourse%20content/B.Sc(H)_Electronics_Sem_IV_Skill_Enhancement_Course_IOS_architecture.pdf
4. https://www.geeksforgeeks.org/architecture-of-ios-operating-system/#google_vignette

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART – III	CORE: IV	24CAP04	OPERATIONS RESEARCH	48	4

Contact hours per semester: 48

Contact hours per week: 4

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
I	I	25	75	100

Preamble

To enable the students to gain the knowledge about Linear Programming Problem and Methods to solve an L.P.P.

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Outline the meaning, purpose and tools of LPP, assignment, replacement, sequencing and pert model	K1
CO2	Express the procedures and steps for LPP, assignment, replacement, sequencing and pert model	K2
CO3	Illustrate the methodologies to get the optimal solution and the period of replacement	K3
CO4	Analyze the concepts of LPP, assignment, replacement, sequencing and pert model	K4
CO5	Cvaluate different situations after the solution of LPP, assignment, replacement, sequencing and pert problems	K5
CO6	construct LP and Replacement models for various type of problems	K6

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	9	9
CO2	9	9	9	9	3	9	9
CO3	9	9	9	9	3	3	1
CO4	9	9	9	9	1	3	1
CO5	9	9	9	9	1	3	1
CO6	9	9	9	9	0	3	0
Total contribution of COs to Pos	54	54	54	54	11	30	21
Weighted Percentage COs Contribution to Pos	4.2	4.2	4.2	4.2	1.8	2.6	5.3

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT

UNIT I : LINEAR PROGRAMMING (10 Hours)

Formulation of LPP - Simplex Method - Big M method - Two Phase Simplex Method.

UNIT II : THE ASSIGNMENT PROBLEM (10 Hours)

Introduction – Mathematical formulation - Hungarian Assignment Method – Maximization in Assignment Problem – Unbalanced Assignment Problem.

UNIT III: REPLACEMENT MODEL (10 Hours)

Introduction – Replacement of items that deteriorates gradually : value of money does not change with time – Value of money changes with time – Replacement of items that fails suddenly - Individual Replacement –Group Replacement.

UNIT IV: SEQUENCING PROBLEMS (10 Hours)

Introduction-Problem of sequencing - Basic terms used in sequencing- Processing n-jobs through 2 machines - Processing n –jobs through k machines - Processing 2 jobs through k machines(Problems only).

UNIT V: **PERT (8 Hours)**

Introduction – Construction of Network - PERT Calculations.

NOTE : *No Derivations and Proof, Simple Problems Only.*

REFERENCES

1. KantiSwarup, P.K.Gupta, ManMohan(2012), "Operations Research", 16th Edition, Publishing Sultan chand& Sons, New Delhi.

UNIT	CHAPTER	SECTION
I	2 4	2.3 – 2.4, 4.3 – 4.4
II	11	11.1 – 11.4
III	18	18.1 –18.3
IV	12	12.1 – 12.6
V	25	25.1 –25.5, 25.7

2. Frederick S. Hillier, Gerald J. Lieberman - "Introduction to Operations Research", Tata McGraw Hill Pub Company Ltd., Seventh Edition.
3. Gupta.P.K., Hira.D.S. - "Problems in Operations Research", S.Chand& Company Ltd.
4. Sharma.J.K. - "Operations Research Theory and Applications", Macmillan India Ltd., Second Edition.

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART – III	**CORE: V PRACTICAL: I**	24CAP05	**PYTHON PROGRAMMING – PRACTICAL**	**48**	**2**

Contact hours per semester: 48
Contact hours per week: 4

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
I	**I**	**40**	**60**	**100**

Preamble:

The Course provides hands on experience on the fundamentals of writing python scripts ,using elementary data items, structuring Python programs, creating GUI based applications and developing web based applications with Django

Course Outcomes:

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

CO Number	CO Statement	Knowledge Level
CO1	Comprehend the programming skills in python and write scripts	K1
CO2	Create python applications with elementary data items, lists, dictionaries and tuples	K2
CO3	Implement the Object-Oriented Programming programming concepts such as objects and classes, inheritance and polymorphism	K3
CO4	Assess the use of Python packages to perform numerical computations and perform data visualization	K4
CO5	Create interactive web applications using Django	K5
CO6	Develop real time applications using python	K6

K1 – Remember; K2 – Understand;K3 – Apply;K4 – Analyze; K5 – Evaluate;K6 – Create.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**9**	**9**	**3**
CO2	**9**	**9**	**9**	**9**	**9**	**9**	**3**
CO3	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO4	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO5	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO6	**9**	**9**	**9**	**9**	**3**	**9**	**3**
Total contribution of COs to POs	**54**	**54**	**54**	**54**	**30**	**54**	**18**
Weighted Percentage COs Contribution to POs	**4.2**	**4.2**	**4.2**	**4.2**	**5.0**	**4.6**	**4.5**

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT

1. Program using elementary data items
2. Program using lists
3. Program using dictionaries
4. Program using tuples
5. Program using conditional branches, loops
6. Program using functions
7. Program using classes and objects
8. Program using inheritance
9. Program using polymorphism
10. Program using Numpy
11. Program using Pandas
12. Program using Matplotlib
13. Create an GUI application using all the appropriate widgets required.
14. Program for creating dynamic and interactive web pages using Django.

.CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART – III	**CORE: VI PRACTICAL: II**	**24CAP06**	**RELATIONAL DATABASE MANAGEMENT SYSTEM– PRACTICAL**	**48**	**2**

Contact hours per semester: 48

Contact hours per week: 4

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
I	**I**	40	**60**	**100**

Preamble:

This course covers the basics on creating database tables using SQL, develop efficient PL/SQL programs to access Oracle databases and manage data retrieval with cursors and cursor variables, Stored Procedures, Functions, Packages and Triggers (PL/SQL Programming).It is designed to provide hands-on experience to create database-level applications using Oracle SQL and PL/SQL.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Relate the basic concepts of relational database system.	K1
CO2	Illustrate the features available in a RDBMS package	K2
CO3	Apply appropriate SQL queries and PL/SQL Programs to write database application.	K3
CO4	Analyze different database requirements and design effective database application.	K4
CO5	Validate data against appropriate constraints.	K5
CO6	Solve real time applications using normalization concepts, SQL and PL/SQL constructs.	K6

K1 – Remember; K2 – Understand;K3 – Apply;K4 – Analyze; K5 – Evaluate; K6 –Create.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO2	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO3	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO4	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO5	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO6	**9**	**9**	**9**	**9**	**3**	**9**	**3**
Total contribution of COs to Pos	**54**	**54**	**54**	**54**	**18**	**54**	**18**
Weighted Percentage COs Contribution to Pos	**4.2**	**4.2**	**4.2**	**4.2**	**3.0**	**4.6**	**4.5**

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT

1. Write SQL queries for Data Definition and Data Manipulation Language.
2. Write SQL queries using logical operations and operators.
3. Write SQL queries for group functions.
4. Write SQL queries for sub queries.
5. Write SQL queries to implement JOINS.
6. Write queries to understand the concepts for ROLL BACK, COMMIT & CHECK POINTS.
7. Write PL/SQL Function to find Armstrong numbers from 1 to n.
8. Write PL/SQL code to update values in created tables by using Explicit Cursors.
9. Write a PL/SQL Procedure to check the given number is prime or not by using call procedure
10. Write a PL/SQL Program to handle the Exceptions.
11. Write a PL/SQL code to implement Trigger.
12. Write a PL/SQL Program to create and execute a package.

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART – III	**CORE: VII ELECTIVE: I**	24CAP07A	**BASIC WEB DEVELOPMENT (HTML, CSS and Javascript)**	**3**	**4**

Contact hours per semester: 36
Contact hours per week: 3

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
I	**I**	**25**	**75**	**100**

Preamble:

To understand HTML, CSS and Javascript programming concepts for simple web application development.

Course Outcomes:

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

CO Number	CO Statement	Knowledge Level
CO1	Remind HTML, XHTML, CSS and Javascript concepts.	K1
CO2	Understand core features of HTML, XHTML, CSS and Javascript.	K2
CO3	Apply HTML, CSS and Javascript constructs in simple programs.	K3
CO4	Analyse various attributes, values and types of CSS	K4
CO5	Evaluate user experiences in creating user interfaces and web pages using HTML,CSS and JavaScript	K5
CO6	Build interactive and user-friendly frontend applications using HTML, CSS and JavaScript.	K6

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 –Create.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**9**	**9**	**3**
CO2	**9**	**9**	**9**	**9**	**9**	**9**	**3**
CO3	**9**	**9**	**9**	**9**	**9**	**9**	**3**
CO4	**9**	**9**	**9**	**9**	**9**	**9**	**3**
CO5	**9**	**9**	**9**	**3**	**3**	**3**	**3**
CO6	**9**	**9**	**9**	**3**	**3**	**3**	**3**
Total contribution of COs to Pos	**54**	**54**	**54**	**42**	**42**	**42**	**18**
Weighted Percentage COs Contribution to POs	**4.2**	**4.2**	**4.2**	**3.3**	**6.9**	**3.6**	**4.5**

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT

UNIT I TRADITIONAL HTML and XHTML (6 Hours)

First Look at HTML and XHTML, Hello HTML and XHTML World, HTML and XHTML: Version History, HTML and XHTML DTDs: The Specifications Up Close, (X) HTML Document Structure, Browsers and (X)HTML, The Rules of (X)HTML, Major Themes of (X)HTML, The Future of Markup—Two Paths?

UNIT II HTML5 (6 Hours)

Hello HTML5, Loose Syntax Returns, XHTML5, HTML5: Embracing the Reality of Web Markup, Presentational Markup Removed and Redefined, HTML5 Document Structure Changes, Adding Semantics, HTML5's Open Media Effort, Client-Side Graphics with <canvas>, HTML5 Form Changes, Emerging Elements and Attributes to Support Web Applications

UNIT III CASCADING STYLE SHEETS (CSS) (8 Hours)

Introduction, CSS Overview , CSS Rules, Example with Type Selectors and the Universal Selector, CSS Syntax and Style, Class Selectors, ID Selectors, span and div Elements, Cascading, style Attribute, style Container, External CSS Files, CSS Properties, Color Properties, RGB Values for Color, Opacity Values for Color, HSL and HSLA Values for Color, Font Properties, line-height Property, Text Properties, Border Properties, Element Box, padding Property, margin Property , Case Study: Description of a Small City's Core Area.

UNIT IV Tables and CSS, Links and Images, Table Elements, Formatting a Data Table (8 Hours)

Borders, Alignment, and Padding, CSS Structural Pseudo- Class Selectors, thead and tbody Elements, Cell Spanning, Web Accessibility, CSS display Property with Table Values, a Element, Relative URLs, Navigation Within a Web Page, CSS for Links, Bitmap Image Formats: GIF, JPEG, PNG, img Element, Responsive Images, Positioning Images, Shortcut Icon, iframe Element .

UNIT V JAVASCRIPT: FUNCTIONS, DOM, FORMS, AND EVENT HANDLER (8 Hours)

History of JavaScript, Hello World Web Page, Buttons, Functions, Variables, Identifiers, Assignment Statements and Objects, Document Object Model, Forms and How They're Processed: Client-Side Versus Server-Side, form Element, Controls, Text Control, Accessing a Form's Control Values, reset and focus Methods

REFERENCES

1. HTML & CSS: The Complete Reference Thomas A. Powell, , Fifth Edition, TataMcGraw Hill
2. WEB PROGRAMMING with HTML5, CSS and JavaScript, John Dean, Jones & Bartlett Learning, First Edition

WEB REFERENCES

1. https://onlinecourses.swayam2.ac.in/aic20_sp11/preview

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART – III	**CORE: VII ELECTIVE: I**	24CAP07B	**DATA MINING**	**36**	**4**

Contact hours per semester: 36
Contact hours per week: 3

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
I	**I**	**25**	**75**	**100**

Preamble:

To understand concepts, algorithms and techniques of data mining

Course Outcomes:

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

CO Number	CO Statement	Knowledge Level
CO1	Learn the concepts of data mining, issues and applications	K1
CO2	Understand various data mining techniques, clustering and association rule mining.	K2
CO3	Apply suitable models, algorithms and clustering techniques to carry out simple data mining tasks	K3
CO4	Compare the performance of various data mining techniques	K4
CO5	Select appropriate models and algorithms for solving real time problems	K5
CO6	Develop applications towards advancements in data mining	K6

K1 – Remember; K2 – Understand;K3 – Apply; K4 – Analyze; K5– Evaluate; K6 – Create

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**9**	**9**	**3**
CO2	**9**	**9**	**9**	**9**	**9**	**9**	**3**
CO3	**9**	**9**	**9**	**9**	**9**	**9**	**3**
CO4	**9**	**9**	**9**	**9**	**9**	**9**	**3**
CO5	**9**	**9**	**9**	**9**	**9**	**3**	**3**
CO6	**9**	**9**	**9**	**9**	**9**	**3**	**3**
Total contribution of COs to POs	**54**	**54**	**54**	**54**	**54**	**42**	**18**
Weighted Percentage COs Contribution to POs	**4.2**	**4.2**	**4.2**	**3.3**	**6.9**	**3.6**	**4.5**

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT

UNIT I INTRODUCTION AND DATA PREPROCESSING (8 Hours)

Data Mining – Kinds of data to be mined- Kinds of patterns to be mined – Technologies – Targeted Applications - Major Issues in Data Mining – Data Objects and Attribute Types – Measuring Data similarity and dissimilarity - Data Cleaning –Data Integration - Data Reduction – Data Transformation – Data Discretization.

UNIT II MINING FREQUENT PATTERNS AND ADVANCED PATTERN MINING (7 Hours)

Basic Concepts – Frequent Itemset Mining Methods – Pattern Evaluation Methods – Pattern Mining in Multilevel, Multidimensional space – Constraint-Based Frequent Pattern Mining – Mining Compressed or Approximate Patterns.

UNIT III CLASSIFICATION TECHNIQUES (7 Hours)

Basic Concepts – Decision Tree Induction – Bayes Classification Methods – Rule-Based Classification – Model Evaluation and Selection – Techniques to Improve Classification Accuracy

UNIT IV CLUSTERING TECHNIQUES (7 Hours)

Cluster Analysis – Partitioning Methods - Hierarchical Methods – Density-Based Methods

UNIT V DATA MINING TRENDS AND RESEARCH FRONTIERS (7 Hours)

Mining Complex Data Types - Other Methodologies - Data Mining Applications - Data Mining and Society – Data Mining Trends

REFERENCES

1. Arun K Pujari, Data Mining Techniques, Second Edition, Universities Press India Pvt. Ltd. 2010
2. Daniel T. Larose and Chantal D. Larose, Data Mining and Predictive Analytics, Wiley Series on Methods and Applications in Data Mining, Wiley Publications
3. Margaret H. Dunham, Data Mining Introductory and Advanced Topics, Pearson Education 2004.
4. Mark A. Hall, Ian H. Witten, Eibe Frank (2011). Data Mining: Practical Machine Learning Tools and Techniques, 3/e, Morgan Kaufmann Publishers, San Francisco

WEB REFERENCES

1. https://onlinecourses.nptel.ac.in/noc21_cs06/preview
2. https://www.coursera.org/specializations/data-mining
3. https://www.mygreatlearning.com/academy/learn-for-free/courses/data-mining1
4. https://www.javatpoint.com/data-mining
5. https://www.tutorialspoint.com/data_mining/index.htm

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART – III	**CORE VIII ELECTIVE: I Practical - III**	24CAP08A	**WEB DEVELOPMENT-PRACTICAL**	**36**	**2**

Contact hours per semester: 36
Contact hours per week: 3

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
I	**I**	**40**	**60**	**100**

Preamble:

To provide practical experience in developing simple web applications using HTML, CSS and Javascript.

Course Outcomes:

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

CO Number	CO Statement	Knowledge Level
CO1	Recall HTML and XHTML tags.	K1
CO2	Understand HTML and, XHTML tags and its usage.	K2
CO3	Apply styles and layouts of CSS to develop simple web pages	K3
CO4	Explore various html tags, CSS types and layouts for its appropriate handling	K4
CO5	Experiment simple user interface with HTML, CSS and JavaScript	K5
CO6	Develop real time web applications using HTML, CSS and JavaScript.	K6

K1 – Remember; K2 – Understand;K3 – Apply; K4 – Analyze; K5 – Evaluate;K6 – Create

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	*PO5*	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**9**	**9**	**3**
CO2	**9**	**9**	**9**	**9**	**9**	**9**	**3**
CO3	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO4	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO5	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO6	**9**	**9**	**9**	**9**	**3**	**9**	**3**
Total contribution of COs to POs	**54**	**54**	**54**	**54**	**30**	**54**	**18**
Weighted Percentage COs Contribution to Pos	**4.2**	**4.2**	**4.2**	**4.2**	**5.0**	**4.6**	**4.5**

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT

1. Create an XHTML page using tags to accomplish the following:
   (i) A paragraph containing text "All that glitters is not gold". Bold face and italicize this text
   (ii) Put a background image to a page and demonstrate all attributes of background image
   (iii) Create unordered list of 5 fruits and ordered list of 3 flowers
2. Create following table using XHTML tags. Properly align cells, give suitable cell padding and cell spacing, and apply background color, bold and emphasis necessary
3. Use HTML5 for performing following tasks:
   (i) Draw a square using HTML5 SVG , fill the square with green color and make 6px brown stroke width
   (ii) Write the following mathematical expression by using HTML5 MathML d=x2-y2
   (iii)Redirecting current page to another page after 5 seconds using HTML5 meta tag
4. Demonstrate the following HTML5 Semantic tags- <article>, <aside>, <details>, <figcaption>, <figure>, <footer>, <header>, <main>, <mark>, <section> for a webpage that gives information about travel experience.
5. Create a class called income, and make it a background color of #0ff.
   Create a class called expenses, and make it a background color of #f0f.
   Create a class called profit, and make it a background color of #f00.
   Throughout the document, any text that mentions income, expenses, or profit, attach the appropriate class to that piece of text. Further create following line of text in the same document: The current price is Rs. 50and new price is Rs.40
6. Change the tag li to have the following properties:
   - A display status of inline
   - A medium, double-lined, black border
   - No list style type
   - Add the following properties to the style for li:
     a. Margin of 5px
     b. Padding of 10px to the top, 20px to the right, 10px to the bottom, and 20px to the left
   - Also demonstrate list style type with user defined image logos
7. Create the web page using HTML and CSS with tabular layout
8. Create following calculator interface with HTML and CSS
9. Write a Java Script program that on clicking a button, displays scrolling text which moves from left to right with a small delay
10. Create a webpage containing 3 overlapping images using HTML, CSS and JS. Further when the mouse is over any image, it should be on the top and fully displayed

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART – III	**CORE VIII ELECTIVE: I Practical –III**	24CAP08B	**DATA MINING USING R - PRACTICAL**	**3**	**2**

Contact hours per semester: 36
Contact hours per week: 3

YEAR	SEMESTER	CINTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
I	**I**	**40**	**60**	**100**

Preamble:

To provide a hands on experience by implementing data mining algorithms in R language

Course Outcomes:

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

CO Number	CO Statement	Knowledge Level
CO1	Recall data preprocessing and data mining tasks	K1
CO2	Understand data mining concepts and algorithms	K2
CO3	Apply data preprocessing and data mining algorithms to solve problems using R	K3
CO4	Analyze various classification and clustering algorithms with real time problems using R	K4
CO5	Evaluate classification and clustering algorithms with real time problems using R	K5
CO6	Develop real time applications using data mining algorithms and R	K6

K1 – Remember;K2 – Understand;K3 – Apply; K4 – Analyze; K5 – Evaluate;K6 – Create

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**9**	**9**	**3**
CO2	**9**	**9**	**9**	**9**	**9**	**9**	**3**
CO3	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO4	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO5	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO6	**9**	**9**	**9**	**9**	**3**	**9**	**3**
Total contribution of COs to POs	**54**	**54**	**54**	**54**	**30**	**54**	**18**
Weighted Percentage COs Contribution to POs	**4.2**	**4.2**	**4.2**	**4.2**	**5.0**	**4.6**	**4.5**

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT

1. Basic data cleaning techniques: handling missing values, outliers, duplicates.
2. Data integration: merging multiple datasets.
3. Implementing the Apriori algorithm
4. Finding and Visualizing frequent itemsets and rules.
5. Applying constraint-based frequent pattern mining.
6. Building decision trees
7. Implementing Naive Bayes classification
8. Building rule-based classifiers
9. Implementing K-means clustering
10. Performing hierarchical clustering
11. Implementing DBSCAN clustering
12. Exploring techniques for mining complex data types like text, time series, and spatial data.

SEMESTER - II

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART – III	**CORE: IX**	24CAP09	**DATA STRUCTURES AND ALGORITHMS**	**48**	**4**

Contact hours per semester: 48
Contact hours per week: 4

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
I	**II**	**25**	**75**	**100**

Preamble

The Paper offers the depth understanding and knowledge of different data structures, algorithms and their applications.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Recognize various data structures, algorithms and sorting methods	K1
CO2	Visualize the range of data structure and algorithm concepts	K2
CO3	Apply appropriate data structures and algorithm to solve real time applications	K3
CO4	Investigate various data structures and algorithm to uncover optimal solutions for the computational problems	K4
CO5	Justify the relevance of an algorithm for a specific application with respect to space and time complexity	K5
CO6	Devise innovative and efficient data structure and algorithm for solving the complex real time problems	K6

K1 – Remember; K2 – Understand; K3 – Apply;K4 –Analyze; K5 - Evaluate; K6–Create.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO2	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO3	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO4	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO5	**9**	**9**	**9**	**9**	**3**	**9**	**1**
CO6	**9**	**9**	**9**	**9**	**3**	**9**	**1**
Total contribution of COs to POs	**54**	**54**	**54**	**54**	**18**	**54**	**14**
Weighted Percentage COs Contribution to POs	**4.2**	**4.2**	**4.2**	**4.2**	**3.0**	**4.6**	**3.5**

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT

UNIT I Data Structure: Introduction and Linear Data Structures (10 Hours)

Introduction-Data structure- Definition-– Arrays - Order List – Sparse Matrices - Representation of Arrays - Stacks and Queues – Fundamentals - Evaluation of Expression - Multiple Stacks and Queues.

UNIT II Linked Lists and Non Linear Data Structures (10 Hours)

Linked Lists: Singly Linked List - Linked Stacks and Queues - Polynomial Addition - Doubly Linked Lists - Tress: Basic Terminology-Binary Trees-binary Tree Representation - Binary Tree Traversal. Graphs: Terminology and representation - Introduction –Definition and Terminology-Graph Representation – Traversals.

UNIT III Algorithm: Introduction and Divide and Conquer Method (10 Hours)

What is algorithm – Algorithm Specification – Performance Analysis: Space Complexity - Time Complexity – Asymptotic Notation. Divide and Conquer: General Method - Binary Search - Finding the maximum and minimum - Merge sort - Quick sort – Selection.

UNIT IV Greedy Method (10 Hours)

Greedy Method: General Method - Knapsack problem - Job sequencing with deadlines - Optimal merge patterns - minimum spanning trees - Single source shortest paths.

UNIT V Dynamic Programming (8 Hours)

Dynamic Programming: General Method - Multistage Graphs- All pair shortest path - Optimal binary search trees - 0/1 Knapsack - Traveling Salesperson problem.

REFERENCES

1. Ellis Horowitz, Sartaj Shani, Fundamentals of Data Structures, First Edition, Galgotia Publication.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, (2008) , Fundamentals of Computer Algorithms, Second Edition, Hyderabad Universities Press (India) Private Limited Publication.
3. Seymour Lipschutz , G.A. Vijayalakshmi Pai, Data Structures , Tata McGrawhill, Year 2006.
4. D. Samanta, “Classical Data Structure”, Prentice Hall India, ISBN: 8120318749.
5. Coremen T H, Leiserson C E, Rivest R L and Stein, Clifford, Introduction to algorithms, PHI, 2nd Edition, 2009.
6. Anany Levitin, Introduction to the Design and Analysis of Algorithm, Pearson Education.

WEB REFERENCES

1. https://www.geeksforgeeks.org/data-structures/
2. https://www.javatpoint.com/data-structure-tutorial
3. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm
4. https://www.geeksforgeeks.org/algorithms-design-techniques/
5. https://techvidvan.com/tutorials/data-structure-and-algorithm/

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART – III	**CORE: X**	24CAP10	**BIG DATA ANALYTICS**	**48**	**4**

Contact hours per semester: 48
Contact hours per week: 4

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
I	**II**	**25**	**75**	**100**

Preamble

This course aims to provide both theoretical knowledge and practical skills in handling large-scale data using the Hadoop ecosystem.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Gain a foundational understanding of big data and the Hadoop ecosystem.	K1
CO2	Comprehend the key concepts and applications of big data technologies.	K2
CO3	Develop practical skills in configuring and managing Hadoop environments.	K3
CO4	Analyze and troubleshoot issues within Hadoop clusters MongoDB and MapReduce jobs.	K4
CO5	Assess different big data solutions and their applicability to various scenarios	K5
CO6	Create new data processing workflows and applications using Hadoop, Hive, and Pig.	K6

K1 – Remember;K2 – Understand; K3 – Apply;K4 – Analyze; K5 – Evaluate; K6 – Create

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**9**	**9**	**3**
CO2	**9**	**9**	**9**	**9**	**9**	**9**	**3**
CO3	**9**	**9**	**9**	**9**	**9**	**9**	**3**
CO4	**9**	**9**	**9**	**9**	**3**	**3**	**3**
CO5	**9**	**9**	**9**	**9**	**3**	**3**	**3**
CO6	**9**	**9**	**9**	**9**	**3**	**3**	**3**
Total contribution of COs to POs	**54**	**54**	**54**	**54**	**36**	**36**	**18**
Weighted Percentage COs Contribution to POs	**4.2**	**4.2**	**4.2**	**4.2**	**6.0**	**3.1**	**4.5**

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

UNIT I BIG DATA AND ANALYTICS (10 Hours)

Classification of Digital Data: Structured Data- Semi Structured -Data and Unstructured Data. Introduction to Big Data: Characteristics – Evolution – Definition - Challenges with Big Data - Other Characteristics of Data - Big Data - Traditional Business Intelligence versus Big Data- Data Warehouse and Hadoop. Environment Big Data Analytics: Classification of Analytics – Challenges - Big Data Analytics important - Data Science - Data Scientist - Terminologies used in Big Data Environments – Basically Available Soft State Eventual Consistency - Top Analytics Tools.

UNIT II TECHNOLOGY LANDSCAPE (8 Hours)

NoSQL, Comparison of SQL and NoSQL, Hadoop -RDBMS Versus Hadoop - Distributed Computing Challenges – Hadoop Overview - Hadoop Distributed File System - Processing Data with Hadoop - Managing Resources and Applications with Hadoop YARN - Interacting with Hadoop Ecosystem

UNIT III MONGODB AND MAPREDUCE PROGRAMMING (10 Hours)

Mongo DB - Terms used in RDBMS and Mongo DB - Data Types - MongoDB Query Language. MapReduce: Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression

UNIT IV HIVE (10 Hours)

Introduction – Architecture - Data Types - File Formats - Hive Query Language Statements – Partitions – Bucketing – Views - Sub- Query – Joins – Aggregations - Group by and Having – RCFile - Implementation - Hive User Defined Function - Serialization and Deserialization.

UNIT V PIG (10 Hours)

Introduction - Anatomy – Features – Philosophy - Use Case for Pig - Pig Latin Overview - Pig Primitive Data Types - Running Pig - Execution Modes of Pig - HDFS Commands - Relational Operators - Eval Function - Complex Data Types - Piggy Bank - User-Defined Functions - Parameter Substitution – Diagnostic Operator - Word Count Example using Pig - Pig at Yahoo! - Pig Versus Hive.

REFERENCES

1. Seema Acharya, Subhashini Chellappan, Big Data and Analytics‖, Wiley Publications, First Edition,2015
2. Judith Huruwitz, Alan Nugent, Fern Halper, Marcia Kaufman, Big data for dummies‖, John Wiley & Sons, Inc. (2013)
3. Tom White, Hadoop The Definitive Guide‖, O‘Reilly Publications, Fourth Edition 2015
4. Dirk Deroos, Paul C.Zikopoulos, Roman B.Melnky, Bruce Brown, Rafael Coss, Hadoop For Dummies‖, Wiley Publications, 2014
5. Robert D.Schneider, Hadoop For Dummies‖, John Wiley & Sons, Inc. (2012)

WEB REFENCES

1. https://measiit.edu.in/wp-content/uploads/435C2B-BIGDATA.pdf
2. https://oms.bdu.ac.in/ec/admin/contents/175_P16CSE5A-P16ITE3A_2020052206242390.pdf

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART – III	**CORE: XI**	24CAP11	**ADVANCED NETWORKS**	**48**	**4**

Contact hours per semester: 48
Contact hours per week: 4

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
I	**II**	**25**	**75**	**100**

Preamble

This course provides a comprehensive understanding of data communication and networking , from basic concepts to advanced applications. Also students will gain practical skills in IP addressing, routing techniques, and network solution design, optimizing performance and reliability.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic concepts of data communication and networks	K1
CO2	Gain knowledge on internet protocol layer, IP addressing, routing techniques, UDP and TCP	K2
CO3	Apply IP addressing and routing techniques in real-time networking scenarios.	K3
CO4	Analyze various routing algorithms and their impact on network performance.	K4
CO5	Evaluate addressing schemes and routing algorithms to determine their suitability for different networking scenarios.	K5
C06	Design comprehensive network solutions by applying advanced addressing schemes and routing algorithms to optimize performance and reliability.	K6

K1 – Remember;K2 – Understand; K3 – Apply;K4 – Analyze; K5 – Evaluate; K6 – Create

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**9**	**9**	**3**
CO2	**9**	**9**	**9**	**9**	**9**	**9**	**3**
CO3	**9**	**9**	**9**	**9**	**9**	**9**	**3**
CO4	**9**	**9**	**9**	**9**	**3**	**3**	**3**
CO5	**9**	**9**	**9**	**9**	**3**	**3**	**3**
CO6	**9**	**9**	**9**	**9**	**3**	**3**	**3**
Total contribution of COs to POs	**54**	**54**	**54**	**54**	**36**	**36**	**18**
Weighted Percentage COs Contribution to POs	**4.2**	**4.2**	**4.2**	**4.2**	**6.0**	**3.1**	**4.5**

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT

UNIT I INTRODUCTION TO DIGITAL NETWORKS (10 Hours)

WAN - WAN standards - Introduction TCP/IP and Internet - network technologies - TCP/IP features, protocol standards Internetworking concepts and Architectural model - Network interface layer.

UNIT II IP LAYER (10 Hours)

Internet Address - Mapping Internet Address to Physical Address - Determining an Internet address at startup - Transparent gateways and subnet addressing - multicast addressing - client-server model of interaction - bootstrap protocol - domain name system - address discovery and binding.

UNIT III INTERNET PROTOCOL (10 Hours)

Connectionless Datagram delivery - data Structures and input processing. Routing IP datagrams - error and control messages - protocol layering - user datagram protocol - reliable stream transport service - fragmentation and reassembly. Routing: Cores - peers and algorithms - autonomous systems – interior gateways protocols - routing table and routing algorithms

UNIT IV UDP (10 Hours)

User datagrams. TCP: Data structures and Input processing - finite state machine implementation - output processing – timer management - flow control and adaptive retransmission - urgent data processing and the push function - socket level interfaces

UNIT V APPLICATION LAYER (8 Hours)

Remote login - File transfer Access - electronic mails - Internet management. X.25 networks and support protocols.

REFERENCES

1. Douglas E. Comer, “Internetworking with TCP/IP Volume I”, Prentice Hall Publications, Edition 1991.
2. Douglas E. Comer, David L. Stevens, “Internetworking with TCP/IP Volume II”, Prentice Hall, Edition 1991.
3. Uyless Black, “TCP/IP & Related Protocols” McGraw-Hill Publications, Edition 1995.

WEB REFERNCES

1. https://www.geeksforgeeks.org/what-is-digital-networking/
2. https://www.cloudflare.com/learning/network-layer/internet-protocol/

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART – III	CORE: XII	24CAP12	SOFTWARE ENGINEERING	48	4

Contact hours per semester: 48

Contact hours per week: 4

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
I	II	25	75	100

Preamble

To understand the principles of Software Quality Control and to enable the students to learn the concepts of Software Engineering

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Remind foundational concepts, process characteristics and phases of software development life cycle.	K1
CO2	Understand the challenges, processes, requirement engineering, design principles, testing strategies, and maintenance processes in software engineering.	K2
CO3	Apply project management methodologies and estimation techniques such as COCOMO and empirical methods for accurate project planning and execution.	K3
CO4	Compare principles of cohesion, coupling, both Function Oriented Design and Object Oriented Design for an optimal design strategies for specific software development scenarios.	K4
CO5	Evaluate software engineering challenges and various software development process models for recommending suitable models for specific project requirements.	K5
CO6	Design comprehensive solutions that address complex real-world problems in software development effectively.	K6

K1 – Remember;K2 – Understand; K3 – Apply;K4 – Analyze; K5 – Evaluate; K6 – Create

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	3
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	9	9	3
CO4	9	9	9	9	3	3	3
CO5	9	9	9	9	3	3	3
CO6	9	9	9	9	3	3	3
Total contribution of COs to POs	54	54	54	54	36	36	18
Weighted Percentage COs Contribution to POs	4.2	4.2	4.2	4.2	6.0	3.1	4.5

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT

UNIT I INTRODUCTION (10 Hours)

The Problem Domain – Software Engineering Challenges - Software Engineering Approach – Software Processes: Software Process – Characteristics of a Software Process – Software Development Process Models – Other software processes.

UNIT II SOFTWARE REQUIREMENTS ANALYSIS AND SPECIFICATION (10 Hours)

Requirement engineering – Type of Requirements – Feasibility Studies – Requirements Elicitation – Requirement Analysis – Requirement Documentation – Requirement Validation – Requirement Management – SRS - Formal System Specification – Axiomatic Specification – Algebraic Specification - Case study: Student Result management system. Software Quality Management – Software Quality, Software Quality Management System, ISO 9000, SEI CMM.

UNIT III SOFTWARE PROJECT MANAGEMENT (10 Hours)

Responsibilities of a software project manager – Project planning – Metrics for Project size estimation – Project Estimation Techniques – Empirical Estimation Techniques – COCOMO – Halsteads software science – Staffing level estimation – Scheduling – Organization and Team Structures – Staffing – Risk management – Software Configuration Management – Miscellaneous Plan.

UNIT IV SOFTWARE DESIGN (10 Hours)

Outcome of a Design process – Characteristics of a good software design – Cohesion and coupling - Strategy of Design – Function Oriented Design – Object Oriented Design - Detailed Design - IEEE Recommended Practice for Software Design Descriptions.

UNIT V SOFTWARE TESTING (8 Hours)

A Strategic approach to software testing – Terminologies – Functional testing – Structural testing – Levels of testing – Validation testing - Regression testing – Art of Debugging – Testing tools - Metrics-Reliability Estimation.Software Maintenance - Maintenance Process - Reverse Engineering – Software Re-engineering - Configuration Management Activities.

REFERENCES

1. Pankaj Jalote "An Integrated Approach to Software Engineering" Narosa Publishing House, Delhi, 3rd Edition. **(Unit – I Chapters: 1.1 to 1.3, 2.1 to 2.4) (Unit – IV Chapters 8.1 to 8.3) (Unit – V Chapter 10.6)**
2. Rajib Mall ,"Fundamentals of Software Engineering", PHI Publication, 3rd Edition. **(Unit – II Chapters 4.1 to 4.9, 11.3 to 11.6) (Unit – III Chapters 3.1 to 3.14) (Unit – V Chapters 5.1 to 5.3)**
3. K.K. Aggarwal and Yogesh Singh,"Software Engineering" –, New Age International Publishers, 3rd Edition. **(Unit – II Chapters 4.2 to 4.5) (Unit – IV Chapters 5.3 to 5.6) (Unit – V Chapters 8.1 to 8.8, 9.1 to 9.2, 9.5 to 9.8)**
4. R. S. Pressman ,"A Practitioners Approach- Software Engineering", McGraw Hill Publications, 6th Edition.
5. Carlo Ghezzi, M. Jarayeri, D. Manodrioli, "Fundamentals of Software Engineering" PHI Publication, 2nd Edition.

WEB REFERNCES

1. https://www.geeksforgeeks.org/software-engineering-introduction-to-software-engineering/
2. https://www.javatpoint.com/software-engineering-requirement-analysis
3. https://www.tutorialspoint.com/software_engineering/software_design_basics.htm

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART – III	**CORE: XIII PRACTICAL: IV**	24CAP13	**DATA STRUCTURES AND ALGORITHMS - PRACTICAL**	**48**	**2**

Contact hours per semester: 48
Contact hours per week: 4

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
I	**II**	**40**	**60**	**100**

Preamble

The course presents various data structures and algorithms with its implementation in JAVA to obtain practical understanding of their concepts and applications.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Recall various data structures, algorithms and sorting methods while writing programs	K1
CO2	Demonstrate the concepts of data structures and algorithms using Java	K2
CO3	Select appropriate data structure and algorithm to solve a specific problem	K3
CO4	Analyze various algorithms with respect to their computational efficiency	K4
CO5	Justify the application of a specific algorithm to solve the given problem with respect to its space and time complexity	K5
CO6	Develop software in Java using various data structures and algorithms for real time applications	K6

K1 – Remember; K2 – Understand; K3 – Apply;
K4 – Analyze; K5 – Evaluate; K6 – Create.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	3
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	9	9	3
CO4	9	9	9	9	9	9	3
CO5	9	9	9	9	3	9	3
CO6	9	9	9	9	9	9	3
Total contribution of COs to POs	54	54	54	54	48	54	18
Weighted Percentage COs Contribution to POs	4.2	4.2	4.2	4.2	7.9	4.6	4.5

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT

1. Implement push and pop operations in a stack.
2. Illustrate insert and delete operations in a queue.
3. Demonstrate insertion and deletion operations in a singly linked list.
4. Convert an infix expression to postfix expression and evaluate it.
5. Analyze in order, pre order and post order traversal of a binary tree.
6. Implement breadth first and depth first search algorithm in a graph.
7. Assess binary search using divide and conquer method
8. Perform quick sort using divide and conquer method
9. Construct minimum cost spanning tree using Kruskal algorithm
10. Execute Job sequencing with deadlines using Greedy algorithm
11. Solve knapsack problem using dynamic programming
12. Solve Travelling Salesman problem using dynamic programming

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART – III	**CORE: XIV PRACTICAL : V**	24CAP14	**BIG DATA ANALYTICS – PRACTICAL**	**48**	**2**

Contact hours per semester: 48
Contact hours per week: 4

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
I	**II**	**40**	**60**	**100**

Preamble

This course is designed to equip the students to analyze, evaluate, and create solutions for a variety of big data problems using the Hadoop ecosystem.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Recognize various data structures, algorithms and sorting methods	K1
CO2	Visualize the range of data structure and algorithm concepts	K2
CO3	Apply appropriate data structures and algorithm to solve real time applications	K3
CO4	Investigate various data structures and algorithm to uncover optimal solutions for the computational problems	K4
CO5	Justify the relevance of an algorithm for a specific application with respect to space and time complexity	K5
CO6	Devise innovative and efficient data structure and algorithm for solving the complex real time problems	K6

K1 – Remember; K2 – Understand; K3 – Apply;
K4 – Analyze; K5 – Evaluate; K6 – Create.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO2	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO3	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO4	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO5	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO6	**9**	**9**	**9**	**9**	**3**	**9**	**3**
Total contribution of COs to POs	**54**	**54**	**54**	**54**	**18**	**54**	**18**
Weighted Percentage COs Contribution to POs	**4.2**	**4.2**	**4.2**	**4.2**	**3.0**	**4.6**	**4.5**

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT

1. Word count application in Hadoop.
2. Sorting the data using MapReduce.
3. Finding max and min value in Hadoop.
4. Implementation of decision tree algorithms using MapReduce.
5. Implementation of K-means Clustering using MapReduce.
6. Generation of Frequent Itemset using MapReduce.
7. Count the number of missing and invalid values through joining two large given datasets.
8. Using hadoop's map-reduce, Evaluating Number of Products Sold in Each Country in
9. The online shopping portal. Dataset is given.
10. Analyze the sentiment for product reviews; this work proposes a MapReduce technique provided by Apache Hadoop.
11. Trend Analysis based on Access Pattern over Web Logs using Hadoop.

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)

PART – III	**Core : XV Elective : II**	24CAP15A	**FRONT END DEVELOPMENT AND REACT**	**36**	**4**

Contact hours per semester: 36
Contact hours per week: 3

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
I	**II**	**25**	**75**	**100**

Preamble

The Paper offers the depth understanding and knowledge of front end development tools and REACT JS

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the various stacks available for web application development	K1
CO2	Visualize the use of Node.js for application development	K2
CO3	Apply and develop applications with MongoDB	K3
CO4	Investigate various data structures and algorithm to uncover optimal solutions for the computational problems	K4
CO5	Justify the Use the features of Angular and Express	K5
CO6	Devise and develop React applications	K6

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate;K6 – Create.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO2	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO3	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO4	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO5	**9**	**9**	**9**	**9**	**3**	**9**	**1**
CO6	**9**	**9**	**9**	**9**	**3**	**9**	**1**
Total contribution of COs to POs	**54**	**54**	**54**	**54**	**18**	**54**	**14**
Weighted Percentage COs Contribution to POs	**4.2**	**4.2**	**4.2**	**4.2**	**3.0**	**4.6**	**3.5**

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT

UNIT I **BASICS OF FULL STACK** **(7 Hours)**

Understanding the Basic Web Development Framework - User - Browser – Webserver - Backend Services – MVC Architecture - Understanding the different stacks –The role of Express – Angular – Node – Mongo DB – React

UNIT II **NODE JS** **(8 Hours)**

Basics of Node JS-Installation – Working with Node packages – Using Node package manager – Creating a simple Node.js application – Using Events – Listeners –Timers - Callbacks – Handling Data I/O – Implementing HTTP services in Node.js

UNIT III **MONGO DB** **(7 Hours)**

Understanding NoSQL and MongoDB – Getting started with MongoDB – Getting Started with MongoDB and Node.js – Manipulating MongoDB Documents from Node.js - Saving Documents in a Collection - Upserting Documents in Collection - Deleting Documents from a Collection - Removing a Single Document from a Collection

UNIT IV **ACCESSING MONGO DB and NODE JS** **(7 Hours)**

Accessing MongoDB from Node.js– Using Mongoose for Structured Schema and Validation Removing Documents Using Mongoose - Removing a Single Document - Removing Multiple Documents - Aggregating Documents Using Mongoose - Using the Validation Framework - Implementing Middleware Functions

UNIT V **Express in NODE JS** **(7 Hours)**

Advanced MongoDB Concepts- Adding Indexes - Using Capped Collections Applying Replication - Implementing Sharding- Repairing a MongoDB Database - Backing Up MongoDB - Implementing Express in Node.js- Getting Started with Express - Configuring Routes - Using Requests Objects - Using Response Objects - Implementing a Template Engine - Defining the Engine - Adding Locals- Creating Templates - Rendering Templates in a Response

REFERENCES

1. Brad Dayley, Brendan Dayley, Caleb Dayley, 'Node.js, MongoDB and Angular Web Development', Addison-Wesley, Second Edition, 2018
2. Vasan Subramanian, 'Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node', Second Edition, Apress, 2019.
3. Chris Northwood, 'The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer', Apress; 1st edition, 2018
4. Kirupa Chinnathambi, 'Learning React: A Hands-On Guide to Building Web Applications Using React and Redux', Addison-Wesley Professional, 2nd edition, 2018

WEB REFERNCES

1. https://www.tutorialspoint.com/the_full_stack_web_development/index.asp
2. 4.https://www.coursera.org/specializations/full-stack-react
3. https://www.udemy.com/course/the-full-stack-web-development/

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)

PART – III	Core : XV Elective : II	24CAP15B	MACHINE LEARNING	36	4

Contact hours per semester: 36
Contact hours per week: 3

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
I	II	25	75	100

Preamble

The Paper offers the depth understanding and knowledge of different data structures, algorithms and their applications.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Recognize various machine learning concepts	K1
CO2	Visualize the range of machine learning models	K2
CO3	Apply appropriate tree and probabilistic models to solve real time applications	K3
CO4	Investigate various data structures and algorithm to uncover optimal solutions for the computational problems	K4
CO5	Justify the relevance of an algorithm for a specific artificial neural networks and its techniques	K5
CO6	Devise innovative and efficient clustering algorithms for solving the complex real time problems	K6

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	9	3
CO2	9	9	9	9	3	9	3
CO3	9	9	9	9	3	9	3
CO4	9	9	9	9	3	9	3
CO5	9	9	9	9	3	9	1
CO6	9	9	9	9	3	9	1
Total contribution of COs to POs	54	54	54	54	18	54	14
Weighted Percentage COs Contribution to POs	4.2	4.2	4.2	4.2	3.0	4.6	3.5

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT

UNIT I INTRODUCTION TO MACHINE LEARNING (8 Hours)

Introduction – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis –Version Spaces and the Candidate Elimination Algorithm–Linear Discriminants–Perceptron–Linear Separability – Linear Regression

UNIT II MACHINE LEARNING MODELS (10 Hours)

Linear Models–Multi-Layer Perceptron–Going Forwards–Going Backwards: Back Propagation Error – Multi-Layer Perceptron in Practice – Examples of using the MLP–Overview–Deriving Back-Propagation–Radial Basis Functions and Splines–Concepts–RBF Network–Curse of Dimensionality– Interpolations and Basis Functions–Support Vector Machines.

UNIT III TREE & PROBABILISTIC MODEL (8 Hours)

Tree and Probabilistic Models–Learning with Trees–Decision Trees–Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Probability and Learning – Data into Probabilities– Basic Statistics– GaussianMixtureModels–NearestNeighborMethods–UnsupervisedLearning– Kmeans Algorithms–Vector Quantization–Self Organizing Feature Map.

UNIT IV ARTIFICIAL NEURAL NETWORKS (5 Hours)

Introduction-Biological motivation- ANN representation- appropriate problem for ANN learning- Perceptron- multilayer networks and the back propagation algorithm- Genetic Algorithms–Genetic Offspring–Genetic Operators– Using Genetic Algorithms–Reinforcements Learning–Overview–Getting Lost Example–Markov Decision Process.

UNIT V ENSEMBLES (5 Hours)

Introduction-Bagging and boosting-Random forest-. Clustering: Introduction, K-mean clustering, agglomerative hierarchical clustering

REFERENCES

1. Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997.
2. Alpaydin, Ethem. Introduction to machine learning. MIT press, 2020.
3. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.
4. JasonBell,- Machine Learning– Handson for Developers and Technical professionals, FirstEdition,Wiley,2014

WEB REFERNCES

1. https://www.geeksforgeeks.org/introduction-machine-learning/
2. https://www.researchgate.net/figure/A-probabilistic-decision-tree-The-decisions-are-modeled
3. https://www.javatpoint.com/probabilistic-model-in-machine-learning
4. https://aws.amazon.com/what-is/neural-network/

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)

PART – III	**Core XVI Elective: II – Practical VI**	24CAP16A	**FRONT END DEVELOPMENT PRACTICAL**	**36**	**2**

Contact hours per semester: 36
Contact hours per week: 3

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
I	**II**	**40**	**60**	**100**

Preamble

This course is designed to equip the students to analyze, evaluate, and create solutions for a variety of Front End problems using the REACT and NODE JS

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Recognize various javascript options	K1
CO2	Visualize the NODEJS with HTML and CSS concepts	K2
CO3	Apply appropriate data in MONGODB to solve real time applications	K3
CO4	Investigate various database details connect with MYSQL for the computational problems	K4
CO5	Justify the relevance of NODEJS concepts with REACT	K5
CO6	Devise innovative and efficient virtual box for solving the complex real time problems	K6

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO2	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO3	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO4	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO5	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO6	**9**	**9**	**9**	**9**	**3**	**9**	**3**
Total contribution of COs to POs	**54**	**54**	**54**	**54**	**18**	**54**	**18**
Weighted Percentage COs Contribution to POs	**4.2**	**4.2**	**4.2**	**4.2**	**3.0**	**4.6**	**4.5**

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT

1. Create a form and validate the contents of the form using JavaScript.

2. Get data using Fetch API from an open-source endpoint and display the contents in the form of a card.
3. Create a NodeJS server that serves static HTML and CSS files to the user without using Express.
4. Create a database using mongoDB and show all databases
5. Create a program using mongoDB collection
6. Write a program using MongoDB comparison query operators
7. Write a program for MongoDB operators using logical and evaluation
8. Write a program using MongoDB Aggregation Pipelines
9. Use MongoDB Node.js Database Interaction
10. Create a custom server using http module and explore the other modules of **Node JS** like OS, path, event.

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)

PART – III	**CORE: XVI Elective II Practical - VI**	24CAP16B	**MACHINE LEARNING - PRACTICAL**	**36**	**2**

Contact hours per semester: 36
Contact hours per week: 3

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
I	**II**	**40**	**60**	**100**

Preamble

The Paper offers the depth understanding and knowledge of different data structures, algorithms and their applications.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic concepts and techniques of Machine Learning.	K1
CO2	Explain the regression methods, classification methods, clustering methods.	K2
CO3	Understand the inference and learning algorithms for the hidden Markov model.	K3
CO4	Demonstrate Dimensionality reduction Techniques	K4
CO5	Appreciate the underlying mathematical relationships within and across Machine Learning algorithms	K5
CO6	Devise innovative and the paradigms of supervised and un-supervised learning for solving the complex real time problems	K6

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO2	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO3	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO4	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO5	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO6	**9**	**9**	**9**	**9**	**3**	**9**	**3**
Total contribution of COs to POs	**54**	**54**	**54**	**54**	**18**	**54**	**18**
Weighted Percentage COs Contribution to POs	**4.2**	**4.2**	**4.2**	**4.2**	**3.0**	**4.6**	**4.5**

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT

1. Basic exercises on Python Machine Learning Packages such as Numpy, Pandas and matplotlib.
2. Given a dataset. Write a program to compute the Covariance, Correlation between a pair of attributes. Extend the program to compute the Covariance Matrix and Correlation Matrix.
3. Given a set of sample points in N dimensional feature space. Write a program to fit the points with a hyper plane using Linear Regression. Calculate sum of residual error.
4. Write a program that provides option to compute different distance measures between two points in the N dimensional feature space. Consider some sample datasets for computing distances among sample points.
5. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
6. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Python ML library classes can be used for this problem.
7. Write a program to implement perceptron for different learning task.
8. Write programs to implement ADALINE and MADALINE for given learning task.
9. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
10. Write a program to implement K means clustering algorithm. Select your own dataset to test the program. Demonstrate the nature of output with varying value of K.

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART – IV	ABILITY ENHANCEMENT	24AEP01	CYBER SECURITY	24	2

Contact hours per semester: 24
Contact hours per week: 2

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
I	II	100	-	100

Preamble

To understand the basics of cyber security and the security threats in day-to-day activities.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Recall the basic concepts of information security and its types	K1
CO2	Gain knowledge on cyber space issues and cyber security measures	K2
CO3	Identify various risks and threats in cyber space	K3
CO4	Apply security measures to prevent ourselves from threats in social media	K4
CO5	Compare various social media, security issues and measures	K5
CO6	Propose a secured cyber platform for people to connect each other for their social and professional concerns	K6

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	3
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	9	9	3
CO4	9	9	9	9	3	3	3
CO5	9	9	3	3	3	3	3
CO6	9	9	3	3	3	3	3
Total contribution of COs to POs	54	54	42	42	36	36	18
Weighted Percentage COs Contribution to POs	4.2	4.2	3.3	3.3	6.0	3.1	4.5

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT

UNIT I INFORMATION SECURITY (5 Hours)

History of Information Security - Need for Security-**Types of Security:** Physical Security – Network Security –Personal Security –Operation Security –Communication Security - Information Security Threats.

UNIT II INTRODUCTION TO CYBER SECURITY (5 Hours)

Cyber Security: Objectives- Roles- Differences between Information Security and Cyber Security. **Cyber Security Principles:** Confidentiality- Integrity – Availability.

UNIT III RISKS & VULNERABILITIES (5 Hours)

Risk Meaning: Risk Management –Problems of Measuring Risk -Risk Levels-Risk Analyzes-Risk Assessment –Response to Risk Terminology- **Threats:** Components of Threats-Types of Threats- **Vulnerabilities:** Computing System Vulnerabilities –Hardware Vulnerabilities-Software Vulnerabilities-Data Vulnerabilities-Human Vulnerabilities.

UNIT IV SOCIAL MEDIA (5 Hours)

Introduction to social media: What, Why –Pros and cons- Security issues in social media: Mail-Facebook-Whatsapp-Twitter-Preventive and control measures.

UNIT V CASE STUDY (4 Hours)

Impact of social media: Education -Business- Banking-Mobile –Human Life- Present generation-Indian scenario.

WEB REFERENCES

1. https://m.youtube.com/watch?v=o6pgd8gLFHg
2. https://m.youtube.com/watch?v=3rl4ZjZpcHU
3. https://blog.barkly.com/10-fundamental-cybersecurity-lessons-for-beginners
4. https://5social media security risk and how to avoid them.html
5. https://10 cyber security twitter profiles to watch.html
6. https://cyber security in banking 4 trends to watch in 2017.html
7. https://gmail hacking security tips-indian cyber security solutions.html
8. https://why social media sites are the new cyber weapons of.html
9. EBook:A complete guide to Staying Ahead in the Cyber Security Game

SEMESTER – III

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART–III	**Core : XVII**	24CAP17	**ADVANCED JAVA PROGRAMMING**	**48**	**4**

Contact hours per semester: 48
Contact hours per week: 4

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
II	**III**	**25**	**75**	**100**

Preamble

To understand the java class & objects, packages, threads, interfaces and Advanced Java programming concepts.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Outline the concepts of Java Programming Language	K1
CO2	Explain the concepts of packages and multithreads, Java collections, Networking , JDBC and Servlets	K2
CO3	Summarizes the concepts of event handling and graphics programming	K3
CO4	Analyze the networking concepts and socket programming	K4
CO5	Applying the java programming techniques for solving the given problem	K5
CO6	Develop simple projects for the real time applications	K6

K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO2	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO3	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO4	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO5	**9**	**9**	**9**	**9**	**3**	**9**	**1**
CO6	**9**	**9**	**9**	**9**	**3**	**9**	**1**
Total contribution of COs to POs	**54**	**54**	**54**	**54**	**18**	**54**	**14**
Weighted Percentage COs Contribution to POs	**4.2**	**4.2**	**4.2**	**4.2**	**3.0**	**4.6**	**3.5**

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT

UNIT I OVERVIEW OF JAVA (8 Hours)

Introducing Classes: Class Fundamentals – Declaring Objects – Introducing Methods – Constructors – The this keyword – Overloading Methods - Understanding static – final. Inheritance: Inheritance Basics – Using super – Method overriding –Dynamic Method Dispatch- Using Abstract Class

UNIT II JAVA PACKAGES & THREADS (10 Hours)

Packages and Interfaces: Declaring Packages – Access Protection – Importing Packages – Defining, Implementing, Applying Interfaces - Exception Handling: Exception Types – try, catch – throw – throws – finally – Creating User-defined Exceptions. Multithreaded Programming: The Java Thread Model – Creating a Thread – Thread Priorities - String Handling

UNIT III JAVA BEANS, FORMS AND EXPRESSION LANGUAGE (10 Hours)

HTML Forms – Java Beans - Simple Web Application – EL overview – EL and Java Beans - EL and Collectionsa – Functions

UNIT IV JAVA SERVLETS AND JDBC (10 Hours)

Java servelets HTML Forms – Java Applets – Form Basics – Echoservey Servlet- JDBC overview – JDBC Servlet : Employee list – Connection pooling

UNIT V EVENT HANDLING (10 Hours)

Event Handling: Event Model – Event Classes – Event Listeners and Interfaces. – Working with Windows,Graphics, and text- The Tour of Swing Component classes: Icons and JLabels - JText Fields – JButtons - JCombo boxes - JTabbed and JScroll Panes – JTrees– JTables - Servlets

REFERENCES

1. Herbert Schildt, The Complete Reference Java 2, Fifth Edition, TMH Education Pvt. Ltd., 2002
2. C. Muthu, Programming with Java, Vijay Nicole imprints private Limited, 2004
3. Herbert Schildt with Joe O' Neil, Java – Programmer's Reference, TMH, 2004
4. Karl Moss, Java Servlets, TMH, 1999
5. Robert J. Brunner, JSP Practical Guide, ELSEVIER, 2003

WEB REFERENCES

1. https://www.edureka.co/blog/advanced-java-tutorial
2. https://www.javatpoint.com/what-is-advance-java
3. https://www.youtube.com/watch?v=Ae-r8hsbPUo

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART–III	**Core : XVIII**	24CAP18	**DATA SCIENCE**	**48**	**4**

Contact hours per semester: 48
Contact hours per week: 4

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
I	**I**	**25**	**75**	**100**

Preamble

To expose the students with the principles, procedures and techniques of research methodology and assist in planning, carrying and implementing a research project.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Define research and describe the research process and research methods	K1
CO2	Establish a theoretical framework for the research topic, define key terms, definitions and terminology, and identify studies, models and case studies supporting the topic.	K2
CO3	Understand and apply basic research methods including research design, data analysis and interpretation	K3
CO4	Deals with basic statistics required for research	K4
CO5	Provide guidelines for oral and written presentation of research findings.	K5
CO6	Develop report writing in your own words for real time problems	K6

K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO2	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO3	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO4	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO5	**9**	**9**	**9**	**9**	**3**	**9**	**1**
CO6	**9**	**9**	**9**	**9**	**3**	**9**	**1**
Total contribution of COs to POs	**54**	**54**	**54**	**54**	**18**	**54**	**14**
Weighted Percentage COs Contribution to POs	**4.2**	**4.2**	**4.2**	**4.2**	**3.0**	**4.6**	**3.5**

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT

UNIT I BASIC TERMINOLOGY OF DATA SCIENCE (10 hours)

The data science Venn diagram - :Python practices – Domain knowledge – Case studies – Types of Data: Flavors of data – Structured versus Unstructured data – Quantitative versus qualitative data. The four levels of data: The Nominal, ordinal, interval and ratio levels. The five steps of Data Science – Exploring the data

UNIT - II BASIC MATHEMATICS (10 hours)

Basic symbols and terminology – Graphs, Logarithms, Exponents, Set theory – Linear Algebra – Probability: Definitions – Bayesian versus Frequentist – Compound events – Conditional probability – Rules of probability – Collectively exhaustive events – Bayes theorem – Applications of Bayes theorem – Random variables

UNIT – III BASIC STATISTICS (10 hours)

Obtaining data – Sampling data – Measures of centre - measures of variation – measures of relative standing – Point estimates – Sampling distributions – Confidence intervals – Hypothesis tests

UNIT – IV COMMUNICATING DATA (10 hours)

Effective and ineffective visualizations – Scatter plots – Line graphs – Bar Charts – Histograms – Box plots. Correlation versus causation – SimPOn's paradox – verbal communication. Machine Learning: Supervised and Unsupervised learning – Linear regression – Probability, odds and logodds – Dummy variables.

UNIT - V PREDICTION USING ALGORITHMS (8 hours)

Prediction: Naïve-Bayes classification – Decision trees – Unsupervised learning – K-means clustering – choosing an optimal number for K and cluster validation – feature extraction and Principal Component Analysis – Bias variance tradeoff – K folds cross-validation – Grid searching – Ensembling techniques – Neural networks.

REFERNCES

1. Sinan Ozdemir, ":Principles of Data Science", Packt Publishing, First Edition, Birmingham- Mumbai, ISBN: 978-1-78588-791-8, 2016.
2. Joel Grus, "Data Science from Scratch", O'Reilly Publishers, First Edition, 2015.
3. Vijay Kotu & Bala Deshpande, "Data Science Concepts and Practice", Morgan Kaufmann publishers, Second Edition, 2019.

WEB REFERENCES

1. https://aws.amazon.com/what-is/data-science/
2. https://www.analyticsvidhya.com/blog/2024/03/basic-statistics-concepts/
3. https://insightsoftware.com/blog/top-5-predictive-analytics-models-and-algorithms/

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART–III	**Core : XIX**	24CAP19	**RESEARCH METHODOLOGY**	**48**	**4**

Contact hours per semester: 48

Contact hours per week: 4

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
I	**III**	**25**	**75**	**100**

Preamble

To expose the students with the principles, procedures and techniques of research methodology and assist in planning, carrying and implementing a research project.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Define research and describe the research process and research methods	K1
CO2	Establish a theoretical framework for the research topic, define key terms, definitions and terminology, and identify studies, models and case studies supporting the topic.	K2
CO3	Understand and apply basic research methods including research design, data analysis and interpretation	K3
CO4	Deals with basic statistics required for research	K4
CO5	Provide guidelines for oral and written presentation of research findings.	K5
CO6	Develop report writing in your own words for real time problems	K6

K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO2	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO3	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO4	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO5	**9**	**9**	**9**	**9**	**3**	**9**	**1**
CO6	**9**	**9**	**9**	**9**	**3**	**9**	**1**
Total contribution of COs to Pos	**54**	**54**	**54**	**54**	**18**	**54**	**14**
Weighted Percentage COs Contribution to POs	**4.2**	**4.2**	**4.2**	**4.2**	**3.0**	**4.6**	**3.5**

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT

UNIT I RESEARCH METHODOLOGY (10 Hours)

Introduction to Research - Meaning, Objectives and Types – Research approaches – Research methods Vs methodology - Research Process – Criteria of Good Research – Limitations of Research.

UNIT II LITERATURE REVIEW & PROBLEM IDENTIFICATION (10 Hours)

Literature Review - Purpose of Review of Literature – Literature Search Procedure – Sources of Literature – Importance of Review of Literature. Selecting a Research Problem – Problem Definition - Necessity, Techniques and Illustration.

UNIT III RESEARCH DESIGN AND DATA (10 Hours)

Essentials of Research Design - Need, Features of a good design and important concepts - Classifications of Research Design – Basic Principles Of Experimental Design - Measurement and Scaling: Quantitative, Qualitative, Classification of Measure scales, Data Collection, Data Preparation.

UNIT IV MATHEMATICAL MODELING (10 Hours)

Descriptive Statistics - Measures of Central Tendency, Measures of Dispersion, Measure of Skewness, Kurtosis, Measure of Relationship - Regression Analysis - Dependent and Independent variables, Simple Linear Regression model - Hypothesis – Fundamentals of Hypothesis testing –Testing the Hypothesis.

UNIT V REPORT WRITING (08 Hours)

Report Writing - Significance Of Report Writing – Different Steps In Writing Report – Layout Of Research Paper – Types Of Report – Oral Presentation – Mechanics Of Writing Research Report - Precautions Of Writing Research Report -Case study - Preparing a research paper for a scientific journal.

REFERENCES

1. C R Kothari, Gaurav Garg “Research methodology Methods and Techniques”, New Age International publishers, 3rd Edition.
2. Santosh Gupta , “Research Methodology Methods and Statistical Techniques”, Deep & Deep Publishers, Edition 2000.
3. Kumar, “Research Methodology: A Step by Step Guide for Beginners”, Pearson Education, 3rd Edition 2010.

WEB REFERNCES

1. https://ebooks.inflibnet.ac.in/hsp16/chapter/report-writing/
2. https://www.researchgate.net/figure/Different-methodologies-for-using-mathematical-modeling-in-biological-research-a-the_fig2_45603702

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART – III	**Core : XX Practical VII**	24CAP20	**ADVANCED JAVA PROGRAMMING-PRACTICAL**	**48**	**2**

Contact hours per semester: 48
Contact hours per week: 4

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
II	**III**	**40**	**60**	**100**

Preamble:

The Course provides hands on experience on implementing the concepts of object oriented programming, event driven programming, packages, JDBC and JSP.

Course Outcomes:

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

CO Number	CO Statement	Knowledge Level
CO1	Recall the concepts of Java Programming Language	K1
CO2	Understand the concepts of packages and multithreads	K2
CO3	Apply JDBC concept for database connectivity	K3
CO4	Analyze the networking concepts in java programming	K4
CO5	Illustrate event handling concepts and servlet	K5
CO6	Develop simple projects for the real time applications	K6

K1 – Remember; K2 – Understand; K3 – Apply;
K4 – Analyze; K5 – Evaluate; K6 – Create.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**9**	**9**	**3**
CO2	**9**	**9**	**9**	**9**	**9**	**9**	**3**
CO3	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO4	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO5	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO6	**9**	**9**	**9**	**9**	**3**	**9**	**3**
Total contribution of COs to Pos	**54**	**54**	**54**	**54**	**30**	**54**	**18**
Weighted Percentage COs Contribution to POs	**4.2**	**4.2**	**4.2**	**4.2**	**5.0**	**4.6**	**4.5**

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT

1. Demonstrate the multilevel inheritance.
2. Generate students mark sheet using package concept.
3. Create a thread using Thread class.
4. Create a POPUP Message Program Using Event in Java script
5. Generate Java Script Timer
6. Apply Javabeans concepts
7. Create Login Form using JSP
8. Display Employee list using JDBC
9. Apply swing components.
10. Implement Servlet concepts.

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART – III	CORE: XXI PROJECT: I	24CAP21	MINI PROJECT AND VIVA VOCE	60	3

Contact hours per semester: 60
Contact hours per week: 5

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
II	III	20	80	100

Preamble

The Proposed Paper intends students to apply the programming knowledge into a real- world situation/problem and promote the concept of entrepreneurship.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Describe the systematic approach for handling a projects	K1
CO2	Illustrate the methodologies and professional way of documentation and communication.	K2
CO3	Demonstrate the key stages in development of the project.	K3
CO4	Analyze the various requirements of the given project	K4
CO5	Evaluate the relevance and level of achievement of project objectives	K5
CO6	Develop innovative thinking and thereby get prepared for main project	K6

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	3
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	9	9	3
CO4	9	9	9	9	3	3	3
CO5	9	9	9	9	3	3	3
CO6	9	9	9	9	3	3	3
Total contribution of COs to Pos	54	54	54	54	36	36	18
Weighted Percentage COs Contribution to POs	4.2	4.2	4.2	4.2	6.0	3.1	4.5

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART–III	**Core : XXII Elective III**	24CAP22A	**FULL STACK DEVELOPMENT TOOLS**	**36**	**4**

Contact hours per semester: 36

Contact hours per week: 3

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
II	**III**	**25**	**75**	**100**

Preamble

To expose the students with the principles, procedures and techniques of research methodology and assist in planning, carrying and implementing a research project.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Define research and describe the research process and research methods	K1
CO2	Establish a theoretical framework for the research topic, define key terms, definitions and terminology, and identify studies, models and case studies supporting the topic.	K2
CO3	Understand and apply basic research methods including research design, data analysis and interpretation	K3
CO4	Deals with basic statistics required for research	K4
CO5	Provide guidelines for oral and written presentation of research findings.	K5
CO6	Develop report writing in your own words for real time problems	K6

K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO2	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO3	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO4	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO5	**9**	**9**	**9**	**9**	**3**	**9**	**1**
CO6	**9**	**9**	**9**	**9**	**3**	**9**	**1**
Total contribution of COs to Pos	**54**	**54**	**54**	**54**	**18**	**54**	**14**
Weighted Percentage COs Contribution to Pos	**4.2**	**4.2**	**4.2**	**4.2**	**3.0**	**4.6**	**3.5**

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT

UNIT I **ANGULAR** **(8 hours)**

Getting Started with Angular- Why Angular?- Understanding Angular- Adding Angular to Your Environment- Using the Angular CLI- Creating a Basic Angular Application

UNIT II **ANGULAR COMPONENTS** **(5 hours)**

Component Configuration- Building a Template- Using Constructors- Using External Templates- Injecting Directives- Expressions- Using Expressions- Using Pipes- Building a Custom Pipe

UNIT III **ADVANCED ANGULAR** **(5 hours)**

Custom Directives- Events and Change Detection- Using Browser Events - Emitting Custom Events- Using Observables

UNIT IV **MERN and REACT** **(8 hours)**

What's MERN? - MERN Components- Why MERN?- Server-Less Hello World- JSX- Express- Separate Script File- JSX Transform- Older Browsers Support – Automate – Basic React applications

UNIT V **REACT COMPONENTS** **(10 hours)**

React Components – React State – Express REST APIs - Modularization and Webpack - Routing with React Router – Server-side rendering

REFERNCES

1. Brad Dayley, Brendan Dayley, Caleb Dayley, 'Node.js, MongoDB and Angular Web Development', Addison-Wesley, Second Edition, 2018
2. Vasan Subramanian, 'Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node', Second Edition, Apress, 2019.

WEB REFERENCES:

1. https://abdullahsurati.github.io/bscit/wp.html
2. https://github.com/wambugucoder/SOFTWARE-ENGINEERING-BOOKS/blob/master/Fullstack%20React.pdf

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART–III	**Core : XXII Elective III**	24CAP22B	**DEEP LEARNING**	**36**	**4**

Contact hours per semester: 36
Contact hours per week: 3

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
I	**I**	**25**	**75**	**100**

Preamble

To expose the students with the principles, procedures and techniques of research methodology and assist in planning, carrying and implementing a research project.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic concepts and techniques of Deep Learning.	K1
CO2	Establish a theoretical framework and apply the Machine learning principles	K2
CO3	Understand and apply the deep learning models in various algorithms	K3
CO4	Deals with basic of CNN	K4
CO5	Provide guidelines for RNN and Tenserflow	K5
CO6	Develop reinforcement learning with deep learning techniques	K6

K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO2	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO3	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO4	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO5	**9**	**9**	**9**	**9**	**3**	**9**	**1**
CO6	**9**	**9**	**9**	**9**	**3**	**9**	**1**
Total contribution of COs to Pos	**54**	**54**	**54**	**54**	**18**	**54**	**14**
Weighted Percentage COs Contribution to POs	**4.2**	**4.2**	**4.2**	**4.2**	**3.0**	**4.6**	**3.5**

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

UNIT I INTRODUCTION TO LEARNING (8 hours)

The Neural Network – Limits of Traditional Computing – Machine Learning – Neuron – FF Neural Networks – Types of Neurons – Softmax output layers- Training Feed-Forward Neural Networks- Gradient Descent- The Delta Rule and Learning Rates - Gradient Descent with Sigmoidal Neurons- The Backpropagation Algorithm- Stochastic and Minibatch Gradient Descent- Test Sets, Validation Sets, and Overfitting- Preventing Overfitting in Deep Neural Networks

UNIT II DEEP LEARNING MODELS (8 hours)

Tensor flow – Variables – Operations – Placeholders – Sessions – Sharing Variables – Graphs – Visualization- Beyond Gradient Descent- Challenges - Model Identifiability- Momentum-Based Optimization - Learning Rate Adaptation

UNIT III CNN (10 hours)

Convolution Neural Network – Feature Selection – Filters and Feature Maps - Convolution Layer- Max Pooling–– Full Architectural Description of Convolution Networks- Closing the Loop on MNIST with Convolutional Networks- Image Preprocessing Pipelines Enable More Robust Models- Accelerating Training with Batch Normalization- Building a Convolutional Network for CIFAR-10- Visualizing Learning in Convolutional Networks- Leveraging Convolutional Filters to Replicate Artistic Styles- Learning Convolutional Filters for Other Problem Domains

UNIT IV RNN (5 hours)

Recurrent Neural Network –LSTM — TensorFlow Primitives for RNN Models- Implementing a Sentiment Analysis Model- Solving seq2seq Tasks with Recurrent Neural Networks- Augmenting Recurrent Networks with Attention- Dissecting a Neural Translation Network- augmented Neural Networks – Neural Turing Machines- Attention-Based Memory Access- NTM Memory Addressing Mechanisms- Differentiable Neural Computers

UNIT V REINFORCEMENT LEARNING (5 hours)

Reinforcement Learning – MDP Policy- Future Return- Discounted Future Return - Explore Versus Exploit- Policy Versus Value Learning- Policy Learning via Policy Gradients –Q-Learning and Deep Q-Networks- The Bellman Equation- Issues with Value Iteration- Approximating the Q-Function- Deep Q-Network (DQN)- Training DQN- Learning Stability- Target Q-Network

REFERENCES

1. Nikhil Buduma, Nicholas Locascio,―Fundamentals of Deep Learning: Designing NextGenerationMachineIntelligenceAlgorithms‖,O'ReillyMedia,2017.
2. IanGoodfellow, YoshuaBengio, AaronCourville, DeepLearning(Adaptive computation and Machine Learning series,MITPress,2017.
3. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016.
4. Ragav Venkatesan, Baoxin Li, “Convolutional Neural Networks in Visual Computing”, CRC Press, 2018.

WEB REFERENCES

1. https://www.sciencedirect.com/topics/computer-science/deep-learning-model
2. https://www.geeksforgeeks.org/introduction-convolution-neural-network/
3. https://www.geeksforgeeks.org/introduction-to-recurrent-neural-network/
4. https://aws.amazon.com/what-is/reinforcement-learning

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART – III	**Core : XXIII Elective III – Practical – VIII**	24CAP23A	**FULL STACK DEVELOPMENT TOOLS- PRACTICAL**	**36**	**2**

Contact hours per semester: 36
Contact hours per week: 3

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
I	**II**	**40**	**60**	**100**

Preamble

This course is designed to equip the students to analyze, evaluate, and create solutions for a variety of Front End problems using the REACT and NODE JS

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Recognize various REACT options	K1
CO2	Visualize the search filter and REACT select concepts	K2
CO3	Apply javascript concepts for website creation	K3
CO4	Investigate various REACT components	K4
CO5	Justify the relevance of Angular JS with REACT	K5
CO6	Devise innovative and efficient style sheets for solving real time problems	K6

K1 – Remember; K2 – Understand; K3 – Apply;
K4 – Analyze; K5 – Evaluate; K6 – Create.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO2	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO3	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO4	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO5	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO6	**9**	**9**	**9**	**9**	**3**	**9**	**3**
Total contribution of COs to POs	**54**	**54**	**54**	**54**	**18**	**54**	**18**
Weighted Percentage COs Contribution to POs	**4.2**	**4.2**	**4.2**	**4.2**	**3.0**	**4.6**	**4.5**

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT:

1. Creating a "Hello World" Component using angular
2. Build Search filter in React
3. Create React Select Dropdown with Search and Multi-select
4. Create countdown timer for your Shopify Store
5. How to Build Website visitor counter in JavaScript using angular
6. Create a counter component that starts at zero and increments by one each time a button is clicked
7. Create a component that toggles the visibility of a piece of text when a button is clicked
8. Create a context that holds a user's name and a function to update it
9. Create a component with an input field and a button
10. Create a parent component with a piece of state. Then, create a child component that can update this state.

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART – III	**Core : XXIII Elective III – Practical – VIII**	24CAP23B	**DEEP LEARNING - PRACTICAL**	**36**	**2**

Contact hours per semester: 36
Contact hours per week: 3

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
I	**II**	**25**	**75**	**100**

Preamble

This course is designed to equip the students to analyze, evaluate, and create solutions for a variety of Front End problems using the REACT and NODE JS

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Recognize various feed forward neural networks	K1
CO2	Visualize the backpropogation and regularization concepts	K2
CO3	Apply Tenserflow models	K3
CO4	Investigate various database details connect with MYSQL for the computational problems	K4
CO5	Justify the filter concepts in CNN	K5
CO6	Devise innovative and efficient Q-learning algorithm	K6

K1 – Remember; K2 – Understand; K3 – Apply;
K4 – Analyze; K5 – Evaluate; K6 – Create.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO2	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO3	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO4	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO5	**9**	**9**	**9**	**9**	**3**	**9**	**3**
CO6	**9**	**9**	**9**	**9**	**3**	**9**	**3**
Total contribution of COs to POs	**54**	**54**	**54**	**54**	**18**	**54**	**18**
Weighted Percentage COs Contribution to POs	**4.2**	**4.2**	**4.2**	**4.2**	**3.0**	**4.6**	**4.5**

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT:

1. Build a simple feed-forward neural network using TensorFlow/Keras.
2. Implement the backpropagation algorithm to train a neural network on a dataset
3. Apply techniques such as dropout regularization or early stopping to prevent overfitting.
4. Create a TensorFlow graph for a simple arithmetic operation.
5. Implement momentum-based optimization or learning rate adaptation techniques in TensorFlow.
6. Construct a CNN architecture using TensorFlow/Keras for a dataset like CIFAR-10.
7. Visualize learned filters in a trained CNN and their effect on different types of images.
8. Implement a sentiment analysis model using LSTM or GRU cells in TensorFlow.
9. Simulate a basic NTM using TensorFlow primitives.
10. Implement a Q-learning algorithm to solve a simple grid world problem.

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART – III	CORE : XXIV		GREEN COMPUTING	36	2

**Open Elective offered for students of other PG Programmes /Departments*

Contact hours per semester: 36

Contact hours per week: 3

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
I	III	25	75	100

Preamble

To acquire knowledge to adopt green computing practices to minimize negative impacts on the environment, skill in energy saving practices in their use of hardware, examine technology tools that can reduce paper waste and carbon footprint by user.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Label the problems concerning with e-waste and its consequences on environment	K1
CO2	Describe the components involved and how effectively we can achieve cost saving without harming environment	K2
CO3	Inspect the procedural aspects towards going green.	K3
CO4	Categorize the means of green compliance	K4
CO5	Specify the certifications necessary for hardware devices	K5
CO6	Assess the green metrics adopt for the entire organization	K6

K1 – Remember; K2 – Understand; K3 – Apply;
K4 – Analyze; K5 – Evaluate; K6 – Create.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	9	9	9	9	3	9	3
CO2	9	9	3	9	3	9	3
CO3	9	9	9	9	3	9	3
CO4	9	6	9	6	3	6	3
CO5	9	6	3	3	3	3	3
CO6	3	3	3	6	3	6	3
Total contribution of Os to POs	48	42	36	42	18	42	18
Weighted Percentage COs Contribution to POs	3.7	3.2	2.8	3.3	3.0	3.6	4.5

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT:

UNIT I Green Computing Essentials (6 Hours)

Overview and Issues: Introduction - green Computing - Problems – Your Company's Carbon Footprint – Cost Savings. **Initiatives and Standards**: Global Initiatives.

UNIT II Green Computing Tribulations and Optimizations (8 Hours)

Minimizing Power Usage: Power problems - Monitoring power Usage – Reducing Power Usage – Low power Computers – Components. **Cooling:** Cooling Costs – Reducing Cooling Costs – Adding Cooling – Datacenter Design.

UNIT III Green Enterprise Transforming (7 Hours)

Changing the Way of Work: Old Behaviour – Steps – Teleworkers and Outsourcing. **Going Paperless:** Paper Problems – Paper and Office – Going Paperless – Intranets – Electronic Data Interchange (EDI).

UNIT IV Green Compliance (7 Hours)

Recycling: Problems – Means of Disposal – Life Cycle – Hard Drive Recycling. **Hardware Considerations**: Certification Programs – Energy Star.

UNIT V Green Accomplishment (8 Hours)

Greening Your Information Systems: Initial Improvement Calculations – Change Business Process – Improve Technology Infrastructure. **Staying Green:** Organizational Check-ups – Equipment Check-ups – Certifications – Helpful Organizations.

TEXT BOOKS:

1. Tushar Sambare , Sonali Sambare: Green Computing, Himalaya Publishing House, First Edition 2008.

REFERENCE BOOKS:

1. Carl Speshocky, Empowering Green Initiatives with IT, John Wiley & Sons, 2010.
2. Jason Harris, Green Computing and Green IT- Best Practices on regulations & Industry, Lulu.com, 2008.

WEB REFERENCE:

1.https://www.himpub.com/documents/Chapter1765.pdf
2,https://studymaterialspdf.com/cs8078-green-computing-cse/

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART V	PROFICIENCY ENHANCEMENT	24PECAP01	INTELLECTUAL PROPERTY RIGHTS (SELF STUDY)	-	2

Contact hours per semester: -
Contact hours per week: -

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
II	III	-	100	100

Preamble

To make the students aware of their rights for the protection of their invention done in their project work.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Define the concepts of Intellectual Property Rights	K1
CO2	Explain copyrights, patterns, trademarks, designs and Information Technology Act	K2
CO3	Develop different trademarks using IPR	K3
CO4	Classify different types of IPR.	K4
CO5	Determine to get the knowledge of plagiarism in their innovations which can be questioned legally.	K5
CO6	Design an academic projects and acquire the patent	K6

K1 – Remember; K2 – Understand; K3 – Apply;
K4 – Analyze; K5 – Evaluate; K6 – Create.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	9	3
CO2	9	9	9	9	3	9	3
CO3	9	9	9	9	3	9	3
CO4	9	3	9	3	3	3	3
CO5	9	3	3	3	3	3	3
CO6	9	3	3	3	3	3	3
Total contribution of COs to POs	54	36	42	36	18	36	18
Weighted Percentage COs Contribution to POs	4.2	2.8	3.3	2.8	3.0	3.1	4.5

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

COURSE CONTENT:

Unit I: INTRODUCTION TO IPR

Meaning of property, Origin, Nature, Meaning of Intellectual Property Rights Introduction to TRIPS and WTO-Kinds of Intellectual property rights—Copy Right, Patent, Trade Mark, Trade-Secret and trade dress, Design, Layout Design, Geographical Indication, PlantVarieties and Traditional Knowledge.

Unit II LATENT RIGHTS AND COPY RIGHTS

Origin, Meaning of Patent, Types,Inventions which are not patentable, Registration Procedure, Rights and Duties ofPatentee, Assignment and licence , Restoration of lapsed Patents, Surrender and- Revocation of Patents, Infringement, Remedies & Penalties- COPY RIGHT—Origin, Definition &Types of Copy Right, Registration procedure, Assignment & licence, Terms of Copy Right, Piracy, Infringement, Remedies, Copy rights with special reference to software

Unit III TRADE MARKS

Origin, Meaning & Nature of Trade Marks, Types,- Registration of Trade Marks, Infringement & Remedies, Offences relating to Trade Marks, Passing Off, Penalties– Domain Names on cyber space hours

UNIT IV DESIGN

Meaning, Definition-Object-Registration of Design-Cancellation of Registration, International convention on design, functions of Design.- Semiconductor Integrated circuits and layout design Act-2000.

UNIT V BASIC TENENTS OF INFORMATION TECHNOLOGY ACT-2000

BASIC TENENTS OF INFORMATION TECHNOLOGY ACT-2000 – IT Act – Introduction-E-Commerce and legal provisions- E- Governance and legal provisions- Digital signature and Electronic Signature. Cybercrimes

REFERNCES

1. Intellectual Property Rights and the Law, Gogia Law Agency, by Dr. G.B. Reddy
2. Law relating to Intellectual Property, Universal Law Publishing Co, by Dr. B.L.Wadehra
3. IPR by P. Narayanan
4. Law of Intellectual Property, Asian Law House, Dr.S.R. Myneni

WEB REFERNCES

1. https://dhsgsu.edu.in/images/Reading-Material/Law/UNIT-IV-Second.pdf

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT (C)
PART-III	CORE: XXV PROJECT: II	24CAP24	MAJOR PROJECT AND VIVA-VOCE	-	10

YEAR	SEMESTER	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS
II	IV	100	100	200

Preamble

The Proposed Paper allows students to apply the programming knowledge into a real- world situation/problem and promote the concept of entrepreneurship.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Recall the principles and methodologies of software engineering	K1
CO2	Demonstrate the ability to locate and use technical information from multiple sources.	K2
CO3	Apply the acquired communication, technical and programming skills in the development of the project.	K3
CO4	Analyze a given problem to apply appropriate problem solving methodology	K4
CO5	Validate the feasibility of the project	K5
CO6	Develop real time projects as per industry needs	K6

K1 – Remember; K2 – Understand; K3 – Apply;
K4 – Analyze; K5 – Evaluate; K6 – Create.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	3
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	9	9	3
CO4	9	9	9	9	3	9	3
CO5	9	9	9	9	3	9	3
CO6	9	9	9	9	3	3	3
Total contribution of COs to POs	54	54	54	54	36	48	18
Weighted Percentage COs Contribution to POs	4.2	4.2	4.2	4.2	6.0	4.1	4.5

Level of correlation: 0–No correlation; 1–Low correlation;
3–Medium correlation; 9-High correlation between COs and POs.

a) List of elective courses for Semester - I:

Course Code	Semester	Course	Hours per Week	Credits
24CAP07A	I	Basic Web Development(HTML, CSS and Javascript)	3	4
24CAP07B	I	Data Mining	3	4
24CAP08A	I	Web Development Lab	3	2
24CAP08B	I	Data Mining using R Lab	3	2

b) List of elective courses for Semester - II:

Course Code	Semester	Course	Hours per Week	Credits
24CAP15A	II	Front End Development and REACT	3	4
24CAP15B	II	Machine Learning	3	4
24CAP16A	II	Front End Development practical	3	2
24CAP16B	II	Machine Learning practical	3	2

c) List of elective courses for Semester – III:

Course Code	Semester	Course	Hours per Week	Credits
24CAP22A	III	Full Stack Development Tools	3	4
24CAP22B	III	Deep Learning	3	4
24CAP23A	III	Full Stack Development Tools-practical	3	2
24CAP23B	III	Deep Learning - practical	3	2

d) Courses for Ability Enhancement:

Course Code	Semester	Course	Hours per Week	Credits
24AEP01	II	Cyber Security	2	2

e) Course for Proficiency Enhancement:

Course Code	Semester	Course	Hours per Week	Credits
24PECAP01	III	Intellectual Property Rights (Self Study)	Self Study No instructional Hours	2

f) Courses for Competency Enhancement:

Semester	Course	Hours per Week	Credit
I - IV	Online Course / Learning Object Repository (LOR)	Self-Paced with Faculty mentoring and Support SEMESTER I – IV	**2**
	Certificate Course		**2**
	Student start-up venture / Internship / Capstone project & Viva-voce (Only for MBA with alternate credits for the above components)		**4**

Total Marks: 2800 Total Credits: 95 credits

Chair Person
Name, designation
College name – full address