New Prince Shri Bhavani College of Engineering and Technology

(An Autonomous Institution)

CURRICULUM & SYLLABUS

(REGULATION 2023)

FOR

MCA – MASTER OF COMPUTER APPLICATIONS

(CHOICE BASED CREDIT SYSTEM)

(Applicable to the students admitted from the Academic Year 2023 – 24)

Sl. No.	Course Category	Course Code	Course Title	L	T	P	Total Contact Periods	Credits
			THEORY COURSES					
1	FC	P23MA102	Applied Probability, Statistics and Operations Research	3	1	0	4	4
2	RMC	P23RM102	Research Methodology and IPR	2	0	0	2	2
3	PCC	P23MC101	Advanced Data Structures and Algorithms	3	0	0	3	3
4	PCC	P23MC102	Object Oriented Software Engineering	3	0	0	3	3
5	PCC	P23MC103	Python Programming	3	0	0	3	3
6	PCC	P23MC104	Fundamentals of Accounting	3	0	2	5	4
7	VAC	P23VAXX	*Value Added Courses - I	2	0	0	2	0
			PRACTICAL COURSES					
8	PCC	P23MC105	Advanced Data Structures and Algorithms Laboratory	0	0	3	3	1.5
9	PCC	P23MC106	Python Programming Laboratory	0	0	3	3	1.5
10	EEC	P23EN101	Communication Skills Laboratory	0	0	2	2	1
			TOTAL CREDITS					23

			SEMESTER – II					
Sl. No.	Course Category	Course Code	Course Title	L	T	P	Total Contact Periods	Credits
			THEORY COURSES					
1	PCC	P23MC201	Full Stack Web Development	3	0	0	3	3
2	PCC	P23MC202	Advanced Database Technology	3	0	0	3	3
3	PCC	P23MC203	Cloud Computing Technologies	3	0	0	3	3
4	PCC	P23MC204	Programming with Java	3	0	2	5	4
5	PCC	P23MC205	Big Data Analytics	3	0	0	3	3
6	PEC	P23MCELXX	Professional Elective – I					3
7	VAC	P23VAXX	*Value Added Courses – II	2	0	0	2	0
			PRACTICAL COURSES					
8	PCC	P23MC206	Advanced Database Technology Laboratory	0	0	3	3	1.5
9	PCC	P23MC207	Full Stack Web Development Laboratory	0	0	3	3	1.5
10	EEC	P23EEMC201	Software Development Laboratory	0	0	3	3	1.5
			TOTAL CREDITS					23.5

			SEMESTER – III					
Sl. No.	Course Category	Course Code	Course Title	L	T	P	Total Contact Periods	Credits
			THEORY COURSES					
1	PCC	P23MC301	Machine Learning	3	0	0	3	3
2	PCC	P23MC302	Mobile Application Development	3	0	2	5	4
3	PCC	P23MC303	Cyber Security	3	0	2	5	4
4	PEC	P23MCELXX	Professional Elective – II	3	0	0	3	3
5	PEC	P23MCELXX	Professional Elective – III	3	0	0	3	3
6	OEC	P23OEMCXX	Open Elective	3	0	0	3	3
			PRACTICAL COURSES					
7	PCC	P23MC304	Machine Learning Laboratory	0	0	3	3	1.5
8	EEC	P23EEMC305	Internship	0	0	4	2	2
			TOTAL CREDITS					23.5
			SEMESTER – IV					
Sl. No.	Course Category	Course Code	Course Title	L	T	P	Total Contact Periods	Credits
			THEORY COURSES					
1	EEC	P23EEMC401	Project Work	0	0	24	24	12
			TOTAL CREDITS					12
			OVERALL CREDITS					82

			PROFESSIONAL ELECTIVES					
Sl. No.	Course Category	CourseCode	Course Title	L	T	P	Total Contact Periods	Credits
PROFESSIONAL ELECTIVE – I								
1	PEC	P23MCEL01	Software Project Management	3	0	0	3	3
2	PEC	P23MCEL02	Professional Ethics in IT	3	0	0	3	3
3	PEC	P23MCEL03	E - Learning	3	0	0	3	3
4	PEC	P23MCEL04	Security in computing	3	0	0	3	3
5	PEC	P23MCEL05	Information Retrieval Techniques	3	0	0	3	3
6	PEC	P23MCEL06	Soft Computing Techniques	3	0	0	3	3
7	PEC	P23MCEL07	Adhoc and Sensor Network	3	0	0	3	3
8	PEC	P23MCEL08	Business Data Analytics	3	0	0	3	3
PROFESSIONAL ELECTIVE – II								
1	PEC	P23MCEL09	Internet of Things	3	0	0	3	3
2	PEC	P23MCEL10	Digital Image Processing	3	0	0	3	3
3	PEC	P23MCEL11	Social Network Analytics	3	0	0	3	3
4	PEC	P23MCEL12	Digital Marketing	3	0	0	3	3
5	PEC	P23MCEL13	Advances in Networking	3	0	0	3	3
6	PEC	P23MCEL14	Geological InformationSystems	3	0	0	3	3
PROFESSIONAL ELECTIVE – III								
1	PEC	P23MCEL15	Wireless Networking	3	0	0	3	3
2	PEC	P23MCEL16	Block Chain Technologies	3	0	0	3	3
3	PEC	P23MCEL17	Organizational Behavior	3	0	0	3	3
4	PEC	P23MCEL18	Service Oriented Architecture	3	0	0	3	3
5	PEC	P23MCEL19	Human Resource Management	3	0	0	3	3
6	PEC	P23MCEL20	Software Testing and Quality Assurance	3	0	0	3	3

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Sl. No.	Course Category	CourseCode	Course Title	L	T	P	Total Contact Periods	Credits
OPEN ELECTIVES								
1	OEC	P23OEMC01	Intellectual Property Rights	3	0	0	3	3
2	OEC	P23OEMC02	Machine Learning and Deep Learning	3	0	0	3	3
3	OEC	P23OEMC03	IOT for Smart Systems	3	0	0	3	3
4	OEC	P23OEMC04	Health Care Management	3	0	0	3	3
5	OEC	P23OEMC05	Environmental Sustainability	3	0	0	3	3

Sl. No.	Course Category	CourseCode	Course Title	L	T	P	Total Contact Periods	Credits
VALUE ADDED COURSES (VAC)								
1	VAC	P23VA01	Disaster Management	2	0	0	2	0
2	VAC	P23VA02	Essence of Indian Traditional knowledge	2	0	0	2	0
3	VAC	P23VA03	Constitution of India	2	0	0	2	0
4	VAC	P23VA04	நற்றமிழ் இலக்கியம்	2	0	0	2	0

BRIDGE COURSES
(For the M.C.A students admitted under non-computer-science background category)
Classes are to be conducted and completed before the start of the class of first semester;
Examinations will be conducted along with first semester

Sl. No.	Course Category	CourseCode	Course Title	L	T	P	Total Contact Periods	Credits
1	BC	P23BC01	Data Structures and Algorithms	3	0	2	5	4
2	BC	P23BC02	Programming in C	3	0	2	5	4

Classes are to be conducted and completed before the start of the class of Second semester;Examinations will be conducted along with Second semester

Sl. No.	Course Category	CourseCode	Course Title	L	T	P	Total Contact Periods	Credits
1	BC	P23BC03	Object Oriented Programming	3	0	2	5	4
2	BC	P23BC04	Database Management System	3	0	0	3	3

Classes are to be conducted and completed before the start of the class of Third semester;Examinations will be conducted along with Third semester

Sl. No.	Course Category	CourseCode	Course Title	L	T	P	Total Contact Periods	Credits
1	BC	P23BC05	Introduction to Computer Organization and Operating Systems	3	0	0	3	3
2	BC	P23BC06	Computer Networks	3	0	0	3	3

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P23MA102   APPLIED PROBABILITY, STATISTICS AND OPERATIONS RESEARCH   L T P C

Prerequisites: Probability Theory, Statistics, Optimization Theory   **3 1 0 4**

COURSE OBJECTIVES:

- To provide necessary concepts of probability, random variables and standard distributions applicable to engineering which can describe real life phenomenon.
- To understand the concepts of tests of hypothesis and apply in various statistical data.
- To understand different methods involved in linear programming models, transportation and assignment models.

UNIT I	PROBABILITY AND RANDOM VARIABLES	12

Probability – Axioms of probability – Conditional probability – Baye's theorem – Random variables– Probability function – Moments – Moment generating functions and their properties – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions – Function of a random variable.

UNIT II	TWO DIMENSIONAL RANDOM VARIABLES	12

Joint distributions - Marginal and conditional distributions – Functions of two dimensional random variables – Covariance - Correlation - Regression curve.

UNIT III	TESTING OF HYPOTHESIS	12

Sampling distributions – Type I and Type II errors – Small and Large samples – Tests based on Normal, t, Chi square and F distributions for testing of mean, variance and proportions – Tests for independence of attributes and goodness of fit.

UNIT IV	LINEAR PROGRAMMING MODELS	12

Mathematical Formulation - Graphical Solution of linear programming models – Simplex method – Artificial variable Techniques.

UNIT V	TRANSPORTATION AND ASSIGNMENT MODELS	12

Mathematical formulation of transportation problem- Methods for finding initial basic feasible solution – optimum solution - degeneracy –Mathematical formulation of assignment models – Hungarian Algorithm.

TOTAL: 60 PERIODS

TEXT BOOKS:

1   P Sivaramakrishna Das, C Vijayakumari, "Probability and Statistics", 2nd Edition, Pearson Education, 2020.
2   Taha H A, "Operations Research: An Introduction", 11th Edition, Pearson Education, 2021.

REFERENCES:

1   Oliver C. Ibe, "Fundamentals of Applied probability and Random Processes", Academic Press, 2019.
2   Johnson R A, Gupta C B, "Miller and Freund's Probability and Statistics for Engineers", 9th Edition, Pearson Education, 2017.
3   Panneerselvam R "Operations Research", 3rd Edition, Prentice Hall of India, 2023.

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ONLINE RESOURCES:

1   https://ugcmoocs.inflibnet.ac.in/index.php/courses/view_ug/327

2   https://archive.nptel.ac.in/courses/111/106/111106112/

3   https://archive.nptel.ac.in/courses/110/106/110106062/

COURSEOUTCOMES:

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

CO1   Apply the concepts of probability and random variables in engineering applications.

CO2   Analyze the concepts of two dimensional random variables.

CO3   Apply statistical tests in testing of hypotheses on data.

CO4   Solve linear programming models.

CO5   Apply the concepts of transportation and assignment models in real life applications.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	2	-	-	-	1	-	-	-	1	2	2
CO2	3	3	2	2	-	-	-	1	-	-	-	1	2	2
CO3	3	2	1	2	-	-	-	1	-	-	-	1	2	2
CO4	3	2	1	2	-	-	-	1	-	-	-	1	2	2
CO5	3	2	1	2	-	-	-	1	-	-	-	1	2	2

P23RM102	RESEARCH METHODOLOGY AND IPR	L	T	P	C
		2	0	0	2

Prerequisites: Nil

COURSE OBJECTIVES:

- To gain a comprehensive understanding of various research methods
- To Learn how to formulate research questions, collect data, design research studies, develop hypotheses, and create research plans.
- To explore national and international laws, agreements, and guidelines governing intellectual property rights, and understand their implications for researchers

UNIT I	RESEARCH DESIGN	6

Overview of research process and design, Use of Secondary and exploratory data to answer the research question, Qualitative research, Observation studies, Experiments and Surveys.

UNIT II	DATA COLLECTION AND SOURCES	6

Measurements, Measurement Scales, Questionnaires and Instruments, Sampling and methods. Data - Preparing, Exploring, examining and displaying.

UNIT III	DATA ANALYSIS AND REPORTING	6

Overview of Multivariate analysis, Hypotheses testing and Measures of Association. Presenting Insights and findings using written reports and oral presentation.

UNIT IV	INTELLECTUAL PROPERTY RIGHTS	6

Intellectual Property – The concept of IPR, Evolution and development of concept of IPR, IPR development process, Trade secrets, utility Models, IPR & Biodiversity,Role of WIPO and WTO in IPR establishments, Right of Property, Common rules ofIPR practices, Types and Features of IPR Agreement, Trademark, Functions of UNESCO in IPR maintenance.

UNIT V	PATENTS	6

Patents – objectives and benefits of patent, Concept, features of patent, Inventive step, Specification, Types of patent application, process E-filling, Examination of patent, Grant of patent, Revocation, Equitable Assignments, Licenses, Licensing of related patents, patent agents, Registration of patent agents.

TOTAL: 30 PERIODS

TEXT BOOKS:

1. C R Kothari, "Research Methodology Methods and Techniques", 4th Edition, New Age International Publishers, 2019.
2. Mousami V Munot, Vinayak Bairagi,"Research Methodology A Practical and Scientific Approach", CRC Press, 2019.

REFERENCES:

1. Schindler Pamela S, "Business Research Methods", 14th Edition, Tata McGraw Hill, 2022.

2. The Institute of Company Secretaries of India, Statutory body under an Act of parliament, "Professional Programme Intellectual Property Rights, Law and practice", 2023.

ONLINE RESOURCES:

1   https://www.mooc-list.com/tags/research-methodology

2   https://onlinecourses.nptel.ac.in/noc22_ge08/preview

3   https://www.wipo.int/academy/en/courses/distance_learning/

COURSE OUTCOMES

CO1   Describe the research process and design.

CO2   Explain the sources and methods for data collection.

CO3   Describe the various data analysis and reporting.

CO4   Apply the concept of IPR and its development process.

CO5   Summarize the various components of patent and the process of E- filling.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	-	2	2
CO2	2	2	1	1	-	-	-	-	1	-	-	-	2	2
CO3	2	2	1	1	-	-	-	-	-	-	-	-	2	2
CO4	3	2	1	2	-	-	1	-	-	-	-	-	2	2
CO5	2	2	1	1	-	-	-	-	-	-	-	-	2	2

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P23MC101 **ADVANCED DATA STRUCTURES AND ALGORITHMS** L T P C

Prerequisites: Data Structures and Analysis of Algorithms 3 0 0 3

COURSE OBJECTIVES:

- To understand the usage of algorithms in computing
- To learn and use hierarchical and non-hierarchical data structures and its operations.
- To study about NP Completeness of problems.

UNIT I   **ROLE OF ALGORITHMS IN COMPUTING & COMPLEXITY ANALYSIS**   9

Algorithms – Algorithms as a Technology -Time and Space complexity of algorithms-Asymptotic analysis-Average and worst-case analysis-Asymptotic notation-Importance of efficient algorithms- Program performance measurement - Recurrences: The Substitution Method – The Recursion- Tree Method- Data structures and algorithms.

UNIT II   **HIERARCHICAL DATA STRUCTURES**   9

Binary Search Trees: Basics – Querying a Binary search tree – Insertion and Deletion- Red Black trees: Properties of Red-Black Trees – Rotations – Insertion – Deletion -B- Trees: Definition of B - trees – Basic operations on B-Trees – Deleting a key from a B- Tree- Heap – Heap Implementation – Disjoint Sets - Fibonacci Heaps: structure – Mergeable-heap operations- Decreasing a key and deleting a node-Bounding the maximum degree.

UNIT III   **GRAPHS**   9

Elementary Graph Algorithms: Representations of Graphs – Breadth-First Search – Depth-First Search – Topological Sort – Strongly Connected Components- Minimum Spanning Trees: Growing a Minimum Spanning Tree – Kruskal and Prim- Single-Source Shortest Paths: The Bellman-Ford algorithm – Single-Source Shortest paths in Directed Acyclic Graphs – Dijkstra's Algorithm; Dynamic Programming - All-Pairs Shortest Paths: Shortest Paths and Matrix Multiplication – The Floyd-Warshall Algorithm

UNIT IV   **ALGORITHM DESIGN TECHNIQUES**   9

Dynamic Programming: Matrix-Chain Multiplication – Elements of Dynamic Programming – Longest Common Subsequence- Greedy Algorithms: – Elements of the GreedyStrategy- An Activity-Selection Problem - Huffman Coding.

UNIT V   **NP COMPLETE AND NP HARD**   9

NP-Completeness: Polynomial Time – Polynomial-Time Verification – NP-Completeness and Reducibility – NP-Completeness Proofs – NP-Complete Problems.

TOTAL: 45 PERIODS

TEXT BOOKS:

1   S Sridhar," Design and Analysis of Algorithms", 2nd Edition, Oxford University Press, 2023.
2   S Chand, "Data Structures", S Chand Publishing, 2024.

REFERENCES:

1   T H Cormen, C E Leiserson, R L Rivest and C.Stein, "Introduction to Algorithms", 4th Edition, Prentice Hall of India, 2022.
2   Wisnu Anggoro, "C++ Data Structures and Algorithms", 1st Edition, Packt Publishing, 2018.

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3   R S Salaria, "Data Structures & Algorithms Using C++", 3rd Edition, Khanna Publishers, 2021.

ONLINE RESOURCES:

1   https://nptel.ac.in/courses/106102064
2   https://www.coursera.org/specializations/data-structures-algorithms#courses
3   https://www.scaler.com/topics/course/cpp-data-structures/

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1   Explain characteristics, complexity and asymptotic notation of an algorithm.
CO2   Create real time application using various tree structures.
CO3   Design an algorithm based on graph structure to solve problems.
CO4   Analyze various algorithm design techniques in dynamic programming.
CO5   Describe Non-deterministic Polynomial completeness problem.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO2	3	3	3	3	-	-	-	1	-	-	-	1	2	2
CO3	3	3	3	3	-	-	-	1	-	-	-	1	2	2
CO4	3	3	1	2	-	-	-	1	-	-	-	1	2	2
CO5	2	2	1	1	-	-	-	1	-	-	-	1	2	2

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P23MC102   OBJECT ORIENTED SOFTWARE ENGINEERING   L T P C

Prerequisites: Object-Oriented Programming, Software Engineering   3 0 0 3

COURSE OBJECTIVES:

- To provide an idea of using various process models according to given circumstances.
- To demonstrate agility in solving software and system challenge.
- To describe data models, object models, context models, design patterns and behavioral models.

UNIT I   SOFTWARE DEVELOPMENT AND PROCESS MODELS   9

Introduction to Software Development – Challenges – An Engineering Perspective – Object Orientation – Software Development Process – Iterative Development Process – Process Models – Life Cycle Models – Unified Process – Iterative and Incremental.

UNIT II   AGILE SOFTWARE DEVELOPMENT   9

Basics and Fundamentals of Agile Process Methods, Values of Agile, Principles of Agile, stakeholders, Challenges. Lean Approach: Waste Management, Kaizen and Kanban, add process and products add value. Roles related to the lifecycle, differences between Agile and traditional plans, differences between Agile plans at different lifecycle phases.

UNIT III   OBJECT ORIENTED ANALYSIS   9

Identifying Usecase – Business object analysis – Usecase driven object oriented analysis – Usecase model – Documentation – Classification – Identifying object, relationships, attributes, methods – Super-sub class – A part of relationships Identifying attributes and methods – Object responsibility

UNIT IV   DESIGN PATTERNS   9

Design Principles – Design Patterns – Various Design Concepts and notations – Real time and Distributed System Design – Documentation – Dataflow Oriented design – Jackson System development – Designing for reuse – Programming standards – Case Study for Design of any Application Project –- GRASP – GoF – Dynamic Object Modeling – Static Object Modeling.

UNIT V   SYSTEM TESTING   9

Software testing: Software Verification Techniques – Object Oriented Checklist:- Functional Testing – Structural Testing – Class Testing – Mutation Testing – Levelsof Testing – Static and Dynamic Testing Tools - Software Maintenance – Categories Challenges of Software Maintenance – Maintenance of Object Oriented Software Regression Testing.

TOTAL: 45 PERIODS

TEXT BOOKS:

1   Yogesh Singh, Ruchika Malhotra, "Object – Oriented SoftwareEngineering", 2nd Edition, Prentice Hall of India, 2018.

2   Rubin Kenneth S, "Essential Scrum: A Practical Guide to the Most Popular Agile Process", 2nd Edition, Addison-Wesley, 2020.

REFERENCES:

1   Roger S. Pressman, "Software Engineering: A Practitioner's Approach", 9th Edition, Tata McGraw-Hill Education, 2021.

2   Doug Rosenberg, Matt Stephens, "Use Case Driven Object Modeling with UML Theory and Practice: Theory and Practice", 2nd Edition, Academic Press, 2016.

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3   Adair Dingle, "Object-Oriented Design Choices", 1st Edition, Chapman and Hall, 2021.

ONLINE RESOURCES:

1   https://fall14cs.files.wordpress.com/2016/03/object-oriented-software-engineering-practical-software-development-using-uml-and-java-2005.pdf
2   https://link.springer.com/article/10.1023/A:1016593309733
3   https://archive.nptel.ac.in/courses/106/105/106105153/

COURSE OUTCOMES:

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

CO1   Explain the software engineering lifecycle models.
CO2   Apply the agile development processes and the principles behind the Agile Manifesto.
CO3   Design UML diagrams based on the requirements.
CO4   Design pattern and Create an application using design patterns.
CO5   Evaluate software applications using software testing techniques.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO2	3	2	1	2	-	-	-	1	-	-	-	1	2	2
CO3	3	3	3	3	-	-	-	1	-	-	-	1	2	2
CO4	3	3	3	3	-	-	-	1	-	-	-	1	2	2
CO5	3	3	2	3	-	-	-	1	-	-	-	1	2	2

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P23MC103	PYTHON PROGRAMMING	L	T	P	C

Prerequisites: Computation and Programming Using Python   3   0   0   3

COURSE OBJECTIVES:

- To know the basics of Python coding with conditionals, loops and functions.
- To understand the concepts of Modules, Packages, web Frameworks and OOPS concepts
- To learn the details of Files and Exception handling

UNIT I   BASICS OF PYTHON   9

Introduction to Python Programming – Python Interpreter and Interactive Mode– Variables and Identifiers – Arithmetic Operators – Values and Types – Statements.Operators – Boolean Values – Operator Precedence – Expression – Conditionals: If-Else Constructs – Loop Structures/Iterative Statements –Function Call and Returning Values – Parameter Passing – Local and Global Scope – Recursive Functions – Lists, Tuples, Sets, Strings, Dictionary.

UNIT II   MODULES AND PACKAGES   9

Modules: Introduction – Module Loading and Execution – Packages – Making YourOwn Module – The Python Libraries for data processing, data mining and visualization- Scatter plot – Line Plot – Bar Plot – Histogram - NUMPY, Pandas, Matplotlib, Plotly.

UNIT III   FILE HANDLING AND EXCEPTION HANDLING   9

Files: Introduction – File Path – Opening and Closing Files – Reading andWriting Files –File Position –Exception: Errors and Exceptions, Exception Handling, Multiple Exceptions.

UNIT IV   PYTHON WEB FRAMEWORKS   9

Popular Frameworks: Django, Flask, Web2Py, Bottle, Pyramid and several other libraries. Features of Django – Django Architecture – MVC – Starting a project – Django Apps – Django Form – Form Validation.

UNIT V   OBJECT ORIENTED PROGRAMMING IN PYTHON   9

Creating a Class, Class methods, Class Inheritance, Encapsulation, Polymorphism, class method vs. static methods, Python object persistence.

TOTAL: 45 PERIODS

TEXT BOOKS:

1   Paul Deital and Harvey Deital, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2   Allen B. Downey, "Think Python: How to think like a Computer scientist", 2nd Edition, O'Reilly Publishers, 2016.

REFERENCES:

1   Charles Dierbach, "Introduction to Computer Science using Python",1st Edition, Wiley, 2022.
2   Allen B. Downey, "Think Python: How to Think Like a ComputerScientist", 2nd Edition, Shroff, O'Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/
3   John V Guttag, "Introduction to Computation and Programming UsingPython", Revised and Expanded Edition, MIT Press, 2016.
4   Reema Thareja, "Python Programming using Problem SolvingApproach", 2nd Edition, Oxford University Press, 2019.

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(AUTONOMOUS INSTITUTION)
GOWRIVAKKAM, CHENNAI - 600 073.

ONLINE RESOURCES:

1 https://onlinecourses.nptel.ac.in/noc19_cs41/preview

2 https://onlinecourses.swayam2.ac.in/cec22_cs20/preview

3 https://www.python.org/about/gettingstarted/

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1 Explain python programs using Conditions, Loop statements and functions.

CO2 Describe the Python Modules and Packages

CO3 Explain python programs to read and write data from/to files.

CO4 Apply python modules, libraries and frameworks to develop the python programs.

CO5 Describe class, objects and its properties, methods in python.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	1	2	1
CO2	2	2	1	1	-	-	-	1	-	-	-	1	2	1
CO3	2	2	1	1	-	-	-	1	-	-	-	1	2	1
CO4	3	2	1	2	-	-	-	1	-	-	-	1	2	1
CO5	2	2	1	1	-	-	-	1	-	-	-	1	2	1

Approved

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P23MC104	FUNDAMENTALS OF ACCOUNTING	L	T	P	C
Prerequisites: Accounting Principles		3	0	2	4

COURSE OBJECTIVES:

- To understand the basic principles of Accounting, Double entry system and the preparation of ledger.
- To understand the process and importance of the electronic accounting system.
- To Prepare the estimate for various business activities such as purchase, sale, production and cash budgets

UNIT I   **INTRODUCTION TO ACCOUNTING**   9

Introduction to Financial, Cost and Management Accounting - Objectives of Financial Accounting –Accounting Principles, Concepts and Conventions – Bookkeeping and Accounting Practical exercise session using Tally:

UNIT II   **MANAGEMENT ACCOUNTING AND BOOKKEEPING**   9

Meaning-Objectives of Management Accounting-Accounting System – Preparation of Journal, Ledger, Cash Book and Trial Balance – Errors disclosed and not disclosed by Trial Balance–Final Accounts - Ratio Analysis

UNIT III   **BUDGETS AND BUDGETARY CONTROL**   9

Budgets and Budgetary Control-Meaning-Types-Sales Budget-Production Budget-Cost of Production Budget-Flexible Budgeting-Cash Budget-Master Budget-Zero Base Budgeting-Computerized Accounting – with adjustments

UNIT IV   **FINANCIAL MANAGEMENT**   9

Objectives of Financial Management- preparation of Suspense Account – Depreciation – Meaningand Types – Methods of Charging and Providing depreciation – Inventory

UNIT V   **BANK RECONCILIATION STATEMENT AND REPORTING**   9

Preparing Bank Reconciliation Statement (simple problems) – Insurance Claim – Average Clause -Export and Import of Data, Data Security,

45 PERIODS

PRACTICAL EXERCISES:

1. Company Creation, Creating Groups, Ledgers and Vouchers
2. Creating Contra, Journals, Credit and Debit Notes, Preparing Trial Balance and Final Accounts
3. Preparing Revenue Management and Portfolio Selection, Final Accounts with Adjustments
4. Preparing Inventory Creation, Purchase order, Sales Order
5. Preparing Sales Journal, Rejections, Delivery Note.
6. Preparing the Bank Reconciliation Statement
7. Preparing the Trading, Profit And Loss Account and Trial Balance

30 PERIODS
TOTAL: 75 PERIODS

TEXT BOOKS:

1. T S Reddy, A Murthy, "Financial Accounting", Margham Publication, 2023.
2. T S Reddy & Y Hari Prasad Reddy, "Management Accounting", Margham Publications, 2020.

REFERENCES:

1   S N Maheswari, "Financial and Management Accounting", 7th Edition, Sultan Chand & Sons, 2021.
2   I M Pandey, "Financial Management", 13th Edition, Vikas Publishing House Pvt. Ltd., 2020.
3   M Y Khan, P K Jain, "Financial Management, Text, Problems and Cases", 8th Edition, Tata McGraw Hill, 2018.
4   I M Pandey, "Management Accounting", 10th Edition, Vikas Publishing House Pvt. Ltd., 2019.
5   R L Gupta, P K Gupta, "Advanced Accounting", Sultan Chand, 2019.

ONLINE RESOURCES:

1   https://icmai.in/upload/Students/Syllabus-2012/Study_Material_New/Inter-Paper5-Revised .pdf
2   https://corporatefinanceinstitute.com/resources/accounting/principles-accounting-book-pdf/
3   https://openstax.org/details/books/principles-financial-accounting

COURSE OUTCOMES:

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

CO1   Explain the concepts of Financial Accounting.
CO2   Create the transaction to the journal, ledger and financial statements.
CO3   Analyze various types of budgets.
CO4   Evaluate the charges for depreciation on fixed assets.
CO5   Create a bank reconciliation statement.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1		1	-	1	1	1
CO2	3	3	3	3	-	-	-	1		1	-	1	1	1
CO3	3	3	2	3	-	-	-	1		1	-	1	1	1
CO4	3	3	2	3	-	-	-	1		1	-	1	1	1
CO5	3	3	3	3	-	-	-	1		1	-	1	1	1

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P23MC105   ADVANCED DATA STRUCTURES AND ALGORITHMS LABORATORY   L   T   P   C

Prerequisites: Data Structures, Design and Analysis of Algorithms laboratory   0   0   3   1.5

COURSE OBJECTIVES:

- To acquire the fundamental design, analysis, and implementation of basic data structures
- To understand the usage of heap, graph structures and spanningtrees
- To understand the problems such as matrix chainmultiplication, activity selection and Huffman coding

LIST OF EXPERIMENTS:

1   Implementation of recursive function for tree traversal and Fibonacci

2   Implementation of iteration function for tree traversal and Fibonacci

3   Implementation of Merge Sort and Quick Sort

4   Implementation of a Binary Search Tree: Red-Black Tree Implementation

5   Heap Implementation

6   Fibonacci Heap Implementation

7   Graph Traversals

8   Spanning Tree Implementation

9   Shortest Path Algorithms (Dijkstra's algorithm, Bellman Ford Algorithm)

10   Implementation of Matrix Chain Multiplication

11   Activity Selection and Huffman Coding Implementation

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1   Create a program that encompasses both basic and advanced data structure.

CO2   Create a tree structure using various algorithms.

CO3   Create a program using sorting techniques.

CO4   Write a program for the shortest path algorithms.

CO5   Design algorithms using design techniques.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	1	1	1	-	1	2	2
CO2	3	3	3	3	-	-	-	1	1	1	-	1	2	2
CO3	3	3	3	3	-	-	-	1	1	1	-	1	2	2
CO4	3	3	3	3	-	-	-	1	1	1	-	1	2	2
CO5	3	3	3	3	-	-	-	1	1	1	-	1	2	2

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P23MC106 PYTHON PROGRAMMING LABORATORY L T P C

Prerequisites: C Programming Laboratory 0 0 3 1.5

COURSE OBJECTIVES:

- To learn Python programs with conditionals, loops, functions, lists, tuples and dictionaries
- To Read and write data from/to files in Python
- To Implement object oriented concepts, Numpy and Scipy Python Libraries

LIST OF EXPERIMENTS:

Note: The examples suggested in each experiment are only indicative. The lab instructor is expected to design other problems on similar lines.

1 Scientific problems using Conditionals and Iterative loops.
2 Programs to implement basic data types, strings and numeric data types.
3 Implementing applications using the Lists, Tuples.
4 Implementing applications using the Sets, and Dictionaries.
5 Programming using functions in python
6 Import basic packages and libraries and execute programs
7 Working with Python packages - Numpy, Scipy, Scikit-learn, Matplotlib
8 Implementing real-time/technical applications using File handling.
9 Implementing real-time/technical applications using Exception handling.
10 Creating and Instantiating a simple class using python.
11 Working with Data visualization - Scatter Plot, Line Plot, Bar plot and Histogram
12 Implementing Machine Learning applications using Python packages.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1 Write a python programs for simple computational problems.
CO2 Write python programs with conditionals and loops.
CO3 Write a python programs step-wise by defining function and calling them.
CO4 Design a python programs using lists, tuples, and dictionaries for representing compound data.
CO5 Design a python program for read and write data from to files in python.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	-	-	2	2	2	-	1	3	2
CO2	3	3	3	3	2	-	-	2	2	2	-	1	3	2
CO3	3	3	3	3	2	-	-	2	2	2	-	1	3	2
CO4	3	3	3	3	2	-	-	2	2	2	-	1	3	2
CO5	3	3	3	3	2	-	-	2	2	2	-	1	3	2

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P23EN101   **COMMUNICATION SKILLS LABORATORY**   L T P C

Prerequisites: Basics of LSRW skills   0 0 2 1

COURSE OBJECTIVES:

- To provide opportunities to learners to practice their communication skills.
- To enhance the performance of learners at various recruitment procedures.
- To improve the performance of students' listening, speaking, reading and writing skills.

LIST OF ACTIVITIES:

1. Listening:
   - Listening and practicing neutral accents
   - Listening to short talks and lectures and completing listening comprehension exercises
   - Listening to TED Talks
2. Speaking:
   - Giving one minute talks
   - Introducing oneself to the Audience & Topic
   - Participating in Group Discussions and Making Presentations
   - Attending job interviews - Answering questions confidently
3. Reading:
   - Reading Comprehension
   - Reading subject specific material
   - Technical Vocabulary
4. Writing:
   - Formal vs Informal Writing
   - Paragraph, Essay and Email Writing
5. Soft Skills
   - People skills
   - Interpersonal and leadership skills
   - Team building skills
6. Problem solving skills

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

CO1   Comprehend Information through Listening to give appropriate responses.
CO2   Apply speaking skills of Group Discussion, Presentation and attend Job Interviews.
CO3   Apply Reading Skills to be a professional in all aspects.
CO4   Write Formal and Informal Emails, Essays, and Paragraphs.
CO5   Apply various kinds of Soft Skills in a Professional Context.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	1	-	-	1	1	1	-	1	-	-
CO2	3	-	-	-	1	-	-	1	1	1	-	1	-	-
CO3	3	-	-	-	1	-	-	1	1	1	-	1	-	-
CO4	3	-	-	-	1	-	-	1	1	1	-	1	-	-
CO5	3	-	-	-	1	-	-	1	1	1	-	1	-	

P23MC201   **FULL STACK WEB DEVELOPMENT**

Prerequisites: Web Application Development

L T P C

3 0 0 3

COURSE OBJECTIVES:

- To understand the fundamentals of web programming, client-side scripting and server side development using NodeJS.
- To understand API development with Express Framework.
- To learn the advanced client side scripting and ReactJS framework.

UNIT I   INTRODUCTION TO CSS and JAVASCRIPT   9

Introduction to Web: Server - Client - Communication Protocol (HTTP) – Structure of HTML Documents – Basic Markup tags – Working with Text and Images with CSS– CSS Selectors – CSS Flexbox - JavaScript: Data Types and Variables - Functions - Events – AJAX: GET and POST.

UNIT II   SERVER SIDE PROGRAMMING WITH NODE JS   9

Introduction to Web Servers – Javascript in the Desktop with NodeJS – NPM – Serving files with the http module – Introduction to the Express framework – Server-side rendering with Templating Engines – Static Files - async/await - Fetching JSON from Express.

UNIT III   ADVANCED NODE JS AND DATABASE   9

Introduction to NoSQL databases – MongoDB system overview - Basic querying with MongoDB shell – Request body parsing in Express – NodeJS MongoDB connection – Adding and retrieving data to MongoDB from NodeJS – Handling SQL databases from NodeJS – Handling Cookies in NodeJS – Handling User Authentication with NodeJS.

UNIT IV   ADVANCED CLIENT SIDE PROGRAMMING   9

React JS: ReactDOM - JSX - Components - Properties – Fetch API - State and Lifecycle - -JS Localstorage - Events - Lifting State Up - Composition and Inheritance.

UNIT V   APP IMPLEMENTATION IN CLOUD   9

Cloud providers Overview – Virtual Private Cloud – Scaling (Horizontal and Vertical) – Virtual Machines, Ethernet and Switches – Docker Container – Kubernetes.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. David Flanagan, "Java Script: The Definitive Guide", 7th Edition, O'Reilly Media, 2020.
2. Paul Zikopoulos, Christopher Bienko, Chris Backer, Chris Konarski, Sai Vennam, "Cloud Without Compromise", 1st Edition, O'Reilly Media, 2021.
3. Matt Frisbie, "Professional JavaScript for Web Developers", 4th Edition, John Wiley & Sons, 2019.

REFERENCES:

1. Alex Banks, Eve Porcello, "Learning React", 2nd Edition, O'Reilly Media, 2020
2. Brad Dayley, Brendan Dayley, Caleb Dayley, "Node.js, MongoDB and Angular Web Development", 2nd Edition, Addison-Wesley, 2018.
3. Vasan Subramanian, "Pro MERN Stack: Full Stack Web App Development with MongoDB, Express, React, and Node", 2nd Edition, Apress, 2019.
4. Chris Northwood, 'The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer', 1st Edition, Apress, 2018.

ONLINE RESOURCES:

1. https://www.coursera.org/articles/full-stack-developer
2. https://www.geeksforgeeks.org/what-is-full-stack-development/
3. https://www.simplilearn.com/skills-required-to-become-a-full-stack-developer-article

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1 Explain the process of client side scripting.
CO2 Apply server-side programming with NodeJs.
CO3 Create a NOSQL database using NodeJs.
CO4 Describe advanced client-side programming.
CO5 Design an application using cloud deploy.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO2	3	2	1	2	-	-	-	1	-	-	-	1	2	2
CO3	3	3	3	3	-	-	-	1	-	-	-	1	2	2
CO4	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO5	3	3	3	3	-	-	-	1	-	-	-	1	2	2

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P23MC202	ADVANCED DATABASE TECHNOLOGY	L	T	P	C
Prerequisites: Database Management Systems		3	0	0	3

COURSE OBJECTIVES:

- To understand the working principles and query processing of distributed databases.
- To understand the basics of spatial, temporal, mobile databases, NoSQL databases and their applications.
- To understand the basics of XML and create well-formed and valid XML documents and gain knowledge about information retrieval and web search.

UNIT I	DISTRIBUTED DATABASES	9

Distributed Systems – Introduction – Architecture – Distributed Database Concepts – Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing.

UNIT II	SPATIAL AND TEMPORAL DATABASES	9

Active Databases Model – Design and Implementation Issues - Temporal Databases - Temporal Querying - Spatial Databases: Spatial Data Types, Spatial Operators and Queries – Spatial Indexing and Mining – Applications -- Mobile Databases: Location and Handoff Management, Mobile Transaction Models – Deductive Databases - Multimedia Databases.

UNIT III	NOSQL DATABASES	9

NoSQL – CAP Theorem – Sharding - Document based – MongoDB Operation: Insert, Update, Delete, Query, Indexing, Application, Replication, Sharding–Cassandra: Data Model, Key Space, Table Operations, CRUD Operations, CQL Types – HIVE: Data types, Database Operations, Partitioning – HiveQL – OrientDB Graph database – OrientDB Features.

UNIT IV	XML DATABASES	9

Structured, Semi structured, and Unstructured Data – XML Hierarchical Data Model – XML Documents – Document Type Definition – XML Schema – XML Documents and Databases – XML Querying – XPath – XQuery.

UNIT V	INFORMATION RETRIEVAL AND WEB SEARCH	9

IR concepts – Retrieval Models – Queries in IR system – Text Preprocessing – Inverted Indexing – Evaluation Measures – Web Search and Analytics – Current trends.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Abraham Silberschatz, Henry F Korth, S Sudharshan, "Database System Concepts", 7th Edition, Tata McGraw Hill, 2019.
2. R Elmasri, S B Navathe, "Fundamentals of Database Systems", 7th Edition, Pearson Education, 2017.

REFERENCES:

1. Jiawei Han, Micheline Kamber, Jian Pei, "Data Mining: Concepts and Techniques", 4th Edition, Morgan Kaufmann, 2022.
2. Guy Harrison, "Next Generation Databases, NoSQL, NewSQL and Big Data", 1st Edition, Apress, 2016.
3. Guy Harrison, "Next Generation Databases, NoSQL, NewSQL and Big Data", 1st Edition, Apress, 2022.

ONLINE RESOURCES:

1 https://learn.mongodb.com/learning-paths/introduction-to-mongodb
2 https://cassandra.apache.org/_/quickstart.html
3 https://www.udemy.com/course/from-0-to-1-hive/?couponCode=NVDPRODIN35

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1 Design, deploy and manage distributed database systems.
CO2 Create Spatial, Temporal, Mobile and Multimedia databases and perform its operations.
CO3 Create NoSQL database system and manipulate the data associated with it.
CO4 Develop XML Databases by using XML Technologies including XML DTD, XSLT, XPath and XQuery.
CO5 Apply the Concept of Information Retrieval and Web Search in Web Databases.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	1	-	-	-	1	2	2
CO2	3	3	3	3	-	-	-	1	-	-	-	1	2	2
CO3	3	3	3	3	-	-	-	1	-	-	-	1	2	2
CO4	3	3	3	3	-	-	-	1	-	-	-	1	2	2
CO5	3	2	1	2	-	-	-	1	-	-	-	1	2	2

P23MC203   **CLOUD COMPUTING TECHNOLOGIES**   L   T   P   C

Prerequisites: Fundamentals of Distributed Systems   **3   0   0   3**

COURSE OBJECTIVES:

- To learn about the current trend and basics of Cloud computing.
- To expose the technologies that enhance cloud computing such as execution environment virtualization, storage virtualization and distributed storage
- To be aware of Microservices and DevOps.

UNIT I   DISTRIBUTED SYSTEMS   9

Introduction to Distributed Systems – Characterization of Distributed Systems – Distributed Architectural Models –Remote Invocation – Request-Reply Protocols – Remote Procedure Call – Remote Method Invocation – Group Communication – Coordination in Group Communication – Ordered Multicast – Time Ordering – Physical Clock Synchronization – Logical Time and Logical Clocks.

UNIT II   BASICS OF CLOUD COMPUTING   9

Cloud Computing Basics – Desired features of Cloud Computing – Elasticity in Cloud – On demand provisioning - Applications – Benefits – Cloud Components: Clients, Datacenters & Distributed Servers – Characterization of Distributed Systems – Distributed Architectural Models - Principles of Parallel and Distributed computing - Applications of Cloud computing – Benefits – Cloud services – Open source Cloud Software: Eucalyptus, Open Nebula, Open stack, Aneka, Cloudsim.

UNIT III   CLOUD INFRASTRUCTURE   9

Cloud Architecture and Design – Architectural design challenges – Technologies for Network based system - NIST Cloud computing Reference Architecture – Public, Private and Hybrid clouds – Cloud Models : IaaS, PaaS and SaaS – Cloud storage providers – Enabling Technologies for the Internet of Things – Innovative Applications of the Internet of Things.

UNIT IV   CLOUD ENABLING TECHNOLOGIES   9

Service Oriented Architecture – Web Services – Basics of Virtualization – Emulation – Types of Virtualization – Implementation levels of Virtualization – Virtualization structures – Tools & Mechanisms – Virtualization of CPU, Memory & I/O Devices – Desktop Virtualization – Server Virtualization – Google App Engine – Amazon AWS - Federation in the Cloud.

UNIT V   MICROSERVICES AND DEVOPS   9

Defining Microservices - Emergence of Microservice Architecture – Design patterns of Microservices – The Mini web service architecture – Microservice dependency tree – Challenges with Microservices - SOA vs Microservice – Microservice and API – Deploying and maintaining Microservices – Reason for having DevOps – Overview of DevOps – Core elements of DevOps – Life cycle of DevOps –Adoption of DevOps - DevOps Tools – Build, Promotion and Deployment in DevOps.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Cornelia Davis, "Cloud Native Patterns: Designing Change-Tolerant Software", 1st Edition, Manning Publishers, 2019.
2. Andrew S. Tanenbaum & Maarten Van Steen, "Distributed Systems - Principles and Paradigms", 3rd Edition, Pearson Education, 2017.

REFERENCES:

1. Magnus Larsson, "Hands-On Microservices with Spring Boot and Spring Cloud: Build and deploy microservices using spring cloud, Istio and kubernetes", 1st Edition, Packt Publishing Ltd, September 2019.
2. Richard Rodger, "The Tao of Microservices", Manning Publications, 1st Edition, December 2017.
4. Jim Lewis, "DEVOPS: A complete beginner's guide to DevOps best practices", ISBN-13:978-1673259148, ISBN-10: 1673259146, 1st Edition, 2019.

ONLINE RESOURCES:

1. https://aws.amazon.com
2. https://www.edx.org/learn/cloud-computing
3. https://www.guvi.in/blog/websites-to-learn-cloud-computing

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1 Explain the design principles in distributed systems and the architectures for distributed systems.

CO2 Describe the basics of Cloud Computing.

CO3 Explain the service models (IaaS, PaaS, SaaS) and deployment models (public, private, hybrid) in cloud computing.

CO4 Apply cloud enabling technologies.

CO5 Describe Microservices and Devops concepts.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	-	-	-	-	1	2	2
CO2	2	2	1	1	-	-	-	-	-	-	-	1	2	2
CO3	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO4	3	2	1	2	-	-	-	-	-	-	-	1	2	2
CO5	2	2	1	1	-	-	-	-	-	-	-	1	2	2

P23MC204 PROGRAMMING WITH JAVA **L T P C**

Prerequisites: Object Oriented Programming Fundamentals **3 0 2 4**

COURSE OBJECTIVES:

- To understand the basic concepts and fundamentals of platform independent object oriented language.
- To demonstrate skills in writing programs using exception handling techniques and multithreading
- To introduce the design of Graphical User Interface using applets and swing controls and the implementation of packages and interfaces

UNIT I   JAVA FUNDAMENTALS   9

Java features – Java Platform – Java Fundamentals – Expressions, Operators, and Control Structures – Classes, Methods – Inheritance - Packages and Interfaces – Boxing, Unboxing – Variable-Length Arguments (Varargs), Exception Handling.

UNIT II   COLLECTIONS AND ADVANCE FEATURES   9

Utility Packages- Introduction to collection –Hierarchy of Collection framework – Generics, Array list, LL, HashSet, Treeset, HashMap – Comparators – Java annotations – Premain method.

UNIT III   ADVANCED JAVAPROGRAMMING   9

Input Output Packages – Inner Classes – Java Database Connectivity - Introduction JDBC Drivers - JDBC connectivity with MySQL/Oracle -Prepared Statement & Result Set – JDBC Stored procedures invocation - Servlets - RMI – Swing Fundamentals - Swing Classes.

UNIT IV   OVERVIEW OF DATA RETRIEVAL & ENTERPRISE APPLICATION   9
DEVELOPMENT

Tiered Application development - Java Servers, containers –Web Container – Creating Web Application using JSP/Servlets – Web Frameworks Introduction to Spring/ Play Framework – ORM Layer – Introduction to Hibernate.

UNIT V   JAVA INTERNALS AND NETWORKING   9

Java jar Files-Introspection – Garbage collection – Architecture and design – GC Cleanup process, Invoking GC, Generation in GC - Networking Basics Java and the Net – Inet Address – TCP/IP Client Sockets – URL –URL Connection – TCP/IP Server Sockets – A Caching Proxy HTTP Server – Datagrams.

45 PERIODS

PRACTICAL EXERCISES:

1 Writing Java programs by making use of class, interface, package, etc.
2 Writing window based GUI applications using frames and applets such as Calculator application, Fahrenheit to Centigrade conversion etc.
3 Application of threads examples.
4 Event Handling in Swing.
5 Reading and writing text files.
6 Writing a Servlet program with database connectivity for a web based application such as students result status checking, PNR number enquiry etc.
7 Creation and usage of Java bean

30 PERIODS
TOTAL: 75 PERIODS

TEXT BOOKS:

1   Vaskaran Sarcar, "Java Design Patterns: A Hands-On Experience with Real-World Examples", Apress, 2022.
2   Herbert Schildt, The Complete Reference – Java 2, 5th Edition, Tata McGraw Hill, 2017.
3   Joyce Farrell, "Java Programming", 9th Edition, Cengage Learning, 2018.

REFERENCES:

1   H M Dietel, P J Dietel, "Java How to Program", 11th Edition, Pearson Education, 2017.

2   Vishwajit Barbuddhe, Shraddha N Zanjat, Bhavana S Karmore, "Object Oriented Programming Through Java," Lambert Academic Publishing, 2020.

3   Vaskaran Sarcar, "Interactive Object-Oriented Programming in Java: Learn and Test Your Programming Skills", APress, 2019.

ONLINE RESOURCES:

1   https://archive.nptel.ac.in/noc/courses/noc21/SEM1/noc21-cs03/
2   https://www.infoworld.com/article/2074929/my-favorite-online-resources-for-advanced-java-developers.html/
3   https://qubit-labs.com/free-resources-learn-java-programming-online/

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1   Explain the concepts of Java Programming.
CO2   Apply the Collection framework hierarchy on Java applications.
CO3   Explain the database connectivity using JDBC.
CO4   Create web based program using servlet and JSP.
CO5   Create a real time application using a Hash map and Java Bean.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO2	3	2	1	2	-	-	-	1	-	-	-	1	2	2
CO3	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO4	3	3	3	3	-	-	-	1	-	-	-	1	2	2
CO5	3	3	3	3	-	-	-	1	-	-	-	1	2	2

P23MC205

BIG DATA ANALYTICS

Prerequisites: Data Mining, Data Engineering

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the concept of big data and its significance in contemporary data-driven decision-making
- To explore the challenges and opportunities associated with handling large volumes of diverse data sources
- To know the principles of machine learning and its application in big data analytics

UNIT I   INTRODUCTION TO BIG DATA   9

Introduction – Understanding Big Data – Big Data: Benefiting – Managing – Organizing and Analyzing Big Data: Learning and Analytics; Technology Challenges for Big Data- Modern Data Analytic Tools- Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error.

UNIT II   SEARCH METHODS AND VISUALIZATION   9

Search by simulated Annealing – Stochastic, Adaptive search by Evaluation – Evaluation Strategies – Genetic Algorithm – Genetic Programming – Visualization – Classification of Visual Data Analysis Techniques – Data Types – Visualization Techniques – Interaction techniques – Specific Visual data analysis Techniques

UNIT III   MINING DATA STREAMS   9

Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP)Applications -- Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

UNIT IV   HADOOP ENVIRONMENT   9

History of Hadoop- The Hadoop Distributed File System – Components of Hadoop- Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Hadoop filesystems-Java interfaces to HDFS- Basics-Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features - Setting up a Hadoop Cluster - Cluster specification - Cluster Setup and Installation – Hadoop Configuration-Security in Hadoop .

UNIT V   FRAMEWORKS AND APPLICATIONS   9

IBM for Big Data –Framework - Hive – Sharding – NoSQL Databases –Mango DB-Casandra- Hbase – Impala – Analyzing big data with twitter – Big data for Ecommerce – Big data for blogs.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, "Mining of Massive Datasets", 3rd Edition, Cambridge University Press, 2020.
2. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding BigData: Analytics for Enterprise Class Hadoop and Streaming Data", Tata McGraw Hill, 2017.

REFERENCES:

1. Subhashini Chellappan Seema Acharya, "Big Data and Analytics", John Wiley & Sons, 2019.
2. David Hand, Michael R. Berthold, Hand, "Intelligent Data Analysis: An Introduction", Springer,

2019.

3   Mayank Bhushan "Big Data and Hadoop: Fundamentals, Tools, and Techniques for Data-Driven Success" 2nd Edition, BPB Publications, 2024.

ONLINE RESOURCES:
1 https://www.mooc-list.com/tags/big-data-analytics
2 https://onlinecourses.nptel.ac.in/noc20_cs92/preview
3 https://www.coursera.org/specializations/big-data

COURSE OUTCOMES:
Upon the completion of the course, the students will be able to
CO1 Analyze the fundamentals of various big data analysis techniques.
CO2 Apply the big data analytic techniques for useful business applications.
CO3 Summarize efficient algorithms for mining the data from large volumes.
CO4 Describe HADOOP and Map Reduce technologies associated with big data analytics.
CO5 Explain the applications of Big Data

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	-	-	-	1	-	-	-	-	2	2
CO2	3	2	1	2	-	-	-	1	-	1	-	-	2	2
CO3	2	2	1	1	1	-	-	1	-	-	1	-	2	2
CO4	2	2	1	1		-	-	1	-	-	-	-	2	2
CO5	2	2	1	1	1	-	-	1	-	-	-	-	2	2

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P23MC206   ADVANCED DATABASE TECHNOLOGY LABORATORY   L T P C

Prerequisites: Database Management Systems Laboratory   0 0 3 1.5

COURSE OBJECTIVES:

- To understand the process of distributing tables across multiple systems.
- To understand the process of storing, retrieving spatial, temporal and NoSQL data.
- To understand the process of storing and retrieving data from a XML Database To use the open source database for building a mobile application.

LIST OF EXPERIMENTS:

1. NOSQL Exercises
   a. MongoDB – CRUD operations, Indexing, Sharding
   b. Cassandra: Table Operations, CRUD Operations, CQL Types
2. HIVE: Data types, Database Operations, Partitioning – HiveQL
3. MySQL Database Creation, Table Creation, Query
4. MySQL Replication – Distributed Databases
5. Spatial data storage and retrieval in MySQL
6. Temporal data storage and retrieval in MySQL
7. Object storage and retrieval in MySQL
8. XML Databases, XML table creation, XQuery FLWOR expression
9. XML DTD Creation, Internal DTD and External DTD
10. Mobile Database Query Processing using open source DB (MongoDB/MySQL etc).
11. Distributed Database creation
12. OrientDB Graph database – OrientDB Features

TOTAL: 45 PERIODS

Course Outcome

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

CO1	Create Distributed databases and perform its operations.
CO2	Create spatial and temporal databases and implement its process.
CO3	Create different types of NOSQL databases and perform CRUD operations
CO4	Create an XML databases and perform Xquery expression.
CO5	Create mobile databases using open source database tools.

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	1	-	1	-	1	2	2
CO2	3	3	3	3	-	-	-	1	-	1	-	1	2	2
CO3	3	3	3	3	-	-	-	1	-	1	-	1	2	2
CO4	3	3	3	3	-	-	-	1	-	1	-	1	2	2
CO5	3	3	3	3	-	-	-	1	-	1	-	1	2	2

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P23MC207 **FULL STACK WEB DEVELOPMENT LABORATORY** **L T P C**

Prerequisites: Web Application Development Laboratory **0 0 3 1.5**

COURSE OBJECTIVES:
- To Develop and present visually appealing and functional front-end and back-end components or projects.
- To Create, manipulate databases, performing CRUD operations, and optimizing queries
- To develop a full stack single page application using React, NodeJS, etc and a Database like MongoDB or SQL.

LIST OF EXPERIMENTS:

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 NodeJS server using Express that stores data from a form as a JSON file and displays it in another page. The redirect page should be prepared using Handlebars.
5   Create a NodeJS server using Express that creates, reads, updates and deletes students' details and stores them in MongoDB database. The information about the user should be obtained from a HTML form.
6   Create a NodeJS server that creates, reads, updates and deletes event details and stores them in a MySQL database. The information about the user should be obtained from a HTML form.
7   Create a counter using ReactJS
8   Create a Todo application using ReactJS. Store the data to a JSON file using a simple NodeJS server and retrieve the information from the same during page reloads.
9   Create a simple Sign up and Login mechanism and authenticate the user using cookies. The user information can be stored in either MongoDB or MySQL and the server should be built using NodeJS and Express Framework.
10 Create and deploy a virtual machine using a virtual box that can be accessed from the host computer using SSH.
11 Create a docker container that will deploy a NodeJS ping server using the NodeJS image.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, the students will able to
CO1   Create a web pages using HTML and CSS.
CO2   Create client-side programming with NodeJs.
CO3   Create a query for MongoDB and Mysql.
CO4   Create a web pages using ReactJs.
CO5   Create real-world web application using NodeJs and MongoDB.

CO-PO-PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	1	-	1	-	1	2	2
CO2	3	3	3	3	-	-	-	1	-	1	-	1	2	2
CO3	3	3	3	3	-	-	-	1	-	1	-	1	2	2
CO4	3	3	3	3	-	-	-	1	-	1	-	1	2	2
CO5	3	3	3	3	-	-	-	1	-	1	-	1	2	2

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P23MC301	MACHINE LEARNING	L	T	P	C
Prerequisites: Probability and Statistics		3	0	0	3

COURSE OBJECTIVES:

- To understanding of the fundamental concepts, algorithms, and techniques in machine learning
- To analyse various evaluation metrics and techniques for assessing the performance of machine learning models
- To explore real-world applications of machine learning across various domains.

UNIT I	INTRODUCTION	9

Human Learning - Types – Machine Learning - Types - Problems not to be solved - Applications Languages/Tools– Issues. Preparing to Model: Introduction – Machine Learning Activities - Types of data - Exploring structure of data - Data quality and remediation - Data Pre-processing.

UNIT II	MODEL EVALUATION AND FEATURE ENGINEERING	9

Model Selection - Training Model - Model Representation and Interpretability – Evaluating Performance of a Model - Improving Performance of a Model - Feature Engineering: Feature Transformation - Feature Subset Selection

UNIT III	SUPERVISED LEARNING	9

Classification: Classification and Regression Trees (CART) - Random Forest – K Nearest Neighbors - Support vector machines. Bayes theorem - Naïve Bayes - Bayesian belief network. Regression: Linear Regression, Multiple Linear Regression, Logistic Regression.

UNIT IV	UNSUPERVISED LEARNING	9

Introduction - Clustering Algorithms -K – Means – Hierarchical Clustering - Cluster Validity - Dimensionality Reduction –Principal Component Analysis – Recommendation Systems - EM algorithm. Reinforcement Learning – Elements -Model based Learning – Temporal Difference Learning

UNIT V	ADVANCED LEARNING TECHNIQUES	9

Reinforcement Learning – State and action space – Reward function – Discounting – Action selection – Policy – Markov decision process – Q-learning. Active Learning - Ensemble Learning - Bootstrap Aggregation - Boosting - Gradient Boosting Machines – Deep learning

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Ethem Alpaydin, "Introduction to Machine Learning (Adaptive Computation and Machine Learning Series)", 3rd Edition, MIT Press, 2020
2. Tom M. Mitchell, "Machine Learning", India Edition, 1st Edition, Tata McGraw Hill, 2017

REFERENCES:

1. Aurelien Geron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow", 2nd Edition, O"Reilly, 2022.
2. Richard O. Duda, Peter E. Hart, David G. Stork, "Pattern Recognition", Wiley & Sons, 2021.
3. Saikat Dutt, Subramanian Chandramouli and Amit Kumar Das, "Machine Learning", 1st Edition, Pearson Education, 2019.

ONLINE REFERENCES:

1. https://www.coursera.org/specializations/machine-learning-introduction
2. https://youtu.be/vStJoetOxJg
3. https://onlinecourses.nptel.ac.in/noc23_cs18/preview

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1 Describe the different types of learning, data and pre-processing techniques

CO2 Evaluate the performance of a model and use feature engineering techniques.

CO3 Apply the supervised machine learning algorithms to classify the data.

CO4 Analyze various unsupervised machine learning algorithms.

CO5 Analyze advanced machine learning techniques to resolve the given problems.

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	-	2	2
CO2	3	3	2	3	-	-	-	1	-	-	-	-	2	2
CO3	3	2	1	2	-	-	-	1	-	-	-	-	2	2
CO4	3	3	2	2	-	-	-	1	-	-	-	-	2	2
CO5	3	3	2	2	-	-	-	1	-	-	-	1	2	2

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P23MC302	MOBILE APPLICATION DEVELOPMENT	L	T	P	C
Prerequisites: Application Development		3	0	2	4

COURSE OBJECTIVES:

- To describe the aspects of mobile programming that make it unique for other platforms.
- To utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces.
- To create an innovative and robust mobile applications.

UNIT I	INTRODUCTION	9

Mobile Application Model – Infrastructure and Managing Resources – Mobile Device Profiles – Frameworks and Tools.

UNIT II	USER INTERFACE	9

Generic UI Development - Multimodal and Multichannel UI –Gesture Based UI – Screen Elements and Layouts – Voice XML.

UNIT III	APPLICATION DESIGN	9

Memory Management – Design Patterns for Limited Memory – Workflow for Application development – Java API – Dynamic Linking – Plugins and rule of thumb for using DLLs – Multithreading in Java - Concurrency and Resource Management.

UNIT IV	MOBILE OS	9

Mobile OS: Android, iOS – Android Application Architecture – Understanding the anatomy of a mobile application - Android basic components –Intents and Services – Storing and Retrieving data – Packaging and Deployment – Security and Hacking.

UNIT V	APPLICATION DEVELOPMENT	9

Communication via the Web – Notification and Alarms – Graphics and Multimedia: Layer Animation, Event handling and Graphics services – Telephony – Location based services

45 PERIODS

PRACTICAL EXERCISES:

1. Develop an application that uses Layout Managers and Event Listeners.
2. Develop an Application using Adapter, Toast and Databases.
3. Develop and application that makes use of RSS feed.
4. Implement an application that implements Multithreading.
5. Develop a native application that uses GPS Location information
6. Implement an application that creates an alert upon receiving a message.
7. Implement an application that writes data to the SD card.

30 PERIODS
TOTAL: 75 PERIODS

TEXT BOOKS:

1. Zigurd Mednieks, Laird Dornin, G. Blake Meike, Masumi Nakamura, "Programming Android", 2nd Edition, O'Reilly, 2021.
2. Reto Meier, Ian Lake, "Professional Android", 4th Edition, Wrox, 2018.

REFERENCES:

1   Bill Phillips, Chris Stewart, Brian Hardy, Kristin Marsicano, "Android Programming: The Big Nerd Ranch Guide", 5th Edition, Big Nerd Ranch Guides, 2022.

2   Christian Keur, Aaron Hillegass, "iOS Programming: The Big Nerd Ranch Guide", 7th Edition, Big Nerd Ranch Guides, 2022.

3   Barry Burd, "Android Application Development All-In-One for Dummies", 3rd Edition, For Dummies, 2021.

ONLINE RESOURCES:

1   https://www.ibm.com/topics/mobile-application-development

2   https://www.techtarget.com/searchapparchitecture/resources/Application-development-and-design

3   https://developer.android.com/

COURSE OUTCOMES:

At the end of the course, the students will able to

CO   Explain the concept of mobile application framework.

CO   Apply XML programming to design an UI model.

CO   Design an application in dynamic environment.

CO   Create an application using mobile based operating system.

CO   Design a real-time application using Graphics and Multimedia.

CO – PO-PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO2	3	2	1	2	-	-	-	1	-	-	-	1	2	2
CO3	3	3	3	3	-	-	-	1	-	-	-	1	2	2
CO4	3	3	3	3	-	-	-	1	-	-	-	1	2	2
CO5	3	3	3	3	-	-	-	1	-	-	-	1	2	2

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P23MC303	CYBER SECURITY	L T P C
		3 0 2 4

COURSE OBJECTIVES:

- To understand the basics of cyber security, cyber crimes and cyber law.
- To learn about data privacy and data security.
- To know about cyber security management, compliance and governance.

UNIT I   **OVERVIEW OF CYBER SECURITY**   9

Cyber security increasing threat landscape, Cyber security terminologies- Cyberspace, attack, attack vector, attack surface, threat, risk, vulnerability, exploit, exploitation, hacker., Non-state actors, Cyber terrorism, Protection of end user machine, Critical IT and National Critical Infrastructure, Cyberwarfare, Case Studies..

UNIT II   **CYBER CRIMES**   9

Cyber crimes targeting Computer systems and Mobiles- data diddling attacks, spyware, logic bombs, DoS, DDoS, APTs, virus, Trojans, ransomware, data breach., Online scams and frauds-email scams, Phishing, Vishing, Smishing, Online job fraud, Online sextortion, Debit/ credit card fraud, Online payment fraud, Cyberbullying, website defacement, Cyber- squatting, Pharming, Cyber espionage, Cryptojacking, Darknet – illegal trades, drug trafficking, human trafficking., Social Media Scams & Frauds- impersonation, identity theft, job scams, misinformation, fake newscyber crime against persons - cyber grooming, child pornography, cyber stalking., social Engineering attacks, Cyber Police stations, Crime reporting procedure, Case studies.

UNIT III   **CYBER LAW**   9

Cyber crime and legal landscape around the world, IT Act, 2000 and its amendments. Limitations of IT Act, 2000. Cyber crime and punishments, Cyber Laws and Legal and ethical aspects related to new technologies – AI/ML, IoT, Blockchain, Darknet and Social media, Cyber Laws of other countries, Case Studies.

UNIT IV   **DATA PRIVACY AND DATA SECURITY**   9

Defining data, meta-data, big data, non- personal data. Data protection, Data privacy and data security, Personal Data Protection Bill and its compliance, Data protection principles, Big data security issues and challenges, Data protection regulations of other countries- General Data Protection Regulations(GDPR), 2016 Personal Information Protection and Electronic Documents Act (PIPEDA), Social media- data privacy and security issues.

UNIT V   **CYBER SECURITY MANAGEMENT, COMPLIANCE AND GOVERNANCE**   9

Cyber security Plan – cyber security policy, cyber crises management plan, Business continuity, Risk assessment, Types of security controls and their goals, cyber security audit and compliance, National cyber security policy and strategy.

45 PERIODS

PRACTICAL EXERCISES:

1. Platforms for reporting cyber crimes.
2. Checklist for reporting cyber crimes online.
3. Setting privacy settings on social media platforms.
4. Registering complaints on a Social media platform.
5. Prepare password policy for computer and mobile device.
6. List out security controls for computer and implement technical security controls in the personal computer.

7 List out security controls for mobile phone and implement technical security controls in the personal mobile phone.
8 Log into computer system as an administrator and check the security policies in the system.

30 PERIODS
TOTAL: 75 PERIODS

REFERENCES:

1 Sumit Belapure, Nina Godbole, "Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", 1st Edition, Wiley India, 2011.
2 Dorothy Elizabeth Robling, "Information Warfare and Security", Addison Wesley Longman, 1999.
3 Henry A Oliver, "Security in the Digital Age: Social Media Security Threats and Vulnerabilities", Create Space Independent Publishing Platform, 2001.
4 Natraj Venkataramanan, Ashwin Shriram, "Data Privacy Principles and Practice", CRC Press, 2016.
5 Krag Brotby, "Information Security Governance, Guidance for Information Security Managers", 1st Edition, John Wiley & Sons. 2009.
6 Martin Weiss, Michael G Solomon, "Auditing IT Infrastructures for Compliance", 2nd Edition, Jones & Bartlett Learning, 2016.
7 E Maiwald, "Fundamentals of Network Security", Tata McGraw Hill, 2017.

ONLINE RESOURCES

1 http://www.digimat.in/nptel/courses/video/106106212/L01.html
2 https://onlinecourses.swayam2.ac.in/cec24_cs03/preview
3 https://onlinecourses.swayam2.ac.in/cec24_cs01/preview

COURSE OUTCOMES:

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

CO1 Explain the concepts of cyber security.
CO2 Apply checklist for reporting cyber crimes online.
CO3 Apply privacy settings on social media platforms
CO4 Apply security controls for personal computer.
CO5 Explain national cyber security policy and strategy.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	1	-	-	-	1	1	1	-	1
CO2	3	2	1	2	2	-	-	1	1	1	-	1
CO3	3	2	1	2	2	-	-	1	1	1	-	1
CO4	3	2	1	2	2	-	-	1	1	1	-	1
CO5	2	2	1	1	2	-	-	1	1	1	-	1

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P23MC304	MACHINE LEARNING LABORATORY	L	T	P	C
		0	0	3	1.5

Prerequisites: Python Programming Laboratory

COURSE OBJECTIVES:

- To implement popular machine learning algorithms using programming languages such as Python.
- To gain hands-on experience with popular machine learning libraries such as scikit-learn, TensorFlow etc.
- To apply machine learning techniques to real-world problems

LIST OF EXPERIMENTS:

1 Implement various data structuring techniques such as Data Binning, Data Sampling, Data Aggregation.
2 Applications of dimensionality reduction techniques on any dataset.
3 Implement data pre-processing techniques on real time dataset
4 Implement Feature subset selection techniques.
5 Implement Confusion matrix using sklearn and matplotlib.
6 Demonstrate how will you measure the performance of a machine learning model
7 Compute the accuracy of the naïve Bayesian classifier for a sample training data set.
8 Construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using the standard Heart Disease Data Set.
9 Apply EM algorithm to cluster a set of data stored in a .CSV file.
10 Write a program to implement k-Nearest Neighbour algorithm to classify the data set.
11 Classification of Email spam and MNIST data using Support Vector Machines.
12 Implement Logistic Regression to classify problems such as spam detection. Diabetes predictions and so on.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1 Apply data pre-processing technique.

CO2 Create and train a model and measure the performance.
CO3 Apply feature selection techniques in Machine Learning
CO4 Design Bayesian Network for appropriate problem
CO5 Write parametric and non-parametric machine Learning algorithms in practical situations

CO-PO - PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	2	-	-	-	1	1	1	-	1	2	2
CO2	3	3	3	3	-	-	-	1	1	1	-	1	2	2
CO3	3	2	1	2	-	-	-	1	1	1	-	1	2	2
CO4	3	3	3	3	-	-	-	1	1	1	-	1	2	2
CO5	3	3	3	3	-	-	-	1	1	1	-	1	2	2

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P23MCEL01	SOFTWARE PROJECT MANAGEMENT	L	T	P	C
Prerequisites: Software Development		3	0	0	3

COURSE OBJECTIVES:

* To know how to do project planning for the software process.
* To learn the cost estimation techniques during the analysis of the project.
* To understand the quality concepts for ensuring the functionality of the software.

UNIT I	SOFTWARE PROJECT MANAGEMENT CONCEPTS	9

Introduction to Software Project Management: An Overview of Project Planning: Select Project, Identifying Project scope and objectives, infrastructure, project products and Characteristics. Estimate efforts, Identify activity risks, and allocate resources- Six Sigma.

UNIT II	SOFTWARE EVALUATION AND ESTIMATION TECHNIQUES	9

Project Evaluation: Strategic Assessment, Technical Assessment, cost-benefit analysis, Cash flow forecasting, cost-benefit evaluation techniques. Selection of Appropriate Project approach: Choosing technologies, choice of process models, structured methods- Software Effort Estimation: Problems with over and under estimations, Basis of software Estimation, Software estimation techniques, expert Judgment, Estimating by analogy.

UNIT III	STANDARDS, CERTIFICATIONS & ASSESSMENTS	9

Quality management standards – ISO 9001 and ISO 9000-3 –Capability Maturity Models – CMM and CMMI assessment methodologies - Bootstrap methodology – SPICE Project – SQA project process standards – Organization of Quality Assurance – Role of management in SQA – SQA units and other actors in SQA systems

UNIT IV	RISK MANAGEMENT	9

Risk Management: Nature of Risk, Managing Risk, Risk Identification and Analysis, Reducing the Risk. Resource Allocation: Scheduling resources, Critical Paths, Cost scheduling, Monitoring and Control: Creating Framework, cost monitoring, prioritizing monitoring.

UNIT V	GLOBALIZATION ISSUES IN PROJECT MANAGEMENT	9

Globalization issues in project management: Evolution of globalization- challenges in building global teams-models for the execution of some effective management techniques for managing global teams. Impact of the internet on project management: Introduction – the effect of the internet on project management – managing projects for the internet – effect on project management activities. Comparison of project management software: dot Project, Launch pad, openProj.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Johannes W P G Oosthuizen, "Software Project Management: A Process-Driven Approach " Springer, 2019.

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2   Hugh Woodward "Software Project Management: A Unified Framework", 2nd Edition, Pearson Education, 2019.

REFERENCES:

1   Bob Hughes, Mike Cotterell & Rajib Mall "Software Project Management", 6th Edition, Tata McGraw Hill, 2017.
2   Ian Somerville, "Software Engineering", 10th Edition, Pearson Education, 2017.
3   Gopalaswamy Ramesh, "Managing Global Software Projects: How to Lead Geographically Distributed Teams, Manage Processes and Use Quality Models", Tata McGraw Hill, 2017.

ONLINE RESOURCES:

1   https://www.ibm.com/products/intelligent-promising/inventory-visibility
2   https://www. projectmanager.com/software
3   https://developer.android.com/

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1   Explain the project scheduling of any software application.
CO2   Explain the risk management activities and the resource allocation for the projects.
CO3   Apply the software estimation and recent quality standards for evaluation of the software projects.
CO4   Apply the skills needed for the construction of highly reliable software project.
CO5   Create reliable, replicable cost estimation of project planning and managing.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO2	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO3	3	2	1	2	-	-	-	1	-	-	-	1	2	2
CO4	3	2	1	2	-	-	-	1	-	-	-	1	2	2
CO5	3	3	3	3	-	-	-	1	-	-	-	1	2	2

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P23MCEL02 PROFESSIONAL ETHICS IN IT

L T P C
3 0 0 3

Prerequisites: Ethical Issues in Computing

COURSE OBJECTIVES:

- To understand the concepts of computer ethics in the work environment.
- To understand the threats, intricacies of accessibility issues in computing environment.
- To understand the concepts of IPR, Social networking ethics and etiquettes.

| UNIT I | INTRODUCTION TO ETHICS | 9 |

Definition of Ethics- Right, Good, Just- The Rational Basis of Ethics -Theories of Right: Intuitionist vs. End-Based vs. Duty-Based -Rights, Duties, Obligations -Theory of Value Conflicting Principles and Priorities -The Importance of Integrity -The Difference Between Morals, Ethics, and Laws -Ethics in the Business World - Corporate Social Responsibility Creating an Ethical Work Environment -Including Ethical Considerations in Decision Making.

| UNIT II | ETHICS IN INFORMATION TECHNOLOGY, INTERNET CRIME | 9 |

IT Professionals - Are IT Workers Professionals- Professional Relationships That Must Be Managed -Professional Codes of Ethics - Professional Organizations - Certification - IT Professional Ethics, Three Codes of Ethics, Management Conflicts. The Reveton Ransomware Attacks -IT Security Incidents: A Major Concern - Why Computer Incidents Are So Prevalent -Types of Exploits -Types of Perpetrators-Federal Laws for Prosecuting Computer Attacks- Implementing Trustworthy Computing -Risk Assessment -Establishing a Security Policy Educating Employees and Contract Workers.

| UNIT III | FREEDOM OF EXPRESSION, PRIVACY | 9 |

First Amendment Rights -Obscene Speech-Defamation -Freedom of Expression: Key Issues Controlling Access to Information on the Internet -Strategic Lawsuit Against Public Participation (SLAPP)-Anonymity on the Internet-Hate Speech- Privacy Protection and the Law- Information Privacy- Privacy Laws, Applications, and Court Rulings-Key Privacy and Anonymity Issues- Data Breaches -Electronic Discovery-Consumer Profiling- Workplace Monitoring -Advanced Surveillance Technology.

| UNIT IV | FREEDOM OF EXPRESSION, INTELLECTUAL PROPERTY RIGHTS | 9 |

Intellectual Property Rights-Copyrights-Copyright Term - Eligible Works -Fair Use Doctrine Software Copyright Protection –Copyright Laws and the internet-Copyright and Piracy– Patents- -Software Patents -Cross-Licensing Agreements -Trade Secrets-Trade Secret Laws - Employees and Trade Secrets-Key Intellectual Property Issues-Plagiarism -Reverse Engineering-Open Source Code- Competitive Intelligence -Trademark Infringement -Cyber squatting.

| UNIT V | SOCIAL NETWORKING ETHICS AND ETIQUETTES | 9 |

Social Networking Web Site- Business Applications of Online Social Networking-Social Network Advertising-The Use of Social Networks in the Hiring Process-Social Networking Ethical Issues –Cyber bullying- Online Virtual Worlds-Crime in Virtual Worlds-Educational and Business Uses of Virtual Worlds.

TOTAL: 45 PERIODS

TEXT BOOKS:

1   George Reynolds, "Ethics in Information Technology", 6th Edition, Cengage Learning, 2022.

2   Sarah Gordon "Professional Ethics in Information Technology", 5th Edition, Cengage Learning, 2021.

REFERENCES:

1   John Weckert and Douglas Adeney, "Computer and Information Ethics", 1st Edition, Greenwood Press, 2019.

2   Sara Baase, "A Gift of Fire: Social, Legal, and Ethical Issues for Computing Technology", 4th Edition, Pearson Education, 2018.

3   Raymond Panko and Sarah P. Williams, "Ethics in Information Technology", 6th Edition, Cengage Learning, 2018.

ONLINE RESOURCES:

1   https://onlinecourses.nptel.ac.in/noc22_mg54/
2   https://www.acm.org / code-of-ethics
3   https://www.ethicsboard.org /

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1   Explain the basic concept of Ethics and its principles in businesses.

CO2   Describe about the code of ethics in the information technology and its security risk.

CO3   Summarize the key issues to access the information and its privacy.

CO4   Describe about Intellectual property rights and its safety.

CO5   Explain the use of social networking ethics in the educational and business sector.

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	2	-	-	-	-	2	2
CO2	2	2	1	1	-	-	-	2	-	-	-	-	2	2
CO3	2	2	1	1	-	-	-	2	-	-	-	-	2	2
CO4	2	2	1	1	-	-	-	2	-	-	-	-	2	2
CO5	2	2	1	1	-	-	-	2	-	-	-	-	2	2

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P23MCEL03 **E – LEARNING** L T P C

Prerequisites: Ethical Theories and Philosophies 3 0 0 3

COURSE OBJECTIVES:

- To learn the various E-learning approaches and Components.
- To understand the types of design models and Authoring tools of E-learning.
- To know about evaluation and management of E-learning solutions.

UNIT I **INTRODUCTION** 9

Need for E-Learning – Approaches of E-Learning – Components of E-Learning –synchronous and Asynchronous Modes of Learning – Quality of E-Learning – Blended Learning: Activities, Team and Technology – Work Flow to Produce and Deliver E-Learning Content – Design Thinking: Introduction – Actionable Strategy – Act to Learn – Leading Teams to Win.

UNIT II **DESIGNING E-LEARNING COURSE CONTENT** 9

Design Models of E-Learning – Identifying and Organizing E-Learning Course Content: Needs Analysis – Analyzing the Target Audience – Identifying Course Content – Defining Learning Objectives – Defining the Course Sequence – Defining Instructional Methods – Defining Evaluation and Delivery Strategies – Case Study.

UNIT III **CREATING INTERACTIVE CONTENT** 9

Preparing Content: Tips for Content Development and Language Style – Creating Storyboards: Structure of an Interactive E-Lesson – Techniques for Presenting Content – Adding Examples – Integrating Multimedia Elements – Adding Examples – Developing Practice and Assessment Tests–Adding Additional Resources – Courseware Development Authoring Tools – Types of Authoring Tools – Selecting an Authoring Tool.

UNIT IV **LEARNING PLATFORMS** 9

Types of Learning Platforms – Proprietary Vs. Open – Source LMS – LMS Vs LCMS – Internally Handled and Hosted LMS – LMS Solutions – Functional Areas of LMS.

UNIT V **COURSE DELIVERY AND EVALUATION** 9

Components of an Instructor-Led or Facilitated Course – Planning and Documenting Activities – Facilitating Learners Activities – E-Learning Methods and Delivery Formats – Using Communication Tools for E-Learning – Course Evaluation.

TOTAL: 45 PERIODS

TEXT BOOKS:

1 Johnny Schneider, "Understanding Design Thinking, Lean and Agile", 1st Edition, O'Reilly Media, 2018.

2 Noor Zaman, "E-Learning: Concepts, Methodologies, Tools and Applications", 2nd Edition, Information Science Reference, 2018.

REFERENCES:

1 Vladimir L Uskov, Robert J Howlett, Lakhmi C Jain, "Smart Education and E-Learning",

1st Edition, Springer, 2019.

2   Caroline Howard, "E-Learning: A Guidebook of Principles, Procedures and Practices", 2nd Edition, Routledge Publisher, 2017.

3   Clark Quinn, "Millennials, Goldfish & Other Training Misconceptions: Debunking Learning Myths and Superstitions", 1st Edition, ATD Press, 2018.

ONLINE RESOURCES:

1   https:// business.udemy.com/ request-demo-elearning

2   https://www. projectmanager.com/software

3   https://elearningindustry.com/8-inspiring-elearning-websites-offer-students-inspiring-educational-alternatives

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1   Summarize the phases of activities in models of E-learning.

CO2   Apply the appropriate instructional methods and delivery strategies.

CO3   Analyze E-learning Authoring tools.

CO4   Create interactive E-learning platforms.

CO5   Evaluate the E-learning courseware.

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO2	3	2	1	2	-	-	-	1	-	-	-	1	2	2
CO3	3	3	2	2	-	-	-	1	-	-	-	1	2	2
CO4	3	3	3	3	-	-	-	1	-	-	-	1	2	2
CO5	3	3	2	3	-	-	-	1	-	-	-	1	2	2

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P23MCEL04	SECURITY IN COMPUTING	L	T	P	C

Prerequisites: Computer Networks

		3	0	0	3

COURSE OBJECTIVES:

- To understand the basics of cryptography and its vulnerabilities in programs.
- To know the different kinds of security threats in networks and databases and its solutions.
- To Learn about the models and standards for security.

UNIT I	ELEMENTARY CRYPTOGRAPHY	9

Terminology and Background – Substitution Ciphers – Transpositions – Making Good Encryption Algorithms- Data Encryption Standard- AES Encryption Algorithm – Public Key Encryption – Cryptographic Hash Functions – Key Exchange – Digital Signatures.

UNIT II	PROGRAM SECURITY	9

Secure programs – Non-malicious Program Errors – Viruses – Targeted Malicious code – Controls Against Program Threat – Control of Access to General Objects – User Authentication – Good Coding Practices – Open Web Application Security Project Flaws.

UNIT III	SECURITY IN NETWORKS	9

Threats in networks – Virtual Private Networks – PKI – SSL – IPSec – Content Integrity – Access Controls – Honeypots – Traffic Flow Security – Firewalls – Intrusion Detection Systems – Secure e-mail.

UNIT IV	SECURITY IN DATABASES	9

Security requirements of database systems – Reliability and Integrity in databases – Redundancy – Recovery – Concurrency/ Consistency – Monitors – Sensitive Data – Types of disclosures –Inference-finding and confirming sql injection.

UNIT V	SECURITY MODELS AND STANDARDS	9

Secure SDLC – Security architecture models – Bell-La Padula Confidentiality Model – Biba Integrity Model – Graham-Denning Access Control Model – Harrison-Ruzzo-Ulman Model – Secure Frameworks – COSO – CobiT – Security Standards - ISO 27000 family of standards – NIST.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Charles P. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", 5th Edition, Pearson Education, 2018
2. Michael Whitman, Herbert J. Mattord, "Management of Information Security", 6th Edition, Course Technology, 2018.

REFERENCES:

1. William Stallings, "Cryptography and Network Security: Principles and Practices", 8th Edition, Prentice Hall, 2021.
2. Matt Bishop, "Computer Security: Art and Science", 2nd Edition, Addison- Wesley, 2018.
3. Charles P. Pfleeger, Shari Lawrence Pfleeger, and Jonathan Margulies, "Security in Computing", 6th Edition, Pearson Education, 2018.

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ONLINE RESOURCES:

1 https:// business.udemy.com/ request-demo-elearning

2 https://www. projectmanager.com/software

3 https://elearningindustry.com/8-inspiring-elearning-websites-offer-students-inspiring-educational-alternatives

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1 Understand the basic of cryptographic algorithms for encrypting and decryption for secure data transmission.

CO2 Analyze the importance of Digital signature for secure e-documents exchange.

CO3 Explain the program threats and apply good programming practice.

CO4 Describe about the security services available for internet and web applications.

CO5 Summarize data vulnerability and sql injection.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO2	3	3	2	2	-	-	-	1	-	-	-	1	2	2
CO3	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO4	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO5	2	2	1	1	-	-	-	1	-	-	-	1	2	2

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P23MCEL05   **INFORMATION RETRIEVAL TECHNIQUES**   L   T   P   C

Prerequisites: Understanding of text processing   3   0   0   3

COURSE OBJECTIVES:

- To understand the basics of information retrieval with pertinence to modeling, query operations and indexing.
- To get an understanding of machine learning techniques for text classification and clustering.
- To understand the various applications of information retrieval giving emphasis to multimedia IR, web search.

UNIT I   INTRODUCTION   9

Basic Concepts – Practical Issues - Retrieval Process – Architecture - Boolean Retrieval – Retrieval Evaluation – Open Source IR Systems–History of Web Search – Web Characteristics– The impact of the web on IR --IR Versus Web Search–Components of a Search engine.

UNIT II   MODELING   9

Taxonomy and Characterization of IR Models – Boolean Model – Vector Model - Term Weighting – Scoring and Ranking –Language Models – Set Theoretic Models - Probabilistic Models – Algebraic Models – Structured Text Retrieval Models – Models for Browsing .

UNIT III   INDEXING   9

Static and Dynamic Inverted Indices – Index Construction and Index Compression. Searching-Sequential Searching and Pattern Matching. Query Operations -Query Languages – Query Processing - Relevance Feedback and Query Expansion - Automatic Local and Global Analysis – Measuring Effectiveness and Efficiency.

UNIT IV   CLASSIFICATION AND CLUSTERING   9

Text Classification and Naïve Bayes – Vector Space Classification – Support vector machines and Machine learning on documents. Flat Clustering – Hierarchical Clustering – Matrix decompositions and latent semantic indexing – Fusion and Meta learning.

UNIT V   SEARCHING THE WEB AND RETRIEVAL   9

Searching the Web –Structure of the Web –IR and web search – Static and Dynamic Ranking – Web Crawling and Indexing – Link Analysis - XML Retrieval Multimedia IR: Models and Languages – Indexing and Searching Parallel and Distributed IR – Digital Libraries.

TOTAL: 45 PERIODS

TEXT BOOKS:

1   Stefan Büttcher, Charles L A Clarke, Gordon V Cormack, "Information Retrieval: Implementing and Evaluating Search Engines", 2nd Edition, MIT Press, 2020

2   Christopher D Manning, Prabhakar Raghavan, Hinrich Schütze, and Stefan Büttcher, "Introduction to Information Retrieval", 2nd Edition, Cambridge University Press, 2021.

REFERENCES:

1   Iresh A Dhotre "Introduction to Information Retrieval", 2nd Edition, Technical Publications, 2021.

2   Massachusetts, "Implementing and Evaluating Search Engines", 2nd Edition, The MIT Press, 2021.

ONLINE RESOURCES:

1   https:// www.researchgate.net /242403883_Information_Retrieval_Techniques
2   https://www.upgrad.com /information-retrieval-system-explained/
3   https:// www.udemy.com course/information-retrieval-and-mining-massive-data- sets/

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1   Apply Information Retrieval system using the available tools.

CO2   Analyze the various components of an Information Retrieval system.

CO3   Evaluate the Models of an information retrieval system.

CO4   Apply machine learning techniques to text classification and clustering.

CO5   Design an efficient search engine and analyze the Web content structure.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	2	-	-	-	1	-	-	-	1	2	2
CO2	3	3	2	2	-	-	-	1	-	-	-	1	2	2
CO3	3	3	2	3	-	-	-	1	-	-	-	1	2	2
CO4	3	2	1	2	-	-	-	1	-	-	-	1	2	2
CO5	3	3	3	3	-	-	-	1	-	-	-	1	2	2

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P23MCEL06   **SOFT COMPUTING TECHNIQUES**   **L T   P C**

Prerequisites: Fuzzy Logic   **3 0   0 3**

COURSE OBJECTIVES:

- To design a soft computing system required to address a computational task.
- To learn and apply artificial neural networks, fuzzy sets and fuzzy logic and genetic algorithms in problem solving and use of heuristics based on human experience.
- To familiarize with genetic algorithms and other random search procedures while seeking global optimum in self – learning situations.

UNIT I   FUNDAMENTALS OF NEURAL NETWORKS   9

Neuron, Nerve Structure and Synapse, Artificial Neuron and its Model, Activation Functions, Neural Network Architecture: Single Layer and Multilayer Feed Forward Networks, Recurrent Networks. Various Learning Techniques; Perception and Convergence Rule, Auto-Associative and Hetero-Associative Memory.

UNIT II   BACKPROPAGATION NETWORKS   9

Back Propagation Networks) Architecture: Perceptron Model, Solution, Single Layer Artificial Neural Network, Multilayer Perceptron Model; Back Propagation Learning Methods, Effect of Learning Rule Co – Efficient ; Back Propagation Algorithm, Factors Affecting Backpropagation Training, Applications.

UNIT III   COMPETITIVE NEURAL NETWORKS   9

Kohenen's Self Organizing Map – SOM Architecture, learning procedure – Application; Learning Vector Quantization – learning by LVQ; Adaptive Resonance Theory – Learning procedure – Applications.

UNIT IV   FUZZY COMPUTING   9

Basic Concepts of Fuzzy Logic, Fuzzy Sets and Crisp Sets, Fuzzy Set Theory and Operations, Properties of Fuzzy Sets, Fuzzy and Crisp Relations, Fuzzy to Crisp Conversion Membership Functions, Interference in Fuzzy Logic, Fuzzy If – Then Rules, Fuzzy Implications and Fuzzy Algorithms, Fuzzification and Defuzzification, Fuzzy Controller, Industrial Applications.

UNIT V   GENETIC ALGORITHM   9

Basic Concepts, Working Principle, Procedures of GA, Flow Chart of GA, Genetic Representations, (Encoding) Initialization and Selection, Genetic Operators, Mutation, Generational Cycle, Applications .

TOTAL: 45 PERIODS

TEXT BOOKS:

1 S Rajasekaran, G A Vijayalakshmi Pai, "Neural Networks, Fuzzy Systems and Evolutionary Algorithms: Synthesis and Applications", 2nd Edition, Prentice Hall of India, 2013.

2 Kannad Ray, Millie Pant, Anirban Bandyopadhyaya, "Soft Computing Applications", Springer, 2018.

REFERENCES:

1 S N Sivanandam, S. N. Deepa, "Principles of Soft Computing", 3rd Edition, Wiley, 2018.

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2   Timothy Ross, "Fuzzy Logic with Engineering Applications", 4th Edition, John Wiley & Sons, 2017.
3   Amit Konar, "Artificial Intelligence and Soft Computing: Behavioral and Cognitive Modeling of the Human Brain", 1st Edition, CRC Press, 2017.

ONLINE RESOURCES:

1   https:// onlinecourses.nptel.ac.in/ noc22_cs54/
2   https://www.ncerc.ac.in/+course+website&sca_esv=9e96d3fc373d3ae1 /
3   https://www.udemy.com course/machinelearning/

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1   Describe soft computing techniques and their roles in building intelligent machines.

CO2   Apply a soft computing methodology for a particular problem.

CO3   Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems.

CO4   Analyze genetic algorithms to optimization problems

CO5   Design neural networks to pattern classification and regression problems using a soft computing approach.

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO2	3	2	1	2	-	-	-	1	-	-	-	1	2	2
CO3	3	2	1	2	-	-	-	1	-	-	-	1	2	2
CO4	3	3	2	2	-	-	-	1	-	-	-	1	2	2
CO5	3	3	3	3	-	-	-	1	-	-	-	1	2	2

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P23MCEL07   AD-HOC AND SENSOR NETWORKS   L   T   P   C

Prerequisites: Computer Networks   3   0   0   3

COURSE OBJECTIVES:

- To understand the basics of Ad-hoc & Sensor Networks.
- To learn various fundamental and emerging protocols of all layers in ad-hoc network.
- To study about the issues pertaining to major obstacles in establishment and efficient management of ad-hoc and sensor networks.

UNIT I	ADHOC NETWORKS FUNDAMENTALS & COMMUNICATION PROTOCOLS	9

Fundamentals Of WLANs – IEEE 802.11 Architecture - Self Configuration and Auto Configuration-issues in Ad-Hoc Wireless Networks – MAC Protocols for Ad-Hoc Wireless Networks – Contention Based Protocols - TCP Over Ad-Hoc Networks-TCP Protocol Overview - TCP and MANETs – Solutions for TCP Over Ad-Hoc Networks.

UNIT II	ADHOC NETWORK ROUTING AND MANAGEMENT	9

Routing in Ad-Hoc Networks- Introduction -Topology based versus Position based Approaches – Proactive Routing - DSDV, WRP, TBRPF Reactive Routing – DSR,AODV, Hybrid Routing Approach ZRP, CBRP- Location services - DREAM – Quorums based Location Service – Forwarding Strategies – Greedy Packet Forwarding, LAR.

UNIT III	SENSOR NETWORK COMMUNICATION PROTOCOLS	9

Introduction – Architecture - Single Node Architecture – Sensor Network Design Considerations – Energy Efficient Design Principles for WSN's – Protocols for WSN – Physical Layer - Transceiver Design Considerations – MAC Protocols for wireless sensor network – IEEE 802.15.4 Zigbee – Link Layer and Error Control Issues - Routing Protocols – Gossiping and agent based unicast forwarding, Energy efficient unicast –Transport Protocols & QoS – Congestion Control Issues – Application specific Support – Target detection and tracking.

UNIT IV	SENSOR NETWORK MANAGEMENT AND PROGRAMMING	9

Sensor Management - Topology Control Protocols and Sensing Mode Selection Protocols - Time Synchronization - Localization and Positioning – Operating Systems and Sensor Network Programming – Sensor Network Simulators- Case study: Industrial automation and tsunami early warning system with wireless sensor networks.

UNIT V	ADHOC AND SENSOR NETWORK SECURITY	9

Security in Ad-Hoc and Sensor Networks – Key Distribution and Management – Software based Anti-tamper Techniques – Water Marking techniques – Defense against Routing Attacks - Secure Adhoc Routing Protocols – Broadcast Authentication WSN Protocols – TESLA – Biba – Sensor Network Security Protocols – SPINS.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Mohammad S Obaidat, Sudip Misra, Sabu M Thampi, "Ad Hoc and Sensor Networks: Theory and Applications", 2nd Edition, Cambridge University Press, 2020.

2   Subir Kumar Sarkar, T G Basavaraju, "Ad Hoc and Sensor Networks: A Cross-Layer Design Perspective", 1st Edition, CRC Press, 2021.

REFERENCES:

1   Sajal K. Das, and Anup Kumar, "Ad Hoc and Sensor Networks: Wireless, Mobile, and Sensor Networks", 2nd Edition, Springer, 2017.
2   Carlos de Morais Cordeiro, Dharma P Agrawal, "Ad Hoc and Sensor Networks: Theory and Applications", 2nd Edition, World Scientific Publishing, 2017.
3   Hossam Hassanein, Al-Sakib Khan Pathan, "Ad Hoc and Sensor Networks: Theory and Practice", 1st Edition, Cambridge University Press, 2018.

ONLINE RESOURCES:

1   https:// archive.nptel.ac.in,./`k ;/106/105/106105160/
2   https://ieeexplore.ieee.org/ document/1249521/
3   https://www.udemy.com/course/wireless-sensor-networks-electronics-telecommunication-f/
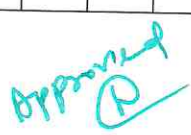
COURSE OUTCOMES:

At the end of the course, the students will able to

CO1   Create a Sensor network environment for different type of applications.
CO2   Design ad-hoc and sensor network architectures using QoS and Congestion control mechanisms.
CO3   Analyze the various control fields of the protocol in each layer.
CO4   Apply appropriate routing algorithms for different network environments.
CO5   Analyze security mechanisms in the wireless ad-hoc and sensor networks.

CO-PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	1	-	-	-	1	2	2
CO2	3	3	3	3	-	-	-	1	-	-	-	1	2	2
CO3	3	3	2	2	-	-	-	1	-	-	-	1	2	2
CO4	3	2	1	2	-	-	-	1	-	-	-	1	2	2
CO5	3	3	2	2	-	-	-	1	-	-	-	1	2	2

P23MCEL08	BUSINESS DATA ANALYTICS	L	T	P	C

Prerequisites: Data Mining

3 0 0 3

COURSE OBJECTIVES:

- To gain knowledge about fundamental business analytics.
- To learn modeling for uncertainty and statistical inference.
- To understand analytics using Hadoop and Map Reduce frameworks.

UNIT I	OVERVIEW OF BUSINESS ANALYTICS	9

Introduction - Drivers for Business Analytics - Applications of Business Analytics: Marketing and Sales, Human Resource, Healthcare, Product Design, Service Design, Customer Service and Support - Skills Required for a Business Analyst - Framework for Business Analytics Life Cycle for Business Analytics Process.

UNIT II	ESSENTIALS OF BUSINESS ANALYTICS	9

Descriptive Statistics – Using Data – Types of Data – Data Distribution Metrics: Frequency, Mean, Median, Mode, Range, Variance, Standard Deviation, Percentile, Quartile, z-Score, Covariance, Correlation – Data Visualization: Tables, Charts, Line Charts, Bar and Column Chart, Bubble Chart, Heat Map – Data Dashboards.

UNIT III	MODELING UNCERTAINTY AND STATISTICAL INFERENCE	9

Modeling Uncertainty: Events and Probabilities – Conditional Probability – Random Variables – Discrete Probability Distributions – Continuous Probability Distribution –Statistical Inference: Data Sampling – Selecting a Sample – Point Estimation – Sampling Distributions – Interval Estimation – Hypothesis Testing.

UNIT IV	ANALYTICS USING HADOOP AND MAPREDUCE FRAMEWORK	9

Introducing Hadoop – RDBMS versus Hadoop – Hadoop Overview – HDFS (Hadoop Distributed File System) – Processing Data with Hadoop – Introduction to MapReduce –Features of MapReduce – Algorithms Using Map-Reduce: Matrix-Vector Multiplication, Relational Algebra Operations, Grouping and Aggregation – Extensions to MapReduce.

UNIT V	OTHER DATA ANALYTICAL FRAMEWORKS	9

Overview of Application development Languages for Hadoop – PigLatin – Hive – Hive Query Language (HQL) – Introduction to Pentaho, JAQL – Introduction to Apache: Sqoop, Drill and Spark, Cloudera Impala – Introduction to NoSQL Databases – Hbase and MongoDB.

TOTAL: 45 PERIODS

TEXT BOOKS:

1 U. Dinesh Kumar, "Business Analytics: The Science of Data-Driven Decision Making", 1st Edition, John Wiley & Sons, 2021.

2 Jeffrey D Camm, James J Cochran, Michael J Fry, Jeffrey W Ohlmann, David R Anderson, "Essentials of Business Analytics", 2nd Edition, Cengage Learning, 2023.

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REFERENCES:

1   Anand Rajaraman, Jeffrey David Ullman, "Mining of Massive Datasets", 1st Edition, Cambridge University Press, 2021.

2   Umesh R Hodeghatta, Umesha Nayak, "Business Analytics Using R – A Practical Approach", 1st Edition, Apress, 2020.

3   Albright, S. C., Winston, W. L., & Zappe, C., "Business Analytics: Data Analysis & Decision Making", 6th Edition, Cengage Learning, 2019.

ONLINE RESOURCES:

1   https://www.udemy.com/analytics-and-intelligence/

2   https:// www.guvi.in /zen-class/data-science-course/

3   https:// excelr.in/ data_analyst_course /

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1   Analyze the real world business problems and model with analytical solutions.

CO2   Analyze the analytical problems with relevant mathematics background knowledge.

CO3   Apply suitable statistical testing for real world decision making problem.

CO4   Create simple applications involving analytics using Hadoop and MapReduce.

CO5   Apply open source frameworks for modeling and storing data.

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	-	-	-	1	-	-	-	1	2	2
CO2	3	3	2	2	-	-	-	1	-	-	-	1	2	2
CO3	3	2	1	1	-	-	-	1	-	-	-	1	2	2
CO4	3	3	3	3	-	-	-	1	-	-	-	1	2	2
CO5	3	2	1	2	-	-	-	1	-	-	-	1	2	2

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P23MCEL09   **INTERNET OF THINGS**   L   T   P   C

Prerequisites: Embedded Systems   3   0   0   3

COURSE OBJECTIVES:

- To understand the concepts of IoT and its working models
- To know the various IoT protocols
- To understand about various IoT Physical devices and Endpoints

UNIT I	FUNDAMENTALS OF IoT	9

Definition and Characteristics of IoT, Sensors, Actuators, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Agriculture and Industry.

UNIT II	IoT PROTOCOLS	9

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE802.15.4–BACNet Protocol– Modbus – KNX – Zigbee– Network layer – APS layer – Security

UNIT III	IOT PHYSICAL DEVICES AND ENDPOINTS	9

Introduction to Arduino and Raspberry Pi- Installation, Interfaces (serial, SPI, I2C), Programming – Python program with Raspberry PI with focus on interfacing external gadgets, controlling output, and reading input from pins

UNIT IV	INTERNET OF THINGS PRIVACY, SECURITY AND GOVERNANCE	9

Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security.

UNIT V	CASE STUDIES	9

IoT APPLICATIONS - IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications. Study of existing IoT platforms /middleware, IoT- A, Hydra etc.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key applications and Protocols", Wiley & Sons, 2018.
2. Rajkumar Buyya, Amir Vahid Dastjerdi, and Pethuru Raj, "Internet of Things: Principles and Paradigms", 2nd Edition, Morgan Kaufmann, 2020.

REFERENCES:

1. Monk, O'Reilly, "Raspberry Pi Cookbook, Software and Hardware Problems and solutions", Simon SPD, 2023.
2. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton, Jerome Henry, "IoT Fundamentals, Networking Technologies, Protocols, and Use cases for the Internet of Things", 1st Edition, Cisco Press, 2017.
3. Marco Zennaro, Vincenzo Vittorini, Nicola Capodieci, "Internet of Things: Architectures, Protocols and Standards", 1st Edition, Springer, 2017.

ONLINE RESOURCES:

1. https://www.edx.org/ learn/iot-internet-of-things

2. https:// www.netacad.com / courses/iot

3. https://www.nptel.ac.in .com//noc22_cs53/

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1   Explain the IoT Communication models and Protocols.

CO2   Apply the IoT protocols for communication between various IoT devices.

CO3   Design portable IoT using Arduino/Raspberry Pi /equivalent boards.

CO4   Summarize the basic concepts of security and governance as applied to IoT.

CO5   Analyze the applications of IoT in real time scenarios.

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	1	-	-	1	-	-	-	1	2	2
CO2	3	2	1	2	1	-	-	1	-	-	-	1	2	2
CO3	3	3	3	3	1	-	-	1	-	-	-	1	2	2
CO4	2	2	1	1	1	-	-	1	-	-	-	1	2	2
CO5	3	3	2	2	1	-	-	1	-	-	-	1	2	2

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P23MCEL10	DIGITAL IMAGE PROCESSING	L T P C

Prerequisites: Digital Image Fundamentals   3 0 0 3

COURSE OBJECTIVES:

- To learn digital image fundamentals.
- To learn image enhancement in the spatial and frequency
- To know image segmentation and compression techniques

UNIT I	DIGITAL IMAGE FUNDAMENTALS	9

Elements of visual perception, Image Acquisition Systems, Sampling and Quantization, Image Formation, Image Geometry, Different types of digital images. Relationship between pixels, Basic concepts of distance transform, Color Image fundamentals-RGB-HIS Models, Different color models-conversion.

UNIT II	IMAGE TRANSFORMS	9

1D Discrete Fourier Transform (DFT), 2D transforms – DFT, Discrete Cosine Transform, Walsh and PCA

UNIT III	IMAGE ENHANCEMENT	9

Gray Level transformations, Histogram Equalization, Spatial Domain: Basics of Spatial Filtering: smoothing and sharpening spatial filters. Frequency domain: smoothing and sharpening frequency domain filters, Ideal, Gaussian filters.

UNIT IV	IMAGE SEGMENTATION AND FEATURE EXTRACTION	9

Segmentation: Point detection, line detection, edge detection, Region based segmentation, Region Splitting and Merging Technique. Thresholding Techniques: multilevel thresholding, optimal thresholding using Bayesian classification. Feature Extraction: GLCM, Hough Transform, 61 Morphological operation.

UNIT V	IMAGE COMPRESSION	9

Lossy and lossless compression schemes, prediction based compression schemes, sub-band encoding schemes, JPEG compression standard, Fractal compression scheme, Wavelet compression scheme

TOTAL: 45 PERIODS

TEXT BOOKS:

1   Rafael C Gonzalez, Richard E Woods, "Digital Image Processing", 4th Edition, Pearson Education, 2018.
2   S Jayaraman, S Esakkirajan, T Veerakumar, "Digital Image Processing", 3rd Edition, McGraw Hill, 2017.

REFERENCES:

1   Kenneth R. Castleman, "Digital Image Processing", 1st Edition, Prentice Hall of India, 2020.
2   John C. Russ, "The Image Processing Handbook", 5th Edition, Prentice Hall of India, 2018.
3   Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing Using MATLAB", 3rd Edition, Gatesmark Publishing, 2018.

ONLINE RESOURCES:

1   https://www.imageprocessingplace.com
2   https://www.ipol.im
3   https://imagemagick.org

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1   Explain the fundamentals of Image processing concepts.
CO2   Apply the image Transformation techniques to various domains.
CO3   Explain the image Enhancement techniques in spatial domain for visual representation.
CO4   Summarize the image segmentation and feature extraction techniques.
CO5   Analyze the different image compression techniques and its significance.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO2	3	2	1	2	-	-	-	1	-	-	-	1	2	2
CO3	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO4	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO5	3	3	2	2	-	-	-	1	-	-	-	1	2	2

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P23MCEL11	WEB AND SOCIAL NETWORK ANALYTICS	L	T	P	C
Prerequisites: Data Structures and Algorithms		3	0	0	3

COURSE OBJECTIVES:

- To know about social networks, its structure and their data sources.
- To analyze the data left behind in social networks.
- To gain knowledge about the community-maintained social media resources.

UNIT I   INTRODUCTION TO SEMANTIC WEB   9

The development of Semantic Web – Emergence of the Social Web – The Development of Social Network Analysis – Basic Graph Theoretical Concepts of Social Network Analysis – Electronic Sources for Network Analysis – Electronic Discussion Networks, Blogs and Online Communities

UNIT II   KNOWLEDGE REPRESENTATION ON THE SEMANTIC WEB   9

Ontology-based knowledge Representation – Ontology languages for the Semantic Web: RDF and OWL

UNIT III   SOCIAL NETWORK MINING   9

Detecting Communities in Social Network – Evaluating Communities –Methods for Community Detection – Applications of Community Mining Algorithms – Tools for detecting communities – Application: Mining Facebook

UNIT IV   COMMUNITY MAINTAINED SOCIAL MEDIA RESOURCES   9

Community Maintained Resources – Supporting technologies for community maintained resources– User motivations-Location based social interaction – location technology– mobile location sharing – Automated recommender system

UNIT V   VISUALIZATION OF SOCIAL NETWORKS   9

Visualization of Social Networks - Node-Edge Diagrams – Random Layout – Force-Directed Layout – Tree Layout – Matrix Representations –Matrix and Node-Link Diagrams– Visualizing Online Social Networks
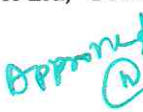
TOTAL: 45 PERIODS

TEXT BOOKS:

1. Jiawei Han, Michalis Vazirgiannis, Diane J. Cook, "Web and Social Network Analytics: Multimodal and Multiscale Approaches", 1st Edition, Springer, 2018.
2. Emilio Ferrara, "Web and Social Network Analytics: A Data-Driven Approach", 1st Edition, Chapman and Hall/CRC, 2019.

REFERENCES:

1. Katarzyna Hano, "Jury Decision Making and Social Network Analysis", VDM Verlag Dr. Mueller E.K., 2021.
2. Borko Furht, "Handbook of Social Network Technologies and Applications", 1st Edition, Springer, 2017.
3. Abbasi, H Chen, L Haque, K Liu, "Social Network Data Analytics", 1st Edition, Springer, 2017.

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ONLINE RESOURCES:

1. https:// www.coursera.org/courses?query=social%20media%20analytics
2. https:// www.quintly.com
3. https:// buffer.com/library/social-media-analytics-tools/

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1   Create entities and relationships of data.
CO2   Explain the model of social semantic Web.
CO3   Apply mining tools for analyzing Social networks.
CO4   Analyze data from various social media resources.
CO5   Explain personalized visualization for Social networks.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	1	-	-	-	1	2	2
CO2	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO3	3	2	1	2	-	-	-	1	-	-	-	1	2	2
CO4	3	3	2	2	-	-	-	1	-	-	-	1	2	2
CO5	2	2	1	1	-	-	-	1	-	-	-	1	2	2

P23MCEL12	DIGITAL MARKETING	L	T	P	C
Prerequisites: Marketing Fundamentals		3	0	0	3

COURSE OBJECTIVES:

- To know about Traditional Marketing and Digital Marketing
- To identify the issues in drafting a digital marketing plan
- To develop Digital marketing platforms and the theoretical aspects of creating a website

UNIT I   INTRODUCTION TO DIGITAL MARKETING   9

What is Digital Marketing- Need of Digital Marketing-Digital Marketing Platforms – Understanding digital marketing process- Difference between Traditional Marketing and digital Marketing- tools of Digital marketing - Advantage of Digital Marketing-Digital Marketing Manager Role and functions - How we use both Digital & Traditional Marketing

UNIT II   WEBSITE AND SEARCH ENGINE   9

Website –Hosting and Domain– Different platforms for website creation- Introduction to SERP- What are search engines- How search engines work- Major functions of a search engine- What are keywords -Different types of keywords- Google keyword planner tool.

UNIT III   MISC TOOLS- GOOGLE WEBMASTER TOOLS   9

Site Map Creators- Browser-based analysis tools-Page Rank tools-pinging & indexing tools- Dead links identification tools- Open site explorer Domain information/ whois tools- Quick sprout

UNIT IV   LEAD MANAGEMENT AND DIGITAL MARKETING   9

Web to lead forms- Web to case forms- Lead generation techniques- Leads are everywhere Social media and lead gen Inbuilt tools for Digital Marketing-Ip Tracker- CPC reduction (in case of paid ads) Group posting on Social Media platforms

UNIT V   TRENDING DIGITAL MARKETING SKILLS   9

Search Engine Optimization (SEO)-Search Engine Marketing (SEM).-Social Media Marketing/Optimization- Email Marketing. Website: Product Marketing- Content Writing. Marketing 68 the created content online Copywriting- Blogging- Local Marketing. Google Ad Words - Campaign Management- PPC Advertising- Affiliate Marketing. Mobile and SMS Marketing- Marketing Automation-Web Analytics- Growth Hacking

TOTAL: 45 PERIODS

TEXT BOOKS:

1 Dave Chaffey, Fiona Ellis-Chadwick, "Digital Marketing: Strategy, implementation and Practice", 6th Edition, Pearson Education, 2019.
2 Chaffey, D., Smith, P. R, "Digital marketing excellence: planning, optimizing and integrating online marketing" Taylor & Francis, 2017.

REFERENCES:

1   Chaffey D, "Digital marketing strategy, Implementation and Practice" Pearson Education, 2019.
2   Mary Lou Roberts, Debra Zahay, "Digital Marketing: Global Strategies from the World's Leading Experts", 1st Edition, CreateSpace Independent Publishing Platform, 2017.
3   Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, "Marketing 4.0: Moving from Traditional to Digital", 1st Edition, Wiley & Sons, 2017.

ONLINE RESOURCES:

1   https://online-em.isb.educourses/digital-marketing-and-analytics
2   https://www.udemy.com/courses/marketing/digital-marketing/
3   https://www.futurelearn.com/subjects/business-and-management-courses/digital-marketing

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1   Analyze the confluence of marketing, operations, and human resources.
CO2   Explain the cognitive knowledge of the skills required in conducting online research.
CO3   Evaluate issues in adapting to globalized markets.
CO4   Explain the range of digital strategies and tactics.
CO5   Summarize cross-cultural and ethical issues in globalized digital markets.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	-	-	-	1	-	-	-	1	2	2
CO2	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO3	3	3	2	3	-	-	-	1	-	-	-	1	2	2
CO4	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO5	2	2	1	1	-	-	-	1	-	-	-	1	2	2

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P23MCEL13   ADVANCES IN NETWORKING   L T P C

Prerequisites: Computer Networks   3 0 0 3

COURSE OBJECTIVES:

- To understand the theme underlying IPv6 Structure and addressing methods
- To understand and analyze the protocols for IPv6 Implementation
- To identify and provide solutions for QoS and Security Issues with IPv6

UNIT I   **IPv6 STRUCTURE AND ADDRESSING**   9

IPv4 Address Depletion- IPv6 Transition Issues-IPv6 Structure: IPv6 Header, Extension Headers: 59 Hop-by-Hop Options Header, Destination Options Header, Routing Header, Fragment Header, AH, ESP- IPv6 Addresses: Unicast, Anycast, Multicast – Address Auto configuration

UNIT II   **IPv6 NETWORKING**   9

IPv6 Internet Control Message Protocol (ICMPv6): ICMPv6 Messages, Fragmentation and Path MTU- IPv6 Neighbor Discovery- IPv6 Routing : RIPng, EIGRP for IPv6, OSPFv3 - Mobile IPv6

UNIT III   **QoS, PROVISIONING AND SECURITY WITH IPv6**   9

QoS in IPv6 Protocols: Differentiated Services and IPv6, IPv6 Flows, Explicit Congestion Notification in IPv6 – Provisioning: Stateless DHCPv6, Stateful DHCPv6, DNS Extensions for IPv6- Security with IPv6: IP Security Protocol (IPsec) Basics, IPv6 Security Elements, Interaction of IPsec with IPv6 Elements

UNIT IV   **SOFTWARE DEFINED NETWORKING**   9

Genesis of SDN – Separation of Control Plane and Data Plane – Distributed Control Plane –IP and MPLS – Characteristics of SDN – Operation – Devices – Controller – OpenFlow Specification

UNIT V   **NETWORK FUNCTION VIRTUALIZATION**   9

Building SDN Framework – Network Functions Virtualization – Introduction –Virtualization and Data Plane I/O – Service Locations and Chaining – Applications – Use Cases of SDNs: Data Centers, Overlays, Big Data and Network Function Virtualization

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Rick Graziani, "IPv6 Fundamentals: A Straightforward Approach to Understanding IPv6" 2nd Edition, Cisco Press, 2017.

2. Jun Zheng, Xuemin (Sherman) Shen, Athanasios V. Vasilakos, "Network Coding: Fundamentals and Applications", 2nd Edition, Academic Press of Elsevier, 2021.

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REFERENCES:

1   William Stallings, "Foundations of Modern Networking – SDN, NFC, QoE, IoT and Cloud", 3rd Edition, Pearson Education, 2019.

2   Oswald Coker, Siamak Azodolmolky, "Software-Defined Networking with OpenFlow", 2nd Edition, Packt Publishing, 2017.

ONLINE RESOURCES:

1   https:// www.edx.org/learn/gis-geographic-information-systems

2   https://www. alison.com / geographic-information-systems

3   https://www.nptel.ac.in/noc23_cs35

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1   Describe IPv6 Structure and addressing methods.
CO2   Apply the strategies for deploying IPv6 in the place of IPv4.
CO3   Analyze the security issues for IPv6 in emerging applications.
CO4   Summarize the need for separation of data and control plane in Networking.
CO5   Apply SDN to enable and enhance NFV

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO2	3	2	1	2	-	-	-	1	-	-	-	1	2	2
CO3	3	3	2	2	-	-	-	1	-	-	-	1	2	2
CO4	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO5	3	2	1	2	-	-	-	1	-	-	-	1	2	2

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P23MCEL14   **GEOLOGICAL INFORMATION SYSTEMS**   L T P C

Prerequisites: Remote Sensing Fundamentals   3 0 0 3

COURSE OBJECTIVES:

- To understand the basic concepts of Geological information systems.
- To provide an exposure to spatial database structures and their utility in GIS.
- To analyze, capture, store, manipulate, manage, and present spatial data.

UNIT I   SPATIAL DATA REPRESENTATION   9

GIS – Definition and related terminology- Digital representation of geospatial data – raster – vector – object oriented – geo database model-analysis.

UNIT II   DATA - DIGITIZATION AND PREPARATION   9

Data – Sources and types. Maps and scales – advantages and limitations. Coordinates, Datum and projection system. Raster data. Characteristics and file formats. Vector data characteristics. Scanner: Principles, On Screen Digitization-post scanning-importing- data editing. Linking digital databases: ODBC – GPS data integration.

UNIT III   RASTER DATA ANALYSIS   9

Raster Geospatial Data Analysis-Local operations: Reclassification, Logical and Arithmetic overlay operations - Neighbourhood operations: Aggregation, Filtering, Slope and Aspect map – Extended neighbourhood operations: - Statistical Analysis, Proximity, Connectivity operations, Buffering, Viewshed analysis – Regional operations: Area, Perimeter, Shape, Identification of region and Classification-output functions of Raster geoprocessing.

UNIT IV   VECTOR DATA PROCESSING   9

Non-topological analysis: Attribute database query, SQL, Summary statistics-statistical computation-calculation-quantification- Address geocoding, -Topological analysis Feature based topological functions-overlay-buffering- Layer based topological function-Reclassification, Aggregation, Overlay analysis- Point-in-polygon, Line-in-polygon, Polygo-on-polygon: Clip, Erase, Identity, Union, Intersection – Network based Geoprocessing – Output functions.

UNIT V   GIS MODELLING AND APPLICATIONS   9

Spatial indexing. Spatial modelling – External, Conceptual, Logical, Internal –GIS Modeling with case study- spatial data mining-DEM- introduction and applications.

                                        TOTAL: 45 PERIODS

TEXT BOOKS:

1   Michael F Goodchild, Paul A Longley, David J Maguire, David W Rhind, "Geographical Information Systems: Principles, Techniques, Management and Applications", 3rd Edition, John Wiley & Sons, 2020.

2   Jonathan D Phillips, "Geographical Information Systems and Remote Sensing in Land and Water Management", 2nd Edition, Springer, 2019.

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REFERENCES:

1. Magwire D J, Goodchild M F, Rhind, D M, "Geographical Information Systems: Principles and Applications", 6th Edition, Longman Group, 2021.
2. Kang-tsung Chang, 'Introduction to Geographic Information Systems' Tata McGraw Hill, 2020.
3. Jonathan P Howarth, "Geographical Information Systems in Archaeology", 2nd Edition, Cambridge University Press, 2018.

ONLINE RESOURCES:

1. https://www.alison.com /cyber-security
2. https:// www.ifsacademy.org/advance-networking
3. https://www.nptel.ac.in/noc22_ce26

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1   Explain GIS and cartography.

CO2   Summarize the spatial data and handle spatial and non-spatial database.

CO3   Describe various GIS tools and techniques within spatial analytical framework.

CO4   Analyze GIS outputs in different dimensions.

CO5   Apply spatial data analysis to solve natural, environmental and societal problems and challenges.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO2	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO3	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO4	3	3	2	2	-	-	-	1	-	-	-	1	2	2
CO5	3	2	1	2	-	-	-	1	-	-	-	1	2	2

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P23MCEL15 **WIRELESS NETWORKING** L T P C

Prerequisites: Computer Networks 3 0 0 3

COURSE OBJECTIVES:

- To understand the concept about Wireless networks, protocol stack and standards
- To learn about evolution of 4G Networks, its architecture and applications.
- To study about fundamentals of 3G Services, its protocols and applications

UNIT I WIRELESS LAN 9

Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum, IEEE802.11: System architecture, protocol architecture, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, WPAN – IEEE 802.15.4, Wireless USB, Zigbee, 6LoWPAN, WirelessHART- IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX

UNIT II MOBILE NETWORK LAYER 9

Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6- Network layer in the internet- Mobile IP session initiation protocol - mobile ad-hoc network: 73 Routing: Destination-Sequenced Distance-Vector (DSDV), Dynamic source routing, IoT: CoAP, TCP enhancements for wireless protocols

UNIT III 3G OVERVIEW 9

Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture: 3G-MSC, 3G-SGSN, 3G-GGSN, 3GPP Architecture, SMS-GMSC/SMS-IWMSC, Firewall, DNS/DHCP-High speed Downlink packet access (HSDPA)- LTE network architecture and protocol, User equipment, CDMA2000 overview- Radio and Network components, Network structure, Radio Network, TDCDMA, TD – SCDM

UNIT IV 4G NETWORKS 9

Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies: Cognitive Radio, IMS Architecture, LTE, Advanced Broadband Wireless Access and Services, MVNO.

UNIT V 5G NETWORKS 9

Introduction to 5G, vision and challenges, 5G NR – New Radio – air interface of 5G, radio access, Ultra-Dense Network Architecture and Technologies for 5G- Generalized frequency division multicarrier (GFDM)- Principles, Transceiver Block diagram-MIMO in LTE, Theoretical background, Single user MIMO, Multi-user MIMO, Capacity of massive MIMO: a summary, Basic forms of massive MIMO implementation.

TOTAL: 45 PERIODS

TEXT BOOKS:

1 William Stallings, "Wireless Communications and Networks", 2nd Edition, Pearson Education, 2021.

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2   Kaveh Pahlavan, Allen H Levesque, "Wireless Information Networks", 4th Edition, John Wiley & Sons - IEEE Press, 2019.

REFERENCES:

1   Thomas L Marzetta, Erik G Larsson, Hong Yang, HienQuoc Ngo, "Fundamentals of Massive MIMO", 1st Edition, Cambridge University Press, 2020.
2   Saad Z Asif, "5G Mobile Communication, Concepts and Challenges", 1st Edition, CRC Press, 2018.
3   T S Rappaport, "Wireless Communications: Principles and Practice", 3rd Edition, Prentice Hall of India, 2022.

ONLINE RESOURCES:

1   https://utsa.pressbooks.pub/networking/chapter/introduction-wireless/
2   https://www.sciencedirect.com/topics/computer-science/wireless-networking
3   https://www.shiksha.com/online-courses/articles/wireless-networking/

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1   Explain the wireless network environment for an application based factors.
CO2   Explain Packet Delivery from source to destination in a mobile network.
CO3   Apply 3G wireless technology and protocol based on the requirement.
CO4   Evaluate various 4G networking technologies and their unique functionalities.
CO5   Analyze latest network Architecture, its principles and evolution.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO2	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO3	3	2	1	2	-	-	-	1	-	-	-	1	2	2
CO4	3	3	2	3	-	-	-	1	-	-	-	1	2	2
CO5	3	3	2	2	-	-	-	1	-	-	-	1	2	2

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P23MCEL16	BLOCKCHAIN TECHNOLOGIES	L T P C

Prerequisites: Distributed Systems   3 0 0 3

COURSE OBJECTIVES:

- To understand the concept of Blockchain technology.
- To explore various aspects of Bitcoin and Cyptocurrency technology.
- To implement the idea about private and public Blockchain

UNIT I   INTRODUCTION OF CRYPTOGRAPHY AND BLOCKCHAIN   9

Introduction to Blockchain, Blockchain Technology Mechanisms & Networks, Blockchain Origins, Objective of Blockchain, Blockchain Challenges, Transactions and Blocks, P2P Systems, Keys as Identity, Digital Signatures, Hashing, and public key cryptosystems, private vs. public Blockchain.

UNIT II   BITCOIN AND CRYPTOCURRENCY   9

Introduction to Bitcoin, The Bitcoin Network, The Bitcoin Mining Process, Mining Developments, Bitcoin Wallets, Decentralization and Hard Forks, Ethereum Virtual Machine (EVM), Merkle Tree, Double-Spend Problem, Blockchain and Digital Currency, Transactional Blocks, Impact of Blockchain Technology on Cryptocurrency

UNIT III   INTRODUCTION TO ETHEREUM   9

Introduction to Ethereum, Consensus Mechanisms, Metamask Setup, Ethereum Accounts, Transactions, Receiving Ethers, Smart Contracts.

UNIT IV   INTRODUCTION TO HYPERLEDGER AND SOLIDITY PROGRAMMING   9

Introduction to Hyperledger, Distributed Ledger Technology & its Challenges, Hyperledger & Distributed Ledger Technology, Hyperledger Fabric, Hyperledger Composer. Solidity - Language of Smart Contracts, Installing Solidity & Ethereum Wallet, Basics of Solidity, Layout of a Solidity Source File & Structure of Smart Contracts, General Value Types.

UNIT V   BLOCKCHAIN APPLICATIONS   9

Internet of Things, Medical Record Management System, Domain Name Service and Future of Blockchain, Alt Coins

TOTAL: 45 PERIODS

TEXT BOOKS:

1 Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, Decentralization, and Smart Contracts Explained", 2nd Edition, Packt Publishing, 2018.
2 Narayanan, j Bonneau, E Felten, A Miller, S Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction" Princeton University Press, 2017.

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REFERENCES:

1   Antonopoulos, "Mastering Bitcoin", O'Reilly Publishing, 2020.
2   Antonopoulos, G Wood, "Mastering Ethereum: Building Smart Contracts and Dapps", O'Reilly Publishing, 2018.
3   D Drescher, "Blockchain Basics", Apress, 2017.

ONLINE RESOURCES:

1   https://www.simplilearn.com/tutorials/blockchain-tutorial/blockchain-technology
2   https:// www.sciencedirect.com/science/article/pii/S266660302100021X
3   https://www. blockgeeks.com/guides/what-is-blockchain-technology/

COURSE OUTCOMES:

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

CO1   Explain the working of Blockchain technology.
CO2   Explain the working of Smart Contracts.
CO3   Analyze the working of Hyperledger.
CO4   Apply the learning of solidity to build de-centralized apps on Ethereum.
CO5   Design applications on Blockchain.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO2	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO3	3	3	2	2	-	-	-	1	-	-	-	1	2	2
CO4	3	2	1	2	-	-	-	1	-	-	·	1	2	2
CO5	3	3	3	3	-	-	-	1	-	-	-	1	2	2

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P23MCEL17	ORGANIZATIONAL BEHAVIOR	L	T	P	C
		3	0	0	3

Prerequisites: Human Resource Management

COURSE OBJECTIVES:

- To develop a better conceptualization of organizational life.
- To enable the students to understand the Organizational Behavior.
- To analyse various factors affecting Personality Organizational Change.

UNIT I	ORGANIZATIONAL BEHAVIOR INTRODUCTION	9

Organization Behaviour – Definition – Scope and Application in Management – Contributions of Other Disciplines to OB. Emerging Issues in Organizational Behaviour- Organizational behaviour models

UNIT II	INDIVIDUAL PROCESSES	9

Personality – types – Factors influencing personality– Theories. Emotions - Theories – Emotional Intelligence- Learning – Types of learners – The learning process – Learning theories. 80 Perceptions – Importance – Factors influencing perception- Attitudes – Nature of Attitudes Components of Attitudes Formation of Attitude Benefits of Positive Attitude Functions of Attitudes– Measurement-Motivation – Importance – Types – Theories

UNIT III	LEADERSHIP AND POWER	9

Meaning – Importance – Leadership styles – Theories – Leaders Vs Managers – Sources of power – Power centers – Power and Politics.

UNIT IV	GROUP DYNAMICS	9

Meaning – Types of Groups – Functions of Small Groups – Group Size Status – Managerial Implications – Group Behaviour – Group Norms – Cohesiveness – Group Thinking

UNIT V	ORGANIZATIONAL CHANGE AND DEVELOPMENT	9

Organizational Change: Meaning – Nature of Work Change – Need for Change – Change Process – Types of Change – Factors Influencing Change – Resistance to Change – Overcoming Resistance – Organizational Development: Meaning and Different Types of OD Interventions

TOTAL: 45 PERIODS

TEXT BOOKS:

1. K Aswathappa, "Organizational Behavior", 11th Edition, Himalaya Publishing House Pvt. Ltd, 2021.
2. Stephen P Robbins, "Organizational Behavior", Global Edition, Pearson Education, 2019.

REFERENCES:

1. Fred Luthans, "Organizational Behavior", 13th Edition, Tata McGraw Hill, 2017.
2. Ivancevich, Konopaske Matteson, "Organizational Behaviour & Management", 7th Edition, Tata McGraw Hill, 2019.
3. Jason Colquitt, Jeffery LePine, Michael Wesson, "Organizational Behavior: Improving Performance and Commitment in the Workplace", 6th Edition, Tata McGraw Hill, 2020.

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ONLINE RESOURCES:

1   https://www.apcas.ac.in/download/downloads/0102221541171740
2   https://ww.investopedia.com/terms/o/organizational-behavior
3   https:// www.capterra.com/resources/what-is-organizational-behavior/

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1   Describe the human behavior in organization.

CO2   Explain the framework for managing individual and group performance.

CO3   Analyze issues and concerns in organizational behavior at the workplace

CO4   Analyze the effective management of individuals and group behavior

CO5   Apply concepts of OB to handle problems in the work environment.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO2	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO3	3	3	2	2	-	-	-	1	-	-	-	1	2	2
CO4	3	3	2	2	-	-	-	1	-	-	-	1	2	2
CO5	3	2	1	2	-	-	-	1	-	-	-	1	2	2

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P23MCEL18	SERVICE ORIENTED ARCHITECTURE	L	T	P	C
Prerequisites: Software Engineering		3	0	0	3

COURSE OBJECTIVES:

- To learn XML concepts and exposed to build applications based on XML.
- To gain knowledge about SOAP, HTTP and UDDI to create web services.
- To understand the SOA architecture and principles of Service Oriented Architecture.

UNIT I	XML AND WEB SERVICES	9

XML structure – Elements – Creating Well-formed XML - Name Spaces – Schema Elements, Types, Attributes – XSL Transformations – Parser – Web Services Overview – Architecture.

UNIT II	WSDL, SOAP and UDDI	9

WSDL - Overview Of SOAP – HTTP – XML-RPC – SOAP: Protocol – Message Structure – Intermediaries – Actors – Design Patterns And Faults – SOAP With Attachments – UDDI.

UNIT III	SOA BASICS	9

Roots of SOA – Characteristics of SOA - Comparing SOA to client-server and distributed internet architectures – Anatomy of SOA- How components in an SOA interrelate - Principles of service orientation – Service Layers.

UNIT IV	SOA in J2EE and .NET	9

SOA platform basics – SOA support in J2EE – Java API for XML-based web services (JAX-WS) - Java architecture for XML binding (JAXB) – Java API for XML Registries (JAXR) - Java API for XML based RPC (JAX-RPC) – JAX-RS SOA support in .NET – ASP.NET web services.

UNIT V	CLOUD COMPUTING	9

Vision of Cloud computing – Cloud Definition – Characteristics and Benefits – Virtualization – Cloud computing Architecture – Cloud Reference Model, Types of Clouds – Cloud Platforms in Industry

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Thomas Erl, Benjamin Carlyle, Cesare Pautasso, "Service-Oriented Architecture: Concepts, Technology, and Design", 2nd Edition, Prentice Hall of India, 2018.

2. Eric A Marks, Michael Bell, "Service-Oriented Architecture (SOA): Concepts, Technology, and Design", 3rd Edition, John Wiley & Sons, 2018.

REFERENCES:

1. Thomas Erl, "Service-Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2017.

2. Philip A Bernstein, Eric Newcomer, "Principles of Transaction Processing", 2nd Edition, Morgan Kaufmann, 2017.

3. Philip Wik, Thomas Erl, André Tost, Peter Zimmerer, "Enterprise Service Bus: Theory in Practice", 3rd Edition, Packt Publishing, 2018.

ONLINE RESOURCES:

1. https://www.ibm.com/topics/soa
2. https://www.oracle.com/in/service-oriented-architecture-soa/
3. https://www.talend.com/resources/service-oriented-architecture/

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1   Understand the basic structure of XML and to design and store data in XML

CO2   Apply SOAP, HTTP and UDDI services in the web applications.

CO3   Describe SOA architecture and the underlying design principles for the web projects

CO4   Summarize the role of SOA in J2EE and .NET.

CO5   Explain about the cloud computing architecture and the types of clouds

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO2	3	2	1	2	-	-	-	1	-	-	-	1	2	2
CO3	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO4	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO5	2	2	1	1	-	-	-	1	-	-	-	1	2	2

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P23MCEL19	HUMAN RESOURCE MANAGEMENT	L	T	P	C
Prerequisites: Principles of Management		3	0	0	3

COURSE OBJECTIVES:

- To understand the importance of human resources and planning process.
- To understand the stages of employee socialization and training needs.
- To know about the purposes of performance management systems and appraisal.

UNIT I	UNDERSTANDING HRM WITH LEGAL & ETHICAL CONTEXT	9

Introduction- Importance of HRM – functions – Structure of HRM Department-Trends and opportunities – External Influences Affect HRM- HRM in global environment – The Changing World of Technology- HR & Corporate Ethics – Equal Employment Opportunities -Laws Affecting discriminatory practices – Enforcing Equal Opportunity Employment-Discipline & Employee Rights

UNIT II	STAFFING, RECRUITING AND FOUNDATIONS OF SELECTION	9

Introduction – An Organizational Framework- Job analysis -Methods -Purpose– Recruiting Goals – Recruiting Sources – Recruiting A Global Perspective- Selection Process – Selection from Global Perspective- job offers – Avoiding hiring mistakes - key element for successful predictors

UNIT III	TRAINING AND DEVELOPMENT	9

Introduction – Socialization Process-Purpose of New employee orientation, Employee training- Employee Development– Organization development Calm Waters Metaphor – White-Water Rapids Metaphor – Evaluating training and Development Effectiveness international training and development issues – Career Development -Value for organization and individual – mentoring and coaching – traditional career stages.

UNIT IV	PERFORMANCE EVALUATION, REWARDS AND BENEFITS	9

Appraisal process – methods – factors distort appraisal – team appraisal – international appraisal –-rewards –Theories of motivation - compensation administration – job evaluation and pay structure – special cases of compensation – executive compensation programs – employee benefits Voluntary Benefits- International Compensation.

UNIT V	SAFE AND HEALTHY WORK ENVIRONMENT	9

Occupational safety and health act -Contemporary Health and Safety Issues –Employee assistance program – International Safety & Health -labor management - employee unions – labor legislation- Unionizing Employees- Collective Bargaining.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Biswajeet Pattanayak, "Human Resource Management", Prentice Hall of India, 2020.
2. Decenzo, Robbins, "Human Resource Management", 16th Edition, John Wiley & Sons, 2021.

REFERENCES:

1 Wayne Cascio, "Managing Human Resource", 12th Edition, Tata McGraw Hill, 2021.
2 Ivancevich, "Human Resource Management", Tata McGraw Hill, 2017.
3 Dessler, "Human Resource Management", 17th Edition, Pearson Education, 2022.

ONLINE RESOURCES:

1 https://www.timechamp.io/blogs/what-is-human-resource-management-hrm/
2 https://www.whatishumanresource.com/human-resource-management
3 https://www.servicenow.com/products/hr-service-delivery/what-is-hr-management

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1	Explain the primary external influences affecting HRM.
CO2	Apply the components and the goals of staffing, training and development.
CO3	Analyze the selection procedure in various organizations.
CO4	Describe the practices used to retain the employees.
CO5	Analyze the stress and the cause of burn out

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO2	3	2	1	1	-	-	-	1	-	-	-	1	2	2
CO3	3	3	2	2	-	-	-	1	-	-	-	1	2	2
CO4	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO5	3	3	2	2	-	-	-	1	-	-	-	1	2	2

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P23MCEL20   SOFTWARE TESTING AND QUALITY ASSURANCE   L T P C

Prerequisites: Software Engineering

                                                              3 0 0 3

COURSE OBJECTIVES:

- To understand the fundamentals of software testing and its methodologies.

- To familiarize with various quality standards, models and understand their implications for software quality management.

- To learn about metrics and measurement techniques for software quality and testing.

UNIT I   **INTRODUCTION**   9

Basic concepts and Preliminaries – Theory of Program Testing– Unit Testing – Control Flow Testing –Data Flow Testing– System Integration Testing

UNIT II   **SOFTWARE TESTING METHODOLOGY**   9

Software Test Plan–Components of Plan - Types of Technical Reviews - Static and Dynamic Testing- – Software Testing in Spiral Manner - Information Gathering - Test Planning - Test Coverage - Test Evaluation - Acceptance Test – Summarize Testing Results.

UNIT III   **EMERGING SPECIALIZED AREAS IN TESTING**   9

Test Process Assessment – Test Automation Assessment - Test Automation Framework –Agile Testing – Testing Centre of Excellence – Onsite/Offshore Model - Modern Software Testing Tools – Software Testing Trends – Methodology to Develop Software Testing Tools.

UNIT IV   **SOFTWARE QUALITY MODELS**   9

Software quality –Verification versus Validation– Components of Quality Assurance – SQA Plan – Quality Standards – CMM – PCMM – CMMI – Malcolm Baldrige National Quality Award.

UNIT V   **QUALITY THROUGH CONTINUOUS IMPROVEMENT PROCESS**   9

Role of Statistical Methods in Software Quality – Transforming Requirements into Test Cases – Deming's Quality Principles – Continuous Improvement through Plan Do Check Act (PDCA)

                                                     TOTAL: 45 PERIODS

TEXT BOOKS:

1   William E Lewis, "Software Testing and Continuous Quality Improvement", 3rd Edition, Auerbach Publications, 2021.

2   Kshirasagar Naik, Priyadarshi Tripathy, "Software Testing and Quality Assurance Theory and Practice", 2nd Edition, John Wiley & Sons, 2018.

REFERENCES:

1   Ron Patton, "Software Testing", 2nd Edition, Pearson Education, 2021.

2   Paul C Jorgensen, "Software Testing, A Craftman's Approach", 4th Edition, CRC Press Taylor & Francis Group, 2018.

ONLINE RESOURCES:

1. https://www.coursera.org/courses?query=software%20testing
2. https://onlinecourses.nptel.ac.in/noc22_cs61/preview
3. https://www.classcentral.com/course/youtube-software-testing-47402

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1   Understand the principles, concepts, and importance of testing.

CO2   Analyze various software testing techniques

CO3   Apply various software testing strategies to identify defects and ensure software quality.

CO4   Analyze various quality standards, models, frameworks and their implications for software quality management.

CO5   Understand the importance of quality metrics and measurement in software testing and qu assurance.

CO-PO-PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	-	2	2
CO2	3	3	2	2	-	-	-	1	-	-	-	-	2	2
CO3	3	2	1	2	-	-	-	1	-	-	-	-	2	2
CO4	3	3	2	2	-	-	-	1	-	-	-	-	2	2
CO5	2	2	1	1	-	-	-	1	-	-	-	-	2	2

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P23OE MC01	INTELLECTUAL PROPERTY RIGHTS	L	T	P	C

Prerequisites: Business Law

3	0	0	3

COURSE OBJECTIVES:

- To recognize the importance of IP and to educate the pupils on basic concepts of Intellectual Property Rights.
- To make the students to understand the statutory provisions of different forms of IPRs in simple forms.
- To acquire the procedure of obtaining Patents, Copyrights, Trade Marks &Industrial Design

UNIT I   **INTRODUCTION**   9

Intellectual property rights - Introduction, Basic concepts, Patents, Copyrights, Trademarks, Trade Secrets, Geographic Indicators; Nature of Intellectual Property, Technological Research, Inventions and Innovations, History - the way from WTO to WIPO, TRIPS.

UNIT II   **PROCESS**   9

New Developments in IPR, Procedure for grant of Patents, TM, GIs, Patenting under Patent Cooperation Treaty, Administration of Patent system in India, Patenting in foreign countries.

UNIT III   **STATUTES**   9

International Treaties and conventions on IPRs, The TRIPs Agreement, PCT Agreement, The Patent Act of India, Patent Amendment Act (2005), Design Act, Trademark Act, Geographical Indication Act, Bayh- Dole Act and Issues of Academic Entrepreneurship.

UNIT IV   **STRATEGIES IN INTELLECTUAL PROPERTY**   9

Strategies for investing in R&D, Patent Information and databases, IPR strength in India, Traditional Knowledge, Case studies.

UNIT V   **MODELS**   9

The technologies Know-how, concept of ownership, Significance of IP in Value Creation, IP Valuation and IP Valuation Models, Application of Real Option Model in Strategic Decision Making, Transfer and Licensing.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. William Patry, "Patry on Copyright", 10th Edition, Thomson Reuters, 2019.
2. Robert P Merges, Peter S Menell "Intellectual Property in the New Technological Age", 6th Edition, Wolters Kluwer, 2020.

REFERENCES:

1. G B Reddy, "Intellectual Property Rights and Law", Reprint Edition, Gogia Law Agency, 2020.

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2   David Bainbridge, "Intellectual Property", 10th Edition, Pearson Education, 2018.
3   Cornish, William R. and Llewelyn, David, "Intellectual Property: Patents, Copyrights, Trademarks and Allied Rights", 9th Edition, Sweet & Maxwell, 2017.

ONLINE RESOURCES:

1   https://www.icsi.edu/media/website/IntellectualPropertyRightLaws&Practice.pdf
2   https://www.facebook.com/krmuniv/videos/fdp-on-meaningful-research-and-ipr/1111028616288503/
3   https://onlinecourses.nptel.ac.in/noc22_hs59/preview

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1   Explain intellectual property and appreciation of the need to protect it.
CO2   Summarize about the process of patenting.
CO3   Analyze the statutes related to IPR.
CO4   Describe strategies to protect intellectual property.
CO5   Apply the models for making strategic decisions related to IPR.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO2	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO3	3	3	2	2	-	-	-	1	-	-	-	1	2	2
CO4	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO5	3	2	1	2	-	-	-	1	-	-	-	1	2	2

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P23OEMC02	MACHINE LEARNING AND DEEP LEARNING	L	T	P	C
Prerequisites: Probability and Statistics		3	0	0	3

COURSE OBJECTIVES:

- To Understand about the learning problem and algorithms
- To Learn about the machine learning fundamentals and pattern recognition
- To apply deep learning algorithms for solving real life problems.

UNIT I	LEARNING PROBLEMS AND ALGORITHMS	9

Various paradigms of learning problems, Supervised, Semi-supervised and Unsupervised algorithms

UNIT II	NEURAL NETWORKS	9

Differences between Biological and Artificial Neural Networks - Typical Architecture, Common Activation Functions, Multi-layer neural network, Linear Separability, Hebb Net, Perceptron, Adaline, Standard Back propagation Training Algorithms for Pattern Association - Hebb rule and Delta rule, Hetero associative, Auto associative, Kohonen Self Organising Maps, Examples of Feature Maps, Learning Vector Quantization, Gradient descent, Boltzmann Machine Learning.

UNIT III	MACHINE LEARNING – FUNDAMENTALS, FEATURE SELECTIONS & CLASSIFICATIONS	9

Classifying Samples: The confusion matrix, Accuracy, Precision, Recall, F1- Score, the curse of dimensionality, training, testing, validation, cross validation, overfitting, under-fitting the data, early stopping, regularization, bias and variance. Feature Selection, normalization, dimensionality reduction, Classifiers: KNN, SVM, Decision trees, Naïve Bayes, Binary classification, multi class classification, clustering.

UNIT IV	DEEP LEARNING: CONVOLUTIONAL NEURAL NETWORKS	9

Feed forward networks, Activation functions, back propagation in CNN, optimizers, batch normalization, convolution layers, pooling layers, fully connected layers, dropout, Examples of CNNs.

UNIT V	DEEP LEARNING: RNNS, AUTOENCODERS AND GANS	9

State, Structure of RNN Cell, LSTM and GRU, Time distributed layers, Generating Text, Autoencoders: Convolutional Autoencoders, Denoising autoencoders, Variational autoencoders, GANs: The discriminator, generator, DCGANs

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow", 2nd Edition, O'Reilly Media, 2019.

2. Andreas C. Müller, Sarah Guido, "Introduction to Machine Learning with Python: A Guide for Data Scientists", 1st Edition, O'Reilly Media, 2017.

REFERENCES:

1. Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning. Trevor Hastie", 2nd Edition. 2017.

2. Shai Shalev-Shwartz, Shai Ben-David, "Understanding Machine Learning", Cambridge University Press. 2017.

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3   Ethem Alpaydin, "Machine Learning: The New AI", 3rd Edition, MIT Press, 2020.

ONLINE RESOURCES:

1   https://www.ibm.com/topics/deep-learning

2   https://www.coursera.org/articles/ai-vs-deep-learning-vs-machine-learning-beginners-guide

3   https://onlinecourses.nptel.ac.in/noc23_ee87/preview

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1   Describe the categorization of machine learning algorithms.

CO2   Describe the types of neural network architectures, activation functions.

CO3   Explain the pattern association using neural networks

CO4   Describe various terminologies related with pattern recognition and architectures of convolutional neural networks

CO5   Create different feature selection and classification techniques and advanced neural network architectures such as RNN, Autoencoders, and GANs.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO2	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO3	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO4	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO5	3	3	3	3	-	-	-	1	-	-	-	1	2	2

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P23OEMC03   IoT FOR SMART SYSTEMS   L   T   P   C

Prerequisites: Embedded Systems and Hardware   3   0   0   3

COURSE OBJECTIVES:

- To study about Internet of Things technologies and its role in real time applications.
- To provide insight about the embedded processor and sensors required for IoT.
- To familiarize the different platforms and Attributes for IoT.

UNIT I   INTRODUCTION TO INTERNET OF THINGS   9

Overview, Hardware and software requirements for IoT, Sensor and actuators, Technology drivers, Business drivers, Typical IoT applications, Trends and implications.

UNIT II   IoT ARCHITECTURE   9

IoT reference model and architecture -Node Structure - Sensing, Processing, Communication, Powering, Networking - Topologies, Layer/Stack architecture, IoT standards, Cloud computing for IoT, Bluetooth, Bluetooth Low Energy beacons.

UNIT III   PROTOCOLS AND WIRELESS TECHNOLOGIES FOR IoT   9

PROTOCOLS: NFC, SCADA and RFID, Zigbee MIPI, M-PHY, UniPro, SPMI, SPI, M-PCIe GSM, CDMA, LTE, GPRS, small cell.

Wireless technologies for IoT: WiFi (IEEE 802.11), Bluetooth/Bluetooth Smart, ZigBee/ZigBee Smart, UWB (IEEE 802.15.4), 6LoWPAN, Proprietary systems-Recent trends.

UNIT IV   IoT PROCESSORS   9

Services/Attributes: Big-Data Analytics for IoT, Dependability, Interoperability, Security, Maintainability.

Embedded processors for IoT: Introduction to Python programming -Building IoT with RASPERRY PI and Arduino.

UNIT V   CASE STUDIES   9

Industrial IoT, Home Automation, smart cities, Smart Grid, connected vehicles, electric vehicle charging, Environment, Agriculture, Productivity Applications, IoT Defense

TOTAL: 45 PERIODS

TEXT BOOKS:

1   Mahmood Hussain Shah, Anand Nayyar, Naveen Chilamkurti, "Internet of Things for Smart Systems: Technologies, Protocols, and Applications", 1st Edition, CRC Press, 2018.
2   Liming Chen, Samarjit Chakraborty, Rajkumar Buyya, "Internet of Things: Principles and Paradigms", 2nd Edition, Morgan Kaufmann of Elsevier, 2020.

REFERENCES:

1   Adrian McEwen, Hakim Cassimally "Designing the Internet of Things", John Wiley & Sons, 2019.
2   Anupam Joshi, Rajendra Kumar, Balamurugan S, T B Isha, "Internet of Things: A Complete Guide", 1st Edition, CRC Press Taylor and Francis Group.

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3   Mohamed A El-Sharkawi, "Internet of Things: A Hands-On Approach", 1st Edition, Chapman and Hall/CRC Press, 2018.

ONLINE RESOURCES:

1   https://www.geeksforgeeks.org/introduction-to-internet-of-things-iot-set-1/
2   https://onlinecourses.nptel.ac.in/noc21_cs17/preview
3   https://www.techtarget.com/whatis/feature/IoT-basics-A-guide-for-begineers

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1   Analyze the concepts of IoT and its present developments
CO2   Summarize and contrast different platforms and infrastructures available for IoT
CO3   Describe Explain different protocols and communication technologies used in IoT.
CO4   Analyze Describe the big data analytic and programming of IoT
CO5   Evaluate Implement IoT solutions for smart applications

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	-	-	-	1	-	-	-	1	2	2
CO2	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO3	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO4	3	3	2	2	-	-	-	1	-	-	-	1	2	2
CO5	3	3	2	3	-	-	-	1	-	-	-	1	2	2

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| | L | T | P | C |

P23OEMC04   HEALTH CARE MANAGEMENT   L   T   P   C

                                                             3   0   0   3

Prerequisites: Business Fundamentals

COURSE OBJECTIVES:

- To understand the basic concepts of health care system.
- To know about creating, accessing and maintaining health care information systems
- To know social media analytics, temporal data mining and visual data analytics for health care data.

UNIT I   **INTRODUCTION**   9

Introduction to health care information – Health care data quality – Health care information regulations, laws and standards

UNIT II   **HEALTH CARE INFORMATION SYSTEMS**   9

History and evolution of health care information systems – Current and emerging use of clinical information systems – system acquisition – System implementation and support

UNIT III   **INFORMATION TECHNOLOGY**   9

Information architecture and technologies that support health care information systems – Health care information system standards – Security of health care information systems.

UNIT IV   **MINING AND SOCIAL MEDIA ANALYTICS FOR HEALTH CARE DATA**   9

Resources – Terminology Acquisition and Management – Information Extraction – Text Mining Environments – Applications – Social Media Analysis for Public Health Research – Analysis of Social Media use in Healthcare

UNIT V   **TEMPORAL DATA MINING AND VISUAL ANALYTICS FOR HEALTH CARE**   9

Association Analysis – Temporal Pattern Mining – Sensor Data Analysis – Introduction to Visual Analysis and Medical Data Visualization – Visual Analytics in Health care – Visual Analytics for Clinicians.

                                                TOTAL: 45 PERIODS

TEXT BOOKS:

1. Peter C Olden, Pauline E Jensen, Herbert E. Braverman, "Health Care Management: Organization Design and Behavior", 7th Edition, Delmar Cengage Learning, 2018.
2. Sharon B Buchbinder, Nancy H. Shanks, "Introduction to Health Care Management", 4th Edition, Jones & Bartlett Learning, 2018.

REFERENCES:

1. Karen A Wager, Frances Wickham Lee, John P Glaser, "Managing Health Care Information Systems: A Practical Approach for Health Care Executives", 2nd Edition, John Wiley & Sons, 2017.
2. Leonard H Friedman, Anthony R Kovner, "Management in Health Care Organizations: Theory and Practice", 4th Edition, Jossey-Bass, 2018.
3. Beaufort B Longest Jr," Health Policy making", 7th Edition, Health Administration Press, 2018.

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ONLINE RESOURCES:

1 https://www.geeksforgeeks.org/hospital-management-system-project-in-software-development/
2 https://www.academia.edu/30270016/Introduction_to_Health_Care_Management
3 https://www.techtarget.com/searchhealthit/resources/Health-IT-infrastructure

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1 Design a basic research skills applicable to the design, evaluation and implementation of appropriate Healthcare Information Systems (HIS).

CO2 Explain the impact, strengths and weaknesses of various HIS in any healthcare settings.

CO3 Describe health care data in temporal data mining.

CO4 Apply sensor data and visual data analytics in health care applications.

CO5 Analyze how to apply state and federal healthcare policies.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	1	-	-	-	1	2	2
CO2	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO3	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO4	3	2	1	2	-	-	-	1	-	-	-	1	2	2
CO5	3	3	2	2	-	-	-	1	-	-	-	1	2	2

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P23OEMC05	ENVIRONMENTAL SUSTAINABILITY	L	T	P	C
Prerequisites: Resource Management		3	0	0	3

COURSE OBJECTIVES:

- To define and apply sustainability principles within their academic programs
- To explain how natural, economic, and social systems interact to foster or prevent sustainability
- To Analyze and explain local, national, and global sustainability using a multidisciplinary approach

UNIT I	INTRODUCTION	9

Valuing the Environment: Concepts, Valuing the Environment: Methods, Property Rights, Externalities, and Environmental Problems

UNIT II	CONCEPT OF SUSTAINABILITY	9

Sustainable Development: Defining the Concept, the Population Problem, Natural Resource Economics: An Overview, Energy, Water, Agriculture

UNIT III	SIGNIFICANCE OF BIODIVERSITY	9

Biodiversity, Forest Habitat, Commercially Valuable Species, Stationary - Source Local Air Pollution, Acid Rain and Atmospheric Modification, Transportation

UNIT IV	POLLUTION IMPACTS	9

Water Pollution, Solid Waste and Recycling, Toxic Substances and Hazardous Wastes, Global Warming.

UNIT V	ENVIRONMENTAL ECONOMICS	9

Development, Poverty, and the Environment, Visions of the Future, Environmental economics and policy by Tom Tietenberg, Environmental Economics

TOTAL: 45 PERIODS

TEXT BOOKS:

1 Stephen Morse, Yosef Jabareen, "Sustainability and the Built Environment", 1st Edition, Routledge, 2018.

2 John A Dernbach, "Environmental Law, Policy, and Economics: Reclaiming the Environmental Agenda", 2nd Edition, Carolina Academic Press, 2018.

REFERENCES:

1 Niko Roorda, "Fundamentals of Sustainable Development", 3rd Edition, Routledge, 2020.

2 Bhavik R Bakshi., "Sustainable Engineering: Principles and Practice", Cambridge University Press, 2019.

3 John H Cushman, "Environmental Sustainability: Practical Global Applications", 1st Edition, CRC Press, 2017.

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ONLINE RESOURCES:

1 https://ncert.nic.in/textbook/pdf/keec109.pdf
2 https://www.slideshare.net/slideshow/environmental-sustainability-ppt/250073328
3 https://onlinecourses.swayam2.ac.in/nou20_ag12/preview

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1 Explain the ways that sustainability topics are approached by a diversity of academic disciplines.

CO2 Summarize concepts of interdependence and dynamic interrelationships within and between social and ecological systems.

CO3 Describe how systemic limits and globalized processes impact socio ecological systems and impose social differences. .

CO4 Analyze human and ecological health and social equity in problem solving strategies.

CO5 Apply creative responses that inform sustainable approaches to promote resilient communities.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	2	-	-	-	-	1	2	2
CO2	2	2	1	1	-	-	2	-	-	-	-	1	2	2
CO3	2	2	1	1	-	-	2	-	-	-	-	1	2	2
CO4	3	3	2	2	-	-	3	-	-	-	-	1	2	2
CO5	3	2	1	2	-	-	3	-	-	-	-	1	2	2

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VALUE ADDED COURSES (VAC)

P23VA01   **DISASTER MANAGEMENT**   L T P C

Prerequisites: Nil   2 0 0 0
COURSE OBJECTIVES:

- To reduce the damage, death, sufferings and destruction of any natural and human induced disaster.
- To identifying the hazard and its cause.
- To increasing the strength among people to survive against disasters.

UNIT I   **INTRODUCTION**
                                                                              6
Disaster: Definition, Factors and Significance; Difference between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

UNIT II   **REPERCUSSIONS OF DISASTERS AND HAZARDS**   6

Economic Damage, Loss of Human and Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

UNIT III   **DISASTER PRONE AREAS IN INDIA**
                                                                              6
Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides And Avalanches; Areas Prone To Cyclonic and Coastal Hazards with Special Reference To Tsunami; Post-Disaster Diseases and Epidemics

UNIT IV   **DISASTER PREPAREDNESS AND MANAGEMENT**   6

Preparedness: Monitoring Of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological And Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT V   **RISK ASSESSMENTS**   6

Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival

TOTAL : 30 PERIODS

TEXT BOOKS:

1. Michael K. Lindell, Carla Prater, Ronald W. Perry, "Emergency Management: Concepts and Strategies for Effective Programs", 2nd Edition, John Wiley & Sons, 2019.

2. George Haddow, Jane Bullock, Damon P. Coppola "Introduction to Emergency Management", 6th Edition, Butterworth-Heinemann, 2018.

REFERENCES:

1 Goel S L, "Disaster Administration and Management Text and Case Studies", Deep & Deep Publication Pvt. Ltd., 2020.

2 Nishitha Rai, Singh A K, "Disaster Management in India: Perspectives, issues and

strategies", New Royal book Company, 2021.

3 Brenda D. Phillips, David M. Neal, Gary Webb," Introduction to Emergency Management", 6th Edition, Butterworth-Heinemann, 2018.

ONLINE RESOURCES:

1 https:// nidm.gov.in/online.asp/
2 https:// elearning.nidm.gov.in/
3 https:// get.disasterready.org /

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1 Summarize basics of disaster.

CO2 Explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.

CO3 Explain disaster risk reduction and humanitarian response policy and practice from multiple perspectives.

CO4 Describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.

CO5 Evaluate the strengths and weaknesses of disaster management approaches.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO2	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO3	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO4	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO5	3	3	2	3	-	-	-	1	-	-	-	1	2	2

P23VA02	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	L	T	P	C
Prerequisites: Nil		2	0	0	0

COURSE OBJECTIVES:

- To understand the traditional knowledge and its characteristics
- To know the need of protecting traditional knowledge.
- To understand the legal framework of TK and IPR.

UNIT I   INTRODUCTION TO TRADITIONAL KNOWLEDGE   6

Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge vs western knowledge traditional knowledge vis-à-vis formal knowledge.

UNIT II   PROTECTION OF TRADITIONAL KNOWLEDGE   6

The need for protecting traditional knowledge Significance of TK Protection, the value of TK in the global economy, Role of Government to harness TK.

UNIT III   LEGAL FRAMEWORK AND TRADITIONAL KNOWLEDGE   6

A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmers Rights Act, 2001 (PPVFR Act); B: The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indications act 2003.

UNIT IV   TRADITIONAL KNOWLEDGE AND INTELLECTUAL PROPERTY   6

Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

UNIT V   TRADITIONAL KNOWLEDGE IN DIFFERENT SECTORS   6

Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

TOTAL : 30 PERIODS

TEXT BOOKS:
1 Amartya Sen, "The Argumentative Indian: Writings on Indian History, Culture and Identity", Penguin Books.
2 David Frawley (Vamadeva Shastri), "Wisdom of the Ancient Seers: Mantras of the Rig Veda", Revised Edition, Motilal Banarsidass, 2017.

REFERENCES:

1 Amit Jha, "Traditional Knowledge System in India", Atlantic publishers, 2024.
2 Kapil Kapoor, "Knowledge Traditions and Practices of India", Michel Danino, 2024.
3 A P J Abdul Kalam, Srijan Pal Singh, "Advantage India: From Challenge to Opportunity", HarperCollins.

ONLINE RESOURCES:

1 https://archive.nptel.ac.in/courses/ 101104065/
2 https://www.goseeko.com/universities/
3 https:// iksindia.org /

Course outcomes:

At the end of the course, the students will able to
CO1 Describe the concept of Traditional knowledge and its importance.
CO2 Explain the need and importance of protecting traditional knowledge.
CO3 Describe the various enactments related to the protection of traditional knowledge
CO4 Explain the concepts of Intellectual property to protect the traditional knowledge.
CO5 Summarize the traditional knowledge in different sectors.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO2	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO3	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO4	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO5	2	2	1	1	-	-	-	1	-	-	-	1	2	2

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P23VA03	CONSTITUTION OF INDIA	L	T	P	C

Prerequisites: Nil

L T P C : 2 0 0 0

COURSE OBJECTIVES:

- To understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional
- Role and entitlement to civil and economic rights as well as the emergence nation hood in the early years of Indian nationalism.

UNIT I   HISTORY OF MAKING OF THE INDIAN CONSTITUTION   6

History, Drafting Committee, (Composition & Working)

UNIT II   PHILOSOPHY OF THE INDIAN CONSTITUTION   6

Preamble, Salient Features

UNIT III   CONTOURS OF CONSTITUTIONAL RIGHTS ANDDUTIES   6

Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT IV   ORGANS OF GOVERNANCE   6

Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

UNIT V   LOCAL ADMINISTRATION   6

District's Administration head: Role and Importance, Municipalities: Innovation, Mayor and role of Elected Representative, CEO, Municipal Corporation. Panchayat raj: Introduction, PRI: Zila Panchayat. Elected officialsand their roles, CEO Zila Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role ofElected and Appointed officials, Importance of grass root democracy.

TOTAL : 30 PERIODS

TEXT BOOKS:

1. "The Constitution of India, 1950 (Bare Act)", Government Publication, 2020.
2. M P Jain, "Indian Constitution Law", 8th Edition. Lexis Nexis, 2018.
3. D D Basu, "Introduction to the Constitution of India", 26th Edition Lexis Nexis,2022

REFERENCES:

1. "Constitution of India "LexisNexis, Eastern Book Company, and Universal Law Publishing Co.
2. Dr S N Busi, Dr B R Ambedkar "Framing of Indian Constitution, 1st Edition, 2016.
3. P M Baksh, "Constitution of India", LexisNexis, 2023.

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ONLINE RESOURCES:

1. https:// ruralindiaonline.org /
2. https:// www.constitutionofindia.net /
3. https:// www.mercatus.org /

Course outcomes:

At the end of the course, the students will able to

CO1 Describe the growth of the demand for civil rights in India forthe bulk of Indians before the arrival of Gandhi in Indian politics.

CO2 Summarize the intellectual origins of the framework of argumentthat informed the conceptualization of social reforms leadingto revolution in India.

CO3 Explain the circumstances surrounding the foundation of theCongress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.

CO4 Explain the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.

CO5 Explain the passage of the Hindu Code Bill of 1956.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO2	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO3	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO4	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO5	2	2	1	1	-	-	-	1	-	-	-	1	2	2

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P23VA04	நற்றமிழ் இலக்கியம்	L	T	P	C
		2	0	0	0

UNIT I   **சங்க இலக்கியம்**   6

1. தமிழின் துவக்க நூல் தொல்காப்பியம் - எழுத்து, சொல், பொருள்
2. அகநானூறு (82) - இயற்கை இன்னிசை அரங்கம்
3. குறிஞ்சிப் பாட்டின் மலர்க்காட்சி - புறநானூறு (95 195)
4. போரை நிருத்திய அவ்வையார்

UNIT II   **அறநெறித்தமிழ்**   6

1. அறநெறி வகுத்த திருவள்ளுவர் - அறம் வலியுறுத்தல், அன்புடைமை, ஒப்புரவறிதல், ஈகை, புகழ்
2. பிற அறநூல்கள் - இலக்கிய மருந்து - ஏலாதி, சிறுபஞ்சமூலம், திரிகடுகம், ஆச்சாரக்கோவை
        (தூய்மையை வலியுறுத்தும் நூல்)

UNIT III   **இரட்டைக்காப்பியங்கள்**   6

1. கண்ணகியின் புரட்சி - சிலப்பதிகார வழக்குரை காதை
2. சமுகசேவை இலக்கியம் மணிமேகலை - சிறைக்கோட்டம் அறக்கோட்டமாகிய காதை

UNIT IV   **அருள்நெறித்தமிழ்**   6

1. சிறுபாணாற்றுப்படை - பாரி முல்லைக்குத் தேர் கொடுத்தது, பேகன் மயிலுக்குப் போர்வை கொடுத்தது, அதியமான் அவ்வைக்கு நெல்லிக்கனி கொடுத்தது, அரசர் பண்புகள்
2. நற்றிணை - அன்னைக்குரிய புன்னை சிறப்பு
3. திருமந்திரம் (617, 618) - இயமம் நியமம் விதிகள்
4. தர்மசாலையை நிறுவிய வள்ளலார்
5. புறநானூறு - சிறுவனே வள்ளலானான்
6. அகநானூறு (4) – வண்டு
7. நற்றிணை (11) - நண்டு
8. கலித்தொகை (11) – யானை, புறா
9. ஐந்திணை 50 (27) – மான் ஆகியவை பற்றிய செய்திகள்

UNIT V   **நவீன தமிழ் இலக்கியம்**   6

1. உரைநடைத்தமிழ்
   - தமிழின் முதல் புதினம்,
   - தமிழின் முதல் சிறுககதை,
   - கட்டுரை இலக்கியம்,
   - பயண இலக்கியம்,
   - நாடகம்.
2. நாட்டு விடுதலைப் போராட்டமும் தமிழ் இலக்கியமும்,
3. சமுதாய விடுதலையும் தமிழ் இலக்கியமும்,
4. பெண் விடுதலையும் விளிம்பு நிலையினரின் மேம்பாட்டில் தமிழ் இலக்கியமும்,

5   அறிவியல் தமிழ்,
6   இணையத்தில் தமிழ்,
7   சுற்று சூழல் மேம்பாட்டில் தமிழ் இலக்கியம்

TOTAL : 30 PERIODS

தமிழ் இலக்கிய வெளியீடுகள் / புத்தகங்கள்:

1   தமிழ் இணைய கல்விக்கழகம் (Tamil Virtual University) - www.tamilvu.org

2   தமிழ் விக்கிப்பீடியா (Tamil Wikipedia) - https://ta.wikipedia.org

3   தர்மபுர ஆதீன வெளியீடு

4   வாழ்வியல் களஞ்சியம் - தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்

5   தமிழ்கலைக் களஞ்சியம் - தமிழ் வளர்ச்சித்துறை (thamilvalarchithurai.com)

6   அறிவியல் களஞ்சியம் - தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்

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BRIDGE COURSE

P23BC01	DATA STRUCTURES AND ALGORITHMS	L	T	P	C
Prerequisites: Programming Fundamentals		3	0	2	4

COURSE OBJECTIVES:

- To understand the basic techniques of ADT and algorithm analysis.
- To learn linear data structures and nonlinear data structures.
- To Develop problem-solving skills through the application of data structures and algorithms to real-world problems

UNIT I   INTRODUCTION   9

Introduction - Abstract Data Types (ADT) – Arrays and its representation – Structures – Fundamentals of algorithmic problem solving – Important problem types – Fundamentals of the analysis of algorithm – analysis framework – Asymptotic notations, Properties, Recurrence Relation.

UNIT II   LINEAR DATA STRUCTURES – LIST   9

List ADT - Array-based Implementation - Linked list implementation - Singly Linked Lists – Circularly linked lists – Doubly Linked Lists - Applications of linked list – Polynomial Addition.

UNIT III   LINEAR DATA STRUCTURES - STACK, QUEUE   9

Stack ADT – Operations on Stack - Applications of stack – Infix to postfix conversion – evaluation of expression - Queue ADT – Operations on Queue -Circular Queue - Applications of Queue.

UNIT IV   NON LINEAR DATA STRUCTURES - TREESAND GRAPHS   9

Trees and its representation – left child right sibling data structures for general trees- Binary Tree – Binary tree traversals –- Binary Search Tree -Graphs and its representation - Graph Traversals - Depth-first traversal – breadth-first traversal-Application of graphs.

UNIT V   SEARCHING, SORTING AND HASH TECHNIQUES   9

Searching: Linear search – Binary Search- comparison of linear search and binary search, Sorting algorithms: Insertion sort - Bubblesort – selection sort - Hashing: Hash Functions – Separate Chaining Open Addressing – Rehashing.

45 PERIODS

PRACTICAL EXERCISES:

1. Develop a program to perform various array operations.
2. Perform Polynomial Manipulation using Single Linked List and various operations in double linked list.
3. Write a program to convert infix to postfix using stack datastructure
4. Develop a program to perform circular queue operations
5. Write a program to delete a node from a given Binary search tree
6. Write a program to perform Graph Traversals.
7. Write a program to sort a given set of numbers and compare among Bubble Sort, Selection Sort and Insertion Sort with respect to computational complexity

30 PERIODS
TOTAL: 75 PERIODS

TEXT BOOKS:

1   A K Sharma, "Data Structures using C", 2nd Edition, Pearson Education, 2020.
2   Michael T Goodrich, Roberto Tamassia, Michael H. Goldwasser, "Data Structures and Algorithms in Python", 2nd Edition, John Wiley & Sons, 2018.

REFERENCES:

1   Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 2017.
2   Jean Paul Tremblay, Paul G Sorensen, "An Introduction to Data Structures with Applications", 2nd Edition, Tata McGraw Hill, 2017.
3   Robert Lafore, "Data Structures and Algorithms in Java", 2nd Edition, Sams Publishing, 2017.

ONLINE RESOURCES:

1   https://archive.nptel.ac.in/courses/106/102/106102064/
2   https://unacademy.com/goal/nta-ugc-net-set-exams/TEWDQ/topic/RVXW/MILTW
3   https://www.tableau.com/learn/articles/books-about-data-structures-algorithms

COURSE OUTCOMES:

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

CO1   Explain the basics of data structures and their implementations.
CO2   Explain the basic data structures such as arrays, strings, and linked lists.
CO3   Explain the linear data structures such as stacks and queues.
CO4   Design tree, heap and graphs along with their basic operations.
CO5   Analyze the different techniques for solving problems like sorting and searching

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	1	-	1	2	2
CO2	2	2	1	1	-	-	-	1	-	1	-	1	2	2
CO3	2	2	1	1	-	-	-	1	-	1	-	1	2	2
CO4	3	3	3	3	-	-	-	1	-	1	-	1	2	2
CO5	3	3	2	2	-	-	-	1	-	1	-	1	2	2

P23BC02   **PROGRAMMING IN C**   L   T   P   C

Prerequisites: Basic Programming Concepts   3   0   2   4

COURSE OBJECTIVES:

- To understand the basic concepts of problem solving approaches and to develop the algorithms.
- To apply the techniques of structured (functional) decomposition to break a program into smaller pieces and describe the mechanics of parameter passing.
- To design, implements, test, and apply the basic C programming concepts.

UNIT I   **INTRODUCTION TO COMPUTER PROBLEM SOLVING**   9

Introduction – The Problem Solving aspect – Top down design – Implementation of algorithm – Program Verification – The efficiency of algorithms – The analysis of algorithms –Fundamental Algorithms

UNIT II   **PROGRAMMING AND ALGORITHMS**   9

Programs and Programming – building blocks for simple programs -pseudocode representation – flow charts - Programming Languages - compiler – Interpreter, Loader and Linker - Program execution – Classification of Programming Language - Structured Programming Concept – IllustratedProblems: Algorithm to check whether a given number is Armstrong number or not- Find factorial of a number

UNIT III   **BASICS OF 'C', INPUT / OUTPUT & CONTROL STATEMENTS**   9

Introduction- Identifier – Keywords - Variables – Constants – I/O Statements Operators - Initialization – Expressions – Expression Evaluation – L valuesand R values – Type Conversion in C –Formatted input and output functions Specifying Test Condition for Selection and Iteration- Conditional Execution - and Selection – Iteration and Repetitive Execution- go toStatement – Nested Loops- Continue and break statements.

UNIT IV   **ARRAYS, STRINGS, FUNCTIONS AND POINTERS**   9

Array – One dimensional Character Arrays- Multidimensional Arrays- Arraysof Strings – Two dimensional character array – functions - parameter passing mechanism scope – storage classes – recursion - comparing iteration and recursion- pointers – pointer operators - uses of pointers- arrays and pointers – pointers and strings - pointer indirection pointers to functions - Dynamic memory allocation.

UNIT V   **USER-DEFINED DATATYPES & FILES**   9

Structures – initialization - nested structures – structures and arrays – structures and pointers - union– type def and enumeration types - bit fields -File Management in C – Files and Streams – File handling functions – Sequential access file- Random access file – Command line arguments.

45 PERIODS

PRACTICAL EXERCISES:

1   Write programs to get some input, perform some operation and display the output using I/O statements
2   Write programs to implement nested loop.
3   Write a program in C to get the largest element of an array using the function.

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4 Display all prime numbers between two intervals using functions.
5 Reverse a sentence using recursion.
6 Write a C program to Store Student Information in Structure and Display it.
   The annual examination is conducted for 10 students for five subjects. Write a program to read the data from a file and determine the following: Total marks obtained by each student; Topper of the class

30 PERIODS
TOTAL : 75 PERIODS

TEXT BOOKS:

1 Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming,1st Edition, BCS Learning and Development Ltd., 2020.
2 Reema Thareja, "Programming in C", Revised Edition, Pearson Education, 2021.

REFERENCES:

1 Deitel, "C How to Program", 7th Edition, Pearson Education. 2020.
2 Byron S Gottfried, "Programming with C, Schaums Outlines,3rd Edition, Tata McGraw Hill, 2018.

ONLINE RESOURCES:

1 https://onlinecourses.nptel.ac.in/noc23_cs02/preview
2 https://www.javatpoint.com/c-programming-language-tutorial
3 https://www.digimat.in/nptel/courses/video/106104128/L01.html

COURSE OUTCOMES:

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

CO1 Explain the basic Problem solving methods.

CO2 Describe basic Programming and algorithms

CO3 Comprehend basic input/output control statements in C programming.

CO4 Describe the Arrays, Strings, Functions and Pointers

CO5 Explain the user defined data types and Files.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	1	-	-	-	1	-	-	-	1	2	2
CO2	2	1	1	1	-	-	-	1	-	-	-	1	2	2
CO3	2	1	1	1	-	-	-	1	-	-	-	1	2	2
CO4	2	1	1	1	-	-	-	1	-	-	-	1	2	2
CO5	2	1	1	1	-	-	-	1	-	-	-	1	2	2

P23BC03	OBJECT ORIENTED PROGRAMMING	L	T	P	C
Prerequisites: Basic Programming Skills		3	0	2	4

COURSE OBJECTIVES:

- To understand and apply the Object Oriented principles in software development.
- Use the generic programming features of C++ including the STL.
- Design and implement reliable and maintainable object-oriented applications of moderate.

UNIT I	FUNDAMENTALS OF OBJECT ORIENTED PROGRAMMING	9

Object–Oriented Programming concepts – Encapsulation – Programming Elements – Program Structure – Enumeration Types –– Functions and Pointers – Function Invocation – Overloading Functions – Scope and Storage Class – Pointer Types – Arrays and Pointers – Call–by–Reference – Assertions.

UNIT II	IMPLEMENTING ADTS AND ENCAPSULATION	9

Aggregate Type struct – Structure Pointer Operators – Unions – Bit Fields – Data Handling and Member Functions – Classes – Constructors and Destructors – Static Member – this Pointer – reference semantics – implementation of simple ADTs.

UNIT III	POLYMORPHISM	9

ADT Conversions – Overloading – Overloading Operators – Unary Operator Overloading – Binary Operator Overloading – Function Selection – Pointer Operators – Visitation – Iterators – containers – Sequence Containers - List – List Iterators – Associative Containers.

UNIT IV	TEMPLATES AND FILE HANDLING	9

Template Class – Function Templates – RTTI Templates - Class Templates – Parameterizing – STL– Algorithms – Function Adaptors – Streams and Formatted I/O – I/O Manipulations -File handling – Random Access.

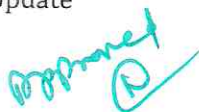| UNIT V	INHERITANCE	9

Derived Class – Typing Conversions and Visibility – Code Reuse – Virtual Functions – Templates and Inheritance – Run–Time Type Identifications – Exceptions – Handlers – Standard Exceptions.

45 PERIODS

PRACTICAL EXERCISES:

1. Write a C++ Program to illustrate Enumeration and Function Overloading.
2. Write a C++ Program to illustrate the use of Constructors and Destructors and Constructor Overloading.
3. Write a Program to overload as binary operator, friend and member function.
4. Write a Program to illustrate Iterators and Containers.
5. Write a C++ Program to illustrate function and class templates
6. Exception Handling
7. File Handling – Read, Write, Update

30 PERIODS
TOTAL: 75 PERIODS

TEXT BOOKS:

1   Bhushan Trivedi, "Programming with ANSI C++", 2nd Edition, Oxford Press, 2021.
2   E Balagurusamy, "Object oriented Programming with C++", 5th Edition, Tata McGraw Hill, 2018.

REFERENCES:

1   H M Deitel, P J Deitel "C++ How to Program", Seventh Edition, Prentice Hall of India, 2020.
2   Ira Pohl, "Object–Oriented Programming Using C++", Pearson Education, 2nd Edition, 2021.
3   Cay S Horstmann, "Big Java: Early Objects", 7th Edition, John Wiley & Sons, 2020.

ONLINE RESOURCES:

1   https://www.javatpoint.com/cpp-oops-concepts
2   https://www.geeksforgeeks.org/object-oriented-programming-in-cpp/
3   https://www.w3schools.com/cpp/cpp_oop.asp

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1   Explain object-oriented programming concepts.
CO2   Apply proper class protection mechanism to provide security.
CO3   Apply the concept of virtual functions to implement polymorphism.
CO4   Write a program using C++ features like templates, exceptions and file handling.
CO5   Design code with extensible Class types, User-defined operators and function Overloading.

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	1	-	-	-	1	-	-	-	1	2	2
CO2	3	2	1	2	-	-	-	1	-	-	-	1	2	2
CO3	3	2	1	2	-	-	-	1	-	-	-	1	2	2
CO4	2	1	1	1	-	-	-	1	-	-	-	1	2	2
CO5	3	3	3	3	-	-	-	1	-	-	-	1	2	2

P23BC04   DATABASE MANAGEMENT SYSTEM   L   T   P   C

Prerequisites: Relational Database Concepts   3   0   0   3

COURSE OBJECTIVES:

- To understand the fundamentals of data models and conceptualize and depict a database system using ER diagram.
- To know about data storage techniques, SQL and relational database design.
- To impart knowledge in transaction processing, concurrency control techniques and recovery procedures.

UNIT I   INTRODUCTION   9

File systems versus Database systems – Data Models – DBMS Architecture – Data Independence – Data Modeling using Entity – Relationship Model –E-R Modeling.

UNIT II   RELATIONAL MODEL AND QUERY EVALUATION   9

Relational Model Concepts – Relational Algebra – SQL – Basic Queries – Complex SQL Queries – Views – Constraints.

UNIT III   DATABASE DESIGN & APPLICATION DEVELOPMENT   9

Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

UNIT IV   TRANSACTION PROCESSING   9

Query Processing-Transaction Processing – Properties of Transactions - Serializability – Transaction support in SQL - Locking Techniques –Validation Techniques –– Recovery concepts – Shadow paging – Log Based Recovery.

UNIT V   FILES AND INDEXING   9

File operations – Hashing Techniques – Indexing – Single level and Multi-level Indexes – B+ tree – Static Hashing.

TOTAL: 45 PERIODS

TEXT BOOKS:

1   Abraham Silberschatz, Henry F Korth, S Sundarshan "Database System Concepts", 7th Edition, Tata McGraw Hill, 2019.

2   Ramez Elmasri, Shamkant Navathe, "Fundamentals of Database Systems", 7th Edition, Pearson Education, 2022.

REFERENCES:

1   C J Date, "An Introduction to Database Systems", 8th Edition, Pearson Education, 2021.

2   Raghu Ramakrishnan, "Database Management Systems", 4th Edition, Tata McGrawHill, 2021.

3   Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", 3rd Edition, Tata McGraw Hill, 2020.

ONLINE RESOURCES:

1. https://www.techtarget.com/searchdatamanagement/definition/database-management-system
2. https://www.ibm.com/docs/en/zos-basic-skills?topic=zos-what-is-database-management-system
3. https://www.appdynamics.com/topics/database-management-systems

COURSE OUTCOMES

At the end of the course, the students will able to

CO1   Explain the basic concepts and the applications of database systems.

CO2   Explain the basics of SQL and construct queries using SQL.

CO3   Apply normalization for the development of software applications.

CO4   Explain the basics of transaction processing and concurrency control.

CO5   Explain the file and page organizations, indexing methods including B tree and hashing.

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO2	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO3	3	2	1	2	-	-	-	1	-	-	-	1	2	2
CO4	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO5	2	2	1	1	-	-	-	1	-	-	-	1	2	2

P23BC05   INTRODUCTION TO COMPUTER ORGANIZATION AND OPERATING SYSTEMS

Prerequisites: Computer Architecture

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To learn the basic structure and operations of a computer.
- To learn the arithmetic and logic unit and implementation of fixed-point and floating point arithmetic unit.
- To understand the memory hierarchies, cache memories and virtual memories and to learn the different ways of communication with I/O devices.

UNIT I   FUNDAMENTAL STRUCTURE AND ARITHMETIC OPERATIONS   9

Functional Units – Basic Operational Concepts – Instructions: Language of the Computer – Operations, Operands – Instruction representation – Logical operations – Decision Making – MIPS Addressing Arithmetic for Computers.

UNIT II   PROCESSOR AND CONTROL UNIT   9

A Basic MIPS implementation – Building a Datapath – Control Implementation Scheme – Pipelining – Pipelined datapath and control – Handling Data Hazards & Control Hazards – Exceptions.

UNIT III   MEMORY & I/O SYSTEMS   9

Memory Hierarchy - Memory technologies – cache memory – measuring and improving cache performance – virtual memory ––Accessing I/O Devices – Interrupts – Direct Memory Access – Bus structure –Interface circuits – USB

UNIT IV   OPERATING SYSTEMS OVERVIEW   9

Operating system overview-objectives and functions, Evolution of Operating System- Operating System Structure - System Calls- Processes – Process Concept, Inter-process Communication.

UNIT V   PROCESS MANAGEMENT   9

CPU Scheduling – Scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Threads Overview– The critical-section problem, Semaphores, Classical problems of synchronization, Critical regions.

TOTAL: 45 PERIODS

TEXT BOOKS:

1   David A Patterson, John L Hennessy, "Computer Organization and Design: The Hardware/Software Interface", 5th Edition, Morgan Kaufmann / Elsevier.

2   Michael Manoochehri, "Introduction to Computer Organization and Operating Systems", 2nd Edition, CRC Press, 2018.

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REFERENCES:

1   Miles J Murdocca, Vincent P. Heuring, "Introduction to Computer Organization and Architecture: Principles and Parallels", 3rd Edition, Pearson Education, 2017.
2   John L Hennessey, David A Patterson, "Computer Architecture – A Quantitative Approach", 5th Edition, Morgan Kaufmann / Elsevier Publishers, 2017.
3   Timothy Williams, "Introduction to Computer Organization: ARM Assembly Language Using the Raspberry Pi", 1st Edition, CRC Press, 2017.

ONLINE REFERENCES:

1   https://jntuh239529920.files.wordpress.com/2018/08/computer-organization and-operating-systems.pdf
2   https://www.slideshare.net/slideshow/network-basicspdf/256103161
3   https://biet.ac.in/pdfs/coos.pdf

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1 Explain the basics structure of computers, operations and instructions.

CO2 Describe arithmetic and logic unit, control unit

CO3 Summarize the various memory systems and I/O communication.

CO4 Design operating system functions, types, system calls.

CO5 Analyze Process and various scheduling algorithms.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO2	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO3	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO4	3	3	3	3	-	-	-	1	-	-	-	1	2	2
CO5	3	3	2	2	-	-	-	1	-	-	-	1	2	2

P23BC06	COMPUTER NETWORKS	L	T	P	C
Prerequisites: Fundamentals of Networking		3	0	0	3

COURSE OBJECTIVES:

- To understand networking concepts and basic communication model.
- To understand network architectures and components required for data communication.
- To analyze the function and design strategy of physical, data link, network layer and transport layer.

UNIT I	NETWORK FUNDAMENTALS	9

Uses of Networks – Categories of Networks -Communication model –Data transmission concepts and terminology – Protocol architecture – Protocols – OSI – TCP/IP – LAN Topology - Transmission media.

UNIT II	DATA LINK LAYER	9

Data link control - Flow Control – Error Detection and Error Correction - MAC – Ethernet, Token ring, Wireless LAN MAC – Blue Tooth – Bridges.

UNIT III	NETWORK LAYER	9

Network layer – Switching concepts – Circuit switching – Packet switching –IP –– Datagrams –– IP addresses- IPV6– ICMP – Routing Protocols – Distance Vector – Link State- BGP.

UNIT IV	TRANSPORT LAYER	9

Transport layer –service –Connection establishment – Flow control – Transmission control protocol – 108 Congestion control and avoidance – User datagram protocol

UNIT V	APPLICATIONS AND SECURITY	9

Applications - DNS- SMTP – WWW –SNMP- Security –threats and services - DES- RSA.

TOTAL: 45 PERIODS

TEXT BOOKS:

1 Larry L. Peterson, Bruce S. Davie, "Computer Networks – A systems Approach", 6th Edition, Morgan Kaufmann, 2021.

2 James F. Kurose, Keith W. Ross, "Computer Networking: A Top-down Approach", Pearson Education, Limited, 8th Edition, 2020.

REFERENCES:

1 Forouzan, "Data Communication and Networking", 6th Edition, Tata McGraw Hill, 2021.
2 William Stallings, "Data and Computer Communications", 10th Edition, Pearson Education, 2017.
3 Larry L Peterson, Bruce S. Davie, "Computer Networks – A systems Approach", 6th Edition, Morgan Kaufmann, 2021.

ONLINE REFERENCES:

1 https://ncert.nic.in/textbook/pdf/lecs110.pdf
2 https://www.slideshare.net/slideshow/network-basicspdf/256103161

3 https://archive.nptel.ac.in/courses/106/105/106105183/

COURSE OUTCOMES:

At the end of the course, the students will able to

CO1 Understand the basic concepts of networks.
CO2 Explain the components required to build different types of networks.
CO3 Describe the basic functionalities needed for data communication into layers
CO4 Apply the required functionality at each layer for given application.
CO5 Explain the working principles of various application protocols and fundamentals of security issues and services available.

CO – PO – PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO2	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO3	2	2	1	1	-	-	-	1	-	-	-	1	2	2
CO4	3	2	1	2	-	-	-	1	-	-	-	1	2	2
CO5	2	2	1	1	-	-	-	1	-	-	-	1	2	2

Approved

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