



Shri Shamrao Patil (Yadravkar) Educational & Charitable Trust's

Sharad Institute of Technology College of Engineering

(An Autonomous Institute)

Yadrav (Ichalkaranji)-416121, Dist. – Kolhapur

Teaching and Evaluation Scheme for SY B. Tech.

Department of Artificial Intelligence & Data Science

Engineering

NEP Structure

(2023-24)

Semester: III





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Department: AI&DS

Rev: Course Structure/01/NEP/2023-24

Class: S.Y. B.Tech.

Semester: III

Sr No	Course Code	Course Type	Course	Teaching Scheme				Evaluation Scheme					Credits
				L	T	P	Total Hrs.	CA1	CA2	MSE	ESE	Total	
1	23AD2301	PCC	Linear algebra and Probability	3		-	3	10	10	30	50	100	3
2	23AD2302	PCC	Data Structure	3	-	-	3	10	10	30	50	100	3
3	23AD2303	PCC	Database Technologies	3	-	-	3	10	10	30	50	100	3
4	23AD2304	PCC	Data Structure Laboratory	-	-	2	2	15	15	-	20	50	1
5	23AD2305	PCC	Database Technologies Laboratory	-	-	2	2	15	15	-	20	50	1
6	23AD2306	EEM	Software Engineering and Management	2	-	-	2	25	25	-	-	50	2
7	23AD2307	VEC	Environmental Sciences	2	-	-	2	25	25	-	-	50	2
8	23AD2308	CEP	Mini Project – II	-	-	2	2	25	25	-	-	50	1
9	23ADMDXX	MDM	Multidisciplinary Minor-I	2	-	-	2	10	10	30	50	100	2
10	23OEAD21	OE	Open Elective I*	2	-	-	2	10	10	30	50	100	2
11	23HSSM01	VEC	Aptitude Skills-I	1	-	-	1	25	25	-	-	50	1
12	23HSSM02	VEC	Language Skills-I	-	-	2	2	25	25	-	-	50	1
Total				18	-	08	26	205	205	150	290	850	22

Basket of Multidisciplinary Minor-I

Basket 1 Finance & Management	Basket 2 Health Sciences	Basket 3 Management & Entrepreneur Development
Fundamentals of Finance and Management (23ADMDA1)	Introduction to Healthcare System (23ADMDB1)	Entrepreneurship (23ADMDC1)

* Indicates Open Elective course will be offered to students of other programs and will not be offered to students of the same program



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Linear Algebra and Probability

23AD2301	PCC	Linear Algebra and Probability	3-0-0	3 Credits
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Teaching Scheme	Examination Scheme
Lecture: 3 hrs/week	CA-I: 10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: HSC Mathematics

Course Outcomes: At the end of the course, students will be able to:

CO1	Determine whether a given structure is vector space, subspace structure, determine basis and dimension of vector space
CO2	Solve algebra of linear transformations, convert a given linear transformation into matrix form.
CO3	Find the Orthogonalization in inner product space, apply diagonalization to find powers of matrices.
CO4	Illustrate and formulate fundamental probability distribution and density functions, as well as functions of random variable.
CO5	Apply different methods to find the correlation between the variables. Develop basic mathematical tools for regression analysis.
CO6	Apply various statistical tests to test the hypothesis.

Course Contents:

Unit 1: Vector spaces The n-dimensional vectors, Vector space, Subspace, Linear dependence & independence of vectors, Basis and dimension.	[6]
Unit 2: Linear transformations Definition, algebra of linear transformations, Inverse of a Linear transformation, Composition of a linear Transformation, Range and Kernel, Rank and nullity, Rank-Nullity theorem, Matrix representation of a linear transformation	[5]
Unit 3: Eigen values, Eigen vectors and Inner product spaces Introduction to Eigen values and Eigen vectors of a matrix, Eigen Bases, Diagonalization, Inner product space, Norm of a vector, Normed vector space, Orthogonal and orthonormal sets, Gram Schmidt Orthogonalization process.	[7]
Unit 4: Basic Probability & Theoretical Probability Distributions Basic concepts of probability, Random variables, Probability distributions, Probability mass	[7]



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function, Probability density function, Binomial distribution, Poisson distribution, Normal distribution, Fitting of binomial & Poisson's distributions, Properties of binomial, Poisson and normal distributions.	
Unit 5: Correlation & Linear Regression Analysis Introduction, Types of correlation, Karl Pearson's correlation coefficient, Spearman's rank correlation Coefficient, Probable errors. Linear and non-linear regression, Lines of regression, Derivation of regression lines of y on x and x on y, Coefficients of regression, Properties of regression coefficient.	[6]
Unit 6: Applied Statistics Test of significance for Large sample size (z tests) for single mean, difference of means, single proportion, difference of proportions, Test of significance for small sample size (t test)	[5]
Text Books: 1. G. V. Kumbhojkar, Probability and Random Processes, C. Jamnadas and Co., 14th Edition, 2010. 2. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010. 3. Stephen H. Friedberg, Linear algebra, 5th Edition, by Pearson 4. David C lay, steven R lay, Linear algebra and its applications, 5th edition, pearson	
Reference Books: 1. Kishor S. Trivedi, Probability, Statistics with Reliability, Queuing and Computer Science Applications, Wiley India Pvt. Ltd, 2nd Edition, 2001. 2. Vijay K. Rohatgi, A. K. Md. Ehsanes Saleh, An Introduction To Probability and Statistics, Wiley Publication, 2nd Edition, 2001. 3. Seymour Lipschutz, Mark Lipson, Linear Algebra, 3rd edition, Schaum's Outline 4. Infostudy's Linear algebra by Dr.A.P.singh , 3rd edition 5. Murray Spiegel, John Schiller, R. ALU Srinivasan, Probability and Statistics, Schaum's Outlines, 4th Edition, 2013	




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Data Structure

23AD2302	PCC	Data Structure	3-0-0	3 Credits
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Teaching Scheme	Examination Scheme
Lecture: 3 hrs/week	CA-I:10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Basics of C programming.

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand the basics of data structure and its application.
CO2	Understand concepts of array and records.
CO3	Demonstrate the concepts of Linked List and apply various operations on them.
CO4	Understand concepts of stack and queue.
CO5	Demonstrate the concepts of Trees apply various operations on them.
CO6	Demonstrate Basic terminologies and representation of Graph.

Course Contents:

Unit 1: Introduction & Overview Introduction to data structures & its data types, Operations, Algorithms: complexity, time space trade-off with example.	[6]
Unit 2: Sorting and Searching Techniques Introduction, linear arrays, representation of linear array in memory, traversing linear arrays, inserting & deleting, Selection sort, Insertion sort, Bubble sort, Merge sort, Radix sort (only algorithm), Quick Sort (only algorithm), Searching – Linear search, Binary Search.	[6]
Unit 3: Stack and Queue Introduction to stacks, stack as an Abstract Data type, representation through Arrays & linked lists, Applications of stacks, stacks & recursion, Queue as an abstract data type representation, circular, double ended, priority, application of queues.	[6]
Unit 4: Linked List Introduction, linked lists & its representation, Traversing & searching a linked list, memory allocation, Garbage collection, insertion & deletion of nodes of linked list, header linked list, two-way lists.	[6]
Unit 5: Tree	[6]



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Binary Tree: introduction, types, definition, properties, representations, operations, binary tree traversal, Header nodes; Threads, BST, Advanced trees : AVL trees or height balanced trees, representation operation, Expression trees. Multiway trees: trees, multiway search trees, B trees, Heaps, construction of a Heap.

Unit 6: Graph and Hashing

Introduction, Graph theory terminology, sequential representation of graphs: Adjacency Matrix, Path matrix, Warshall's Algorithm, shortest paths, linked representation. Operations, Traversing, Posets, Topological sorting.
Array Representation· Linked list Representation ,Traversal of graphs· Depth-first search (DFS)· Breadth-first search (BFS). Applications of Graph Hashing, Hash function, Collision resolution techniques.

[6]

Text Books

1. S.Lipschutz,DataStructures,McGraw-HillPublication,Revised.
2. Thomas Cormen, Introduction to Algorithms, PHI Publication, 2nd Edition, 2002.
3. E. Horowitz, S. Sahani, Fundamentals of Data Structures, Galgotia Publication, 1st Edition,1983

Reference Books:

1. Kyle Loudon, Mastering Algorithms with C: Useful Techniques from Sorting to Encryption, O'Reilly Media, 1st Edition, 1999
2. Mark Allen Weiss, Data structures and algorithms analysis in C++, Pearson Education, 4thEdition, 2013.
3. Y. Langsm, M. Augenstin, A. Tanenbaum, Data Structure using C and C++, Prentice Hall India Learning Private Limited, 2nd Edition, 1998.
4. Trembley and Sorenson, Introduction to Data Structures, PHI Publication, 2nd Revised Edition, 1983.




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Database Technologies

23AD2303	PCC	Database Technologies	3-0-0	3 Credits
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Teaching Scheme	Examination Scheme
Lecture: 3 hrs/week Tutorial: --	CA-I: 10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Fundamentals of computer architecture, storage, and data

Course Outcomes: At the end of the course, students will be able to:

CO1	Build conceptual data model using Entity Relationship Diagram
CO2	Construct normalized database schemas
CO3	Make use of SQL commands to develop database
CO4	Apply triggers on database and develop procedure and function using PL/SQL.
CO5	Demonstrate database administration skills
CO6	Demonstrate NOSQL Database for applications

Course Contents:

Unit 1: Introduction to Database Management System Introduction, Advantages and applications of DBMS, Data Independence, Data Abstraction, Database System architecture, Database users and DBA roles, Structure of relational databases, Keys, Entity-Relationship model: Basic concepts, Design process, E-R diagrams, constraints, extended E-R features – generalization, specialization, aggregation, reduction to E-R database schema.	[6]
Unit 2: Relational Database Design The purposes of Normalization, Data Redundancies and Anomalies, Functional Dependencies-types of functional dependency, closure of set of functional dependency, canonical cover, The Process of Normalization, First Normal Form, Second Normal Form, Third Normal Form, Boyce-Codd Normal Form, Fourth Normal Form, Fifth Normal Form.	[5]
Unit 3: SQL concepts Basics of SQL, DDL, data manipulation constraints – Primary key, foreign key, unique, not null, check,	[7]



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DML, DCL, Functions - aggregate functions, Built-in functions –numeric, date, string functions, set operations, sub-queries, Use of group by, having, order by, join and its types, view and its types. Transaction control commands – Commit, Rollback, Savepoint.	
Unit 4: Introduction to PL/SQL Introduction of PL/SQL, The PL/SQL block structure, Data types, Variables, and Constants. Control structure: Conditional control, Iterative control, Sequential control. Exception handling: Predefined Exception, User defined Exception. Cursors: Implicit and Explicit cursors, Declaring, Opening, and Closing a cursor, Fetching a Record from the cursor. Procedures, Functions, Database Triggers.	[7]
Unit 5: Transaction management and Concurrency control Transaction concept, A simple transaction model, ACID properties, serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks), Time stamping model, Recovery systems- Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, checkpoint, Shadow paging.	[6]
Unit 6: Introduction to NoSQL Database Introduction, Structured versus unstructured data, Comparative study of SQL and NoSQL, Types and examples of NoSQL Database- Key-value store, document store, graph, Distribution Models.	[5]
Text Books: - Abraham Silberschatz, Henry F Korth, S Sudharshan, Database System Concepts, 6th Edition, McGraw-Hill International Edition, 2011. - Pramod J. Sadalage, Martin Fowler, —NoSQL Distilled-A Brief Guide to the Emerging World of Polyglot Persistencel, Pearson Education, Inc-2013.	
Reference Books: - Date CJ, Kannan A, Swamynathan S, An Introduction to Database System , 8th Edition, PearsonEducation-2006. - Raghu Ramakrishna, Johannes Gehrke, Database Management Systems, 3rd Edition, McGraw Hill, 2003. - Adam Fowler, NoSQL For Dummies, John Wiley & Sons, Inc., 2015	



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Data Structure Laboratory

23AD2304	PCC	Data Structure Laboratory	0-2-0	1 Credits
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Teaching Scheme	Examination Scheme
Practical: 2hr/week	CA-I: 15 Marks CA-II: 15 Marks Practical & Oral Exam: 20 Marks

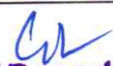
Course Outcomes: At the end of the course, students will be able to:

CO1	Develop logic for insertion, deletion & display
CO2	Make use of an array for searching & sorting.
CO3	Construct a linked list, stack, queue, tree, and graph.

Practical List:

Sr. No.	List of Experiments
1	Program to insert an element into an array. Program to delete an element from an array.
2	Program to sort the array using Insertion sorting.
3	Program to sort the array using bubble sorting.
4	Program to search a number in an array using linear search.
5	Program to search a number in an array using binary search.
6	Program to perform PUSH & POP operation on the stack.
7	Write a program to implement linear queue operation using array.
8	Program to insert and delete node into linked list.
9	Write a program to create binary tree and perform In order, Preorder and Post Order.
10	Write a program to create a graph of n vertices using an adjacency list.




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Database Technologies Laboratory

23AD2305	PCC	Database Technologies Laboratory	0-2-0	1 Credits
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Teaching Scheme	Examination Scheme
Practical: 2 hrs/week	CA-I: 15 Marks CA-II: 15 Marks Practical & Oral Exam :20 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Build conceptual data model using Entity Relationship Diagram
CO2	Make use of DDL, DML commands to develop database
CO3	Build SQL queries using operators, functions and SQL clauses.
CO4	Develop PL/SQL programs on SQL database.
CO5	Make use of database administration skills
CO6	Create NOSQL Database for applications

Practical List:

1. Construct ER model for Bank/ Employee data management/College management.
2. Use DDL commands to design schema using integrity constraints.
3. Use DML commands and Apply SQL operators to queries.
4. Write SQL queries for implementing SQL functions, group by, order by, and having clauses.
5. Build SQL queries for the implementation of Joins and views.
6. Make use of control structures and exception handling to develop PL/SQL programs.
7. Develop PL/SQL Programs using Cursor and Trigger.
8. Write PLSQL code for functions/procedures.
9. Set transaction controls for schemas.
10. Create collections and documents in MongoDB using the command line



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Software Engineering and Management

23AD2306	EEM	Software Engineering and Management	2-0-0	2 Credits
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Teaching Scheme:	Examination Scheme:
Lecture: 2 hrs./week	CA-I: 25 Marks CA-II: 25 Marks

Pre-Requisites:

Course Outcomes: At the end of the course, students will be able to:

CO1	Evaluate the significance of software engineering in IT industry.
CO2	Demonstrate expertise in software requirements gathering, analysis, and validation.
CO3	Evaluate effectiveness of applied architectural patterns and design principles.
CO4	Compare and contrast software development methodologies for project suitability
CO5	Implement project management techniques to ensure effective planning and risk mitigation.
CO6	Explain the application of agile principles in project management.

Course Contents:

Unit 1: Introduction to Software Engineering and Management Overview of Software Engineering, Importance of Software Engineering in the IT Industry, Software Development Life Cycle (SDLC), Roles and Responsibilities in Software Development Teams	[4]
Unit 2: Requirements Engineering Understanding Requirements Engineering Process, Requirements Elicitation Techniques, Requirements Analysis and Specification, Requirements Validation and Management	[4]
Unit 3: Software Design and Architecture Principles of Software Design, Architectural Patterns and Styles, Design Patterns,	[4]



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Software Architecture Documentation	
Unit 4: Software Development Methodologies Waterfall Model, Iterative and Incremental Development-Model, Introduction to Agile Methodologies	[4]
Unit 5: Project Management in Software Development Project Planning and Estimation, Risk Management in Software Projects, Project Scheduling and Tracking, Communication and Collaboration in Project Teams	[4]
Unit 6: Agile Software Development Principles of Agile Manifesto, Scrum Framework, Kanban Method, Agile Practices: Sprint Planning, Daily Stand-ups, Retrospectives	[4]
Text Books: 1. Software Engineering: A Practitioner's Approach by Roger S. Pressman 2. Requirements Engineering: From System Goals to UML Models to Software Specifications by Axel van Lamsweerde 3. Software Architecture in Practice by Len Bass, Paul Clements, and Rick Kazman Agile Estimating and Planning by Mike Cohn	
Reference Books: 1. Clean Code: A Handbook of Agile Software Craftsmanship by Robert C. Martin 2. Scrum: The Art of Doing Twice the Work in Half the Time by Jeff Sutherland 3. Kanban: Successful Evolutionary Change for Your Technology Business by David J. Anderson Agile Retrospectives: Making Good Teams Great by Esther Derby and Diana Larsen	




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Environmental Sciences

23AD2307	VEC	Environmental Sciences	2-0-0	2 Credit
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Teaching Scheme:	Examination Scheme:
Lecture: 2 hrs/week	Continuous Assessment 1: 25 Marks Continuous Assessment 2: 25 Marks

Pre-Requisites: NA

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain nature of environmental studies
CO2	Explain various natural resources and associated Problems
CO3	Summarize various ecosystems
CO4	Explain the importance of conservation of biodiversity and its importance in balancing the earth.
CO5	Recognize various causes of environmental pollution along with various protection acts in India to limit the pollution
CO6	Interpret the information based on field study and prepare a report.

Course Contents:

Unit 1: Nature of Environmental studies: Definition, scope and importance, Multidisciplinary nature of environmental studies. Need for public awareness.	[2]
Unit 2: Natural Resources and Associated Problems Forest resources: Use and over-exploitation, deforestation, dams and their effects on forests and tribal people. Water resources: Use and over-utilization of surface and ground water, floods, conflicts over water. Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources. Energy resources: Growing energy needs, renewable and nonrenewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, Nuclear energy. Land resources: land degradation, man-induced landslides, soil erosion and desertification. Role of individuals in the conservation of natural resources.	[5]
Unit 3: Ecosystems Concept of an ecosystem, types of ecosystems, structure and function of an ecosystem.	[4]



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producers, consumer and decomposers. Energy flow in the ecosystem, food chain, food web and ecological pyramids, ecological succession. Different types of ecosystem a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystem	
Unit 4: Biodiversity Introduction-Definition: genetic, species and ecosystem diversity, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Western Ghat as a biodiversity region Hot spot of biodiversity. Threats to biodiversity, man and wildlife conflicts. Conservation of biodiversity. In-situ conservation and Ex-situ conservation.	[4]
Unit 5: Environmental Pollution and Environmental Protection Definition: Causes, effects and control measures of various types of pollution. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution, Concept of sustainable development: From Unsustainable to Sustainable development. Environmental Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Forest Conservation Act. Wildlife Protection Act. Human Rights.	[4]
Unit 6: Field work Visit to a local area to document Environmental assets-River, Forest, Grassland Visit to local polluted site Study of common plants, insects, birds Study of ecosystem river, ponds etc	[4]
Text Books : 1. P. N. Wartikar & J. N. Wartikar, A Text Book of Applied Mathematics (Vol I & II), Pune Vidyarthi GrihaPrakashan, Pune. 2. N. P. Bali, A Text Book of Engineering Mathematics, Laxmi Publications, New Delhi.	
Reference Books: 1. C. R. Wylie & L. C. Barrett, Advanced Engineering Mathematics, McGraw Hill Publishing Company Ltd. 2. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publications, New Delhi. 3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers. 4. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons. 5. Peter O'Neil, A Text Book of Engineering Mathematics, Thomson Asia Pvt. Ltd., Singapore.	



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Mini Project-II

23AD2308	CEP	Mini Project	0-0-2	1 credit
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Teaching Scheme	Examination Scheme
Practical: 2 hrs/week	Continuous Assessment-I: - 25 Marks Continuous Assessment-II: -25 Marks

Pre-Requisites: None.

About Mini project

The project is a part of addressing societal and industrial needs. A Mini project is a brief, intense event where students can work on some of the most important problems that the world is facing today. Mini projects are brainstorming events where people with diverse knowledge backgrounds, skill sets, and interests get together to predetermined problems, and come up with substantive, innovative, and comprehensive solutions. A Mini project's output might be ideas, a roadmap, or an actionable plan. Teams leverage design thinking and cutting-edge techniques to brainstorm and collaborate on potential solutions within a given time frame.

Course Outcomes: At the end of the course, students will be able to:

CO1	Identify problems based on societal /research needs
CO2	Apply Knowledge and interpersonal skills to solve societal problems in a group.
CO3	Draw the proper inferences from available results through theoretical/ experimental/simulations.
CO4	Analyze the impact of solutions in societal and environmental context for sustainable development.
CO5	Demonstrate capabilities of self-learning in a group, which leads to lifelong learning.
CO6	Demonstrate project management principles during project work.




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Course Contents:

Week 1: Higher Education and Case Study Pedagogy - Students shall form a group of 3 to 4 students, while forming a group shall not be allowed less than three or more than four students, as it is a group activity. - Allocation of mentor	[2]
Week 2: Topic Selection - Briefly interact with students to provide hand-holding for topic selection. - Students should do survey and identify needs, which shall be converted into problem statement for mini project in consultation with faculty supervisor Illustrative Examples: Any Industry or Societal Problem - Finalization of Title.	[2]
Week 3: Case Study Design/Mini project: Part 1 - If needed, provide hand-holding to students for finalizing objectives. - Review the objectives of the case study groups. - Identify what can be quantified related to your topic and how. - Decide objectives for your case study. - Continue reading especially recent work specific to your topic.	[2]
Week 4: Case Study Design/Mini project: Part 2 - Prepare a roadmap of your case study, identify what is to be measured on the field. - Ensure student groups have finalized the objectives.	[2]
Week 5: Survey Design - Prepare a questionnaire and try it out with your group members as mock. - Decide sampling strategy.	[2]
Week 6: Analysis Phase-1 - Students in a group shall understand problem effectively, propose multiple solution. - The students have to work on different approaches and search for the different methodology to solve the problem in consultation with the project guide.	[2]
Week 7 Analysis Phase-2 - The students have to finalize the best methodology to solve the problem in consultation with the project guide. 25% Presentation has to be conducted by mentor/guide based on above activity.	[2]
Week 8: Analysis-3 - Identify appropriate data visualization tools for your case study. - Analyze the data	[2]
Week 9: Analysis-4 - Identify appropriate data visualization tools for your case study. - Analyze the data	[2]



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Week 10: Report writing Part:1 • Prepare an outline of the report and start organizing the write-up for the first draft. • Prepare and submit the first draft of the report to the course coordinator.	[2]
Week 11: Report writing Part:2 • Make necessary corrections if any as per the suggestions of course coordinator. • Submit the final draft of the case study	[2]
Week 12: Final Presentation • 50% Presentation has to be conducted by mentor/guide based on above activity.	[2]




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Fundamentals of Finance and Management

23ADMDA1	MDM	Fundamentals of Finance and Management	2-0-0	2 Credits
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Teaching Scheme:	Examination Scheme:
Lecture: 2 hrs./week	CA- I: 10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the Importance of Financial Management
CO2	Explain the different types of Annuity and Perpetuity
CO3	Identify different sources of finance
CO4	Analyze Capital Expenditure Decisions
CO5	Explain Dividend Decisions
CO6	Explain Liquidity Management

Course Contents:

Unit 1: Introduction & Basic Concepts	[4]
Important functions of Financial Management, Objectives of the firm: Profit maximization vs. Value maximization, Role of Chief Financial Officer, Time Value of Money: concept and reasons, Compounding and Discounting techniques	
Unit 2: Annuity and Perpetuity	[5]
Types of Annuity: Deferred annuity, Fixed annuity, Immediate annuity, Variable annuity, Indexed annuity, Life annuity, Group annuity contracts, Fixed annuity, Perpetuity, Annuity payable for guaranteed time, Types of Perpetuity	
Unit 3: Sources of Finance and Cost of Capital	[4]
Different sources of finance, long term and short term sources, Cost of capital: concept, relevance of cost of capital, Implicit and Explicit cost, specific costs (if applicable) and	



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weighted average cost (its computation)	
Unit 4: Capital Expenditure Decisions Objectives of Capital Budgeting Process, Concept of Cash flow, Methods of long term Investment decisions - Discounted Payback Period, Net Present Value, Profitability Index, Average Rate of Return / Accounting Rate of Return, Internal Rate of Return (Including relative merits and demerits of each of the methods)	[5]
Unit 5: Dividend Decisions Meaning, Nature and Types of Dividend, concept of pay-out ratio, retention ratio, Decisions and growth, Dividend policies and formulating a dividend policy, Dividend Theories: Walter's Model, Gordon's Model	[4]
Unit 6: Liquidity Management Various concepts of Working Capital, Management of Working Capital and Issues in Working Capital, Estimating Working Capital Needs; Operating or Working Capital Cycle, Policies relating to Current Assets – Conservative, Aggressive and Balance, Various sources of finance to meet working capital requirements	[4]
Text Books: 1. Rostogi, Fundamentals of Financial Management, Taxmann Publications 2. Fundamental of Financial Management, Sharma, Gupta, Kalyani Publishers, New Delhi.	
Reference Books: 3. Fundamentals of Financial Management, Vandana Dangi, V.K. Global Pvt. Ltd., New Delhi 4. Parasuraman – Financial Management: A Step by Step Approach, Cengage Learning	




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Introduction to Healthcare System

23ADMDB1	MDM	Introduction to Healthcare System	2-0-0	2 Credits
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Teaching Scheme:	Examination Scheme:
Lecture: 2 hrs./week	CA-I: 10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the Importance of Healthcare system
CO2	Explain the different models of Healthcare system
CO3	Identify different functions of Healthcare technology and policy
CO4	Analyze Healthcare system technologies
CO5	Explain Health Care Management
CO6	Explain Recent Trends in Medical Healthcare

Course Contents:

Unit 1: Introduction & Basic of Healthcare History of healthcare, Important functions of healthcare, Primary care, Secondary care.	[3]
Unit 2: Health System Models The Beveridge Model, The Bismarck Model, National health insurance model, Uninsured model.	[2]
Unit 3: Health technology Privacy of health data, Policy, Assessment, Types of Medical technology, Assistive technologies.	[4]
Unit 4: Biomedical Equipment Bio Potential Recording, Analytical & Diagnostic Instruments, Blood Flow Meters and Radiation Detectors, Physiotherapy and Surgical Instruments.	[6]
Unit 5: Health Care Management Introduction to principles of management in healthcare environment, Healthcare Service Providers, Computer and Information Management in Hospitals, Hospital Standards and	[3]



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Maintenance.	
Unit 6: Recent Trends in Medical Healthcare Embedded system design for bio medical applications, Health care System design using general purpose processor, IoT in Biomedical Applications, Medical Image Processing, mobile health care technologies.	[6]
Text Books: 1. Ronald S. Krug, Introduction to Health Care Systems, Springer Publications 2. Lee Haroun, Dakota Mitchel, Introduction To Health Care, Delmar Cengage Learning	
Reference Books: 1. Anam Faruqi, Healthcare Management, Orange Books Publication 2. Joseph J Carr, John M Brown, Introduction to Biomedical Equipment Technology, Pearson India	




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Entrepreneurship

23ADMDC1	MDM	Entrepreneurship	2-0-0	2 Credits
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Teaching Scheme:	Examination Scheme:
Lecture: 2 hrs./week	CA-I: 10 Marks CA-II : 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Identify qualities of entrepreneurs
CO2	Write project proposal
CO3	Use various entrepreneurship models
CO4	Explain various schemes supporting entrepreneurship
CO5	Think creative and innovative
CO6	Demonstrate entrepreneurial process by way of studying different case studies and find exceptions to the process

Course Contents:

Unit 1: Introduction to entrepreneurship, concept of Market Survey Definition, Steps towards successful enterprise, opportunity identification, various analytics to be performed for idea validation. Meaning, types of markets & their characteristics (Perfect Competition, Monopoly, Monopolistic Competition, Oligopoly)	[3]
Unit 2: Project report preparation Prepare a specimen project report, Manage the project with network diagrams, Understand the dynamics of project review and control	[2]
Unit 3: Introduction to various types of entrepreneurship Social Entrepreneurship, Indigenous Entrepreneurship, Community-Based Enterprises and Community-Based Entrepreneurship.	[4]
Unit 4: Business Plan and Idea Presentation Transforming idea to plan on paper, various reports for validation of business, presenting and pitching idea.	[6]



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Unit 5: Business operations, Project Management and Organizational Structure Establishment of standard operating procedures, project management methodologies and tools, various organizational structure and role of each position in an enterprise.	[3]
Unit 6: Sales and Marketing Fundamentals and Methodologies Difference between sales and marketing, methods and models of sales and marketing for product and services, targeting international market	[6]
Text Books: 1. Entrepreneurship - Successfully Launching New Ventures by Bruce R. Barringer, R. Duane Ireland 2. Engineering Economics, R.Paneerselvam, PHI publication	
Reference Books: 1. Fundamentals of Management: Essential Concepts and Applications, Pearson Education, Robbins, S.P. and Decenzo David A. 2. Economics: Principles of Economics, N Gregory Mankiw, Cengage Learning	




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Aptitude Skills-I (Numerical Ability)

23HSSM01	VEC	Aptitude Skills- I	1-0-0	1 Credit
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Teaching Scheme:	Examination Scheme:
Lecture: 1hr	CA-I:25 Marks
Tutorial: NA	CA-II:25 Marks
Practical: NA	

Pre-Requisites: English Communication

Course Outcomes: At the end of the course, students will be able to:

1	Make use of multiplications, squares, square roots, cubes and cube roots to solve aptitude problems
2	Solve questions based on the Number system
3	Solve questions based on percentage, average, ratio, proportion, Speed, Time and Distance
4	Solve questions based on Profit & Loss and mensuration.

Course Contents:

Unit 1	Speed Math Techniques Multiplication, Squares, Square roots, Cubes, Cube roots	[3]
Unit 2	Number System Types of Number System, Last Digit Method, BODMAS Calculation, HCF and LCM, Progressions	[3]
Unit 3	Basic Aptitude Percentage, Average, Ratio and Proportion, Fraction, Partnership, Speed- Time- Distance, Speed, Time, and Distance, Trains, Boats, Streams, Races	[3]
Unit 4	Business Aptitude Profit & Loss, Simple Interest, Compound Interest, Geometry and Venn Diagram 2D and 3D Mensuration, Venn diagram	[3]

Text Books :

1. Arun Shrama - Quantitative aptitude for CAT.
2. RS Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S. Chand Publisher; 2016 edition

Reference Books:

1. Fast Track Objective Arithmetic Paperback, by Rajesh Verma – 2018
2. Teach Yourself Quantitative Aptitude, Arun Sharma
3. The Pearson Guide To Quantitative Aptitude For Competitive Examination by Dinesh Khattar



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Language Skill-I

23HSSM02	VEC	Language Skill- I	0-0-2	1 Credits
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Teaching Scheme:	Examination Scheme:
Practical: 2hrs/week	CA-1: 25 CA-2: 25

Pre-Requisites: Basics of Programming

Course Outcomes: At the end of the course, students will be able to:

1	Develop a flowchart and Algorithm to solve the given problem statements
2	Develop programs using Data Types and Operators
3	Make use of Decision Making and Looping Statements to develop conditional programs
4	Make use of Arrays to develop programs in C language

Experiment No.	Name of Experiment
1	Explain basics of C such as Editing, Compiling, Error Checking, executing, testing and debugging of Programs and Design Algorithms and Flowcharts.
2	Explain basics of Variable, Data types and operators and develop programs on arithmetic Operators.
3	Develop programs on Conditional, logical and Bitwise Operators.
4	Develop programs on Sizeof () and typecasting operator.
5	Develop programs on increment and decrement operator.
6	Develop programs on simple if and if-else statement.
7	Develop programs on simple if-else ladder and Nested if-else.
8	Develop programs on Switch case statement.
9	Develop programs on For-loop & Nested For-loop.
10	Develop programs on while and do-while loop.
11	Develop programs on one dimensional array.
12	Develop programs on two-dimensional array.
13	Develop programs on string handling functions.

Text Books:

1. C Programming Absolute Beginner's Guide, Que Publishing; 3rd edition (22 August 2013)
2. C Programming Language 2nd Edition, Pearson Publication

Reference Books:

1. Programming in C Practical Approach by Ajay Mittal, Pearson
2. Let Us C, By Yashwat Kanetkar




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Department: Artificial Intelligence and Data Science **Rev:** Course Structure/01/NEP/2023-24

Class: S.Y. B.Tech.

Semester: IV

Sr No	Course Code	Course Type	Course	Teaching Scheme				Evaluation Scheme					Credits
				L	T	P	Total Hrs.	CA1	CA2	MSE	ESE	Total	
1	23AD2401	PCC	Principles of AI	2	-	-	2	10	10	30	50	100	2
2	23AD2402	PCC	Java Programming	2	-	-	2	10	10	30	50	100	2
3	23AD2403	PCC	Operating System	2	-	-	2	10	10	30	50	100	2
4	23AD2404	PCC	Java Programming Laboratory	-	-	2	2	15	15	-	20	50	1
5	23AD2405	PCC	Operating System Laboratory	-	-	2	2	15	15	-	20	50	1
6	23AD2406	VSEC	Application development I		-	4	4	25	25	-	20	70	2
7	23AD2407	EEM	Patents and IPR	1			1	25	25			50	1
8	23AD2408	CEP	Mini Project-III	-	-	2	2	25	25	-	-	50	1
9	23AD2409	AEC	Modern Indian Language	2	-		2	25	25	-	-	50	2
10	23ADMDXX	MDM	Multidisciplinary Minor	3			3	10	10	30	50	100	3
11	23OEAD22	OE	Open Elective II	3			3	10	10	30	50	100	3
12	23HSSM03	VEC	Aptitude Skills-II	1	-	-	1	25	25	-	-	50	1
13	23HSSM04	VEC	Language Skills-II	-	-	2	2	25	25	-	-	50	1
Total				16		12	28	230	230	150	310	920	22

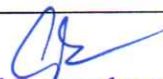
***Open Elective II: Introduction to AI**

Note- Open Elective course will be offered to students of other programs and will not be offered to students of the same program.

Multidisciplinary Minor-

Basket	Finance & Management	Health Sciences/ Science & Technology/Environment	Management & Entrepreneur Development
Course Code, Name	Introduction to AI for Finance & Management (23ADMDA2)	Applications of AI in health care (23ADMDB2)	Leadership and Team Effectiveness (23ADMDC2)




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23AD2401	PCC	Principles of AI	2-0-0	2 Credits
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Teaching Scheme	Evaluation Scheme
Lecture: 2 hrs/week	CA I: 10 Marks CA II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Principles of Advanced AI, Python Programming.

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand the Fundamentals of AI
CO2	Apply Problem Solving and Search Techniques
CO3	Develop Knowledge Representation and Reasoning Models
CO4	Model Reasoning Under Uncertainty
CO5	Demonstrate AI Applications in Robotics
CO6	Demonstrate Ethical Awareness in AI

Course Contents:

Unit I: Introduction to Artificial Intelligence Definition and Scope of AI, History of AI: Key milestones, Types of AI: Weak AI vs. Strong AI, Application areas of AI (Robotics, Natural Language Processing, Expert Systems, etc.), AI agents and their environments, AI techniques: Knowledge representation, Reasoning, and Learning	[4]
Unit II: Problem Solving and Search Algorithms Problem-solving as State Space Search, Uninformed Search Strategies: Breadth-First, Search, Depth-First Search, Informed Search Strategies: Heuristic Search, A* Algorithm, Game Playing: Minimax Algorithm, Alpha-Beta Pruning, Constraint satisfaction problems	[4]
Unit III: Knowledge Representation Logic-based representation, Propositional logic and first-order logic (FOL), Inference in FOL, Ontologies and semantic networks, Frames, scripts, and conceptual graphs, Rule-based systems and Expert systems	[4]
Unit IV: Reasoning and Decision Making Logical reasoning and theorem proving, Uncertainty in AI-Probabilistic reasoning, Bayesian networks, Fuzzy logic, Decision theory and utility theory, Markov decision processes (MDPs), Reinforcement learning basics	[4]
Unit V: AI in Real-World Applications	[4]



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AI in Healthcare: Diagnostics, predictive analytics, and personalized treatment. AI in Finance: Algorithmic trading, fraud detection, and risk assessment. AI in Manufacturing: Automation, quality control, and predictive maintenance. AI in Social Media and Marketing: Personalization, recommendation systems, and sentiment analysis.	
Unit VI: AI Ethics and Future Trends Ethical Implications of AI: Bias in AI, AI and Privacy, AI in Warfare. Future of AI: Trends in AI research, AI in Autonomous Systems. AI Governance and Regulation: Ethical AI development frameworks.	[4]
Text Books: 1. Russell, S and Norvig, P. 2015. Artificial Intelligence-A Modern Approach, 3rd edition, PrenticeHall. 2. Poole, D and Mackworth, A. 2010. Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press 3. Tom Mitchell, Machine Learning, McGraw Hill, 2015. 4. Peter Flach, Machine Learning: The Art and Science of Algorithms that make sense of data, Cambridge, 2014.	
Reference Books: 1. Steger, Carsten, Markus Ulrich, Christian Wiedemann. Machine Vision Algorithms and Applications (2nd ed.). Wiley, 2018. ISBN 978-3-527-41365-2. 2. Mikell P Groover, Automation, Production System and Computer Integrated Manufacturing, Prentice Hall, Publications, 2016. ISBN 9789332549814 3. Bhattacharya S., Artificial Intelligence, Laxmi Publications, Ltd., 2008, ISBN 9788131804896 4. Chopra Rajiv, Artificial Intelligence, S. Chand Publishing, 2012, ISBN 9788121939485 5. Pawar P. J., Evolutionary Computations for Manufacturing, Studium Press, 2019, ISBN: 978-93-85046-52-0 6. Jain N, Artificial Intelligence: making a system intelligent, 2018, ISBN: 9788126579945 7. Hal Daume III, A course in Machine Learning, Todo, 2015. 8. Ethem Alpaydin, Introduction to Machine Learning, The MIT Press, 2004. 9. David MacKay, Information Theory, Inference and Learning Algorithms, Cambridge, 2003	



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23AD2402	PCC	Java Programming	2-0-0	2 Credits
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Teaching Scheme	Evaluation Scheme
Lecture:2 hrs/week	CA I: 10 Marks CA II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Basics of Programming

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand basics of java and IDE to run program
CO2	Develop control and loop statements in Java
CO3	Develop object-oriented programming concepts and packages of java.
CO4	Comprehend building blocks of OOPs language, inheritance and interfaces.
CO5	Develop exception handling program programs.
CO6	Develop multithreading programs.

Course Contents:

Unit I- Introduction to Java Basics of Java, Features and Advantages of Java, Java Virtual Machine & Byte Code, Java Environment Setup, Java Program Structure, Compiling and running a program, Tokens, Data Types, Identifiers & Literals, constants, variables, Operator, expression, precedence and associativity of operator, Type Conversion and Casting, Wrapper classes, I/O- console-Scanner	[4]
Unit II- Basics in java and Decision & Control Statements: Selection Statement (if, if...else, nested if-else, Ladder if-else, switch), Loops (while, do-while, for), Jump statements (break, continue, return & exit), nested loop. Array, array Types, String- string operations, Mutable String- string buffer- create, capacity, Add, find, replace,	[4]
Unit II- OOP Concepts and Packages Defining classes, fields and methods, creating objects, accessing rules, Nested- class, this keyword, static keyword, method overloading, final keyword, Constructors: Default constructors, Parameterized constructors, Copy constructors, Passing object as a parameter, constructor overloading. Creating package, importing package, access rules for packages, class hiding rules in a package,	[5]



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Unit IV- Inheritance, Interfaces Basics of Inheritance, Types of inheritance: single, multiple, multilevel, hierarchical and hybrid inheritance, concepts of method overriding, extending class, super class, subclass, dynamic method dispatch & Object class, Defining interface, inheritance on interfaces, implementing interface, multiple inheritance using interface, , Abstract class and final class.	[5]
Unit – V Exception Handling & Types of errors, exceptions, try-catch statement, multiple catch blocks, throw and throws keywords, finally clause, uses of exceptions, user defined exceptions,	[3]
Unit – VI Multithreading and Collection in java Creating thread, extending Thread class, implementing Runnable interface, life cycle of a thread, Thread priority & thread synchronization, and exception handling in threads. Collections: the Collections Framework. Collection Interfaces- List, Queue, Set,	[3]
Text Books: 1. Programming With Java- : Balagurusamy, E. 2nd ed TMH	
Reference Books:- 1. Ivor Horton, Beginning JAVA, WileyIndia. 2. "Java: The Complete Reference" by Herbert Schildt 3. JAVA Programming, Black Book, DreamtechPress	




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23AD2403	PCC	Operating System	2-0-0	2 Credits
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Teaching Scheme	Evaluation Scheme
Lecture: 2 hrs/week	CA I: 10 Marks CA II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Basic Logic, Set, Graph related concepts

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the basic concept of operating system & their types.
CO2	Illustrate the flow of process with its states and different process scheduling policies.
CO3	Explain concepts of Mutual exclusion and IPC
CO4	Make use the concept of deadlocks
CO5	Illustrate concept of memory management policies.
CO6	Illustrate the concepts of Unix and Linux OS.

Course Contents:

Unit I- Introduction: Basics of Operating Systems: Definition – Generations of Operating systems – Types of Operating Systems, OS Service, System Calls, OS structure: Layered, Monolithic, Microkernel Operating Systems – Concept of Virtual Machine	[03]
Unit II- Process Management Processes: Definition , Process Relationship , Process states , Process State transitions , Process Control Block ,Context switching – Threads – Concept of multithreads , Benefits of threads – Types of threads Process Scheduling: Definition , Scheduling objectives ,Types of Schedulers ,Scheduling criteria : CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time (Definition only) Scheduling algorithms : Preemptive and Non , preemptive , FCFS – SJF– RR , Multiprocessor scheduling : Types , Performance evaluation of the scheduling.	[05]
Unit III- Inter-process Communication Race Conditions, Critical Section, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dining Philosopher Problem etc.	[04]



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Unit IV- Deadlocks: Definition, Deadlock characteristics, Deadlock Prevention, Deadlock Avoidance: banker's algorithm, Deadlock detection and Recovery.	[04]
Unit 5 Memory Management Basic Memory Management: Definition , Logical and Physical address map , Memory allocation : Contiguous Memory allocation – Fixed and variable partition – Internal and External fragmentation and Compaction , Paging : Principle of operation – Page allocation – Hardware support for paging –Protection and sharing – Disadvantages of paging. Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault , Working Set , Dirty page/Dirty bit – Demand paging (Concepts only) – Page Replacement policies : Optimal (OPT) , First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU)	[05]
Unit VI Unix/Linux Operating System Development of Unix/Linux, Role & Function of Kernel, System Calls, Elementary Linux command & Shell Programming, Directory Structure, System Administration Case study: Linux, Windows Operating System	[03]
Text Books 1. William Stallings, Operating System: Internals and Design Principles, Prentice Hall, ISBN-10: 0-13- 380591-3, ISBN-13: 978-0-13-380591-8, 8thEdition. 2. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, WILEY, ISBN 978-1- 118-06333-0 , 9thEdition 3. Andrew S. Tanenbaum & Herbert Bos, Modern Operating System, Pearson, ISBN-13: 9780133592221, 4th Edition.	
Reference Books 1. Tom Adelstein and Bill Lubanovic, Linux System Administration, O'Reilly Media, ISBN-10: 0596009526,ISBN- 13:978-0596009526 2. Harvey M. Deitel, Operating Systems, Prentice Hall, ISBN-10: 0131828274, ISBN-13: 978-0131828278 3. Thomas W. Doeppner, Operating System in depth: Design and Programming, WILEY, ISBN: 978-0-471-68723-	




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23AD2404	PCC	Java Programming Laboratory	0-0-2	1 Credits
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Teaching Scheme	Evaluation Scheme
Practical: 2hrs/week	CA I: 15 Marks CA II: 15 Marks End Semester Exam: 20 Marks

Pre-Requisites: Basics of Programming

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand basics of java and IDE to run program
CO2	Develop control and loop statements in Java
CO3	Develop object-oriented programming concepts and packages of java.
CO4	Comprehend building blocks of OOPs language, inheritance and interfaces.
CO5	Develop exception handling program programs.
CO6	Develop multithreading programs.

List of Experiments:

1.	Setup a java programming development environment by using: i)Command prompt(class path and path setup) ii)Any IDE(like eclips)
2.	Implement simple program.
3.	Implement program to accept various data from user and perform different operation using operators.
4.	Develop programs in Java to use Wrapper class of each primitive data types
5.	Program on control statement and looping.
6.	Programs on Array.
7.	Programs on String and String Buffer.
8.	Develop a program in Java to demonstrate the use of 'final' keyword in the field declaration. How it is accessed using the objects.
9.	Develop a program in Java to demonstrate use of this keyword.
10.	Develop a program in Java to develop overloaded constructor. Also develop the copy constructor to create a new object with the state of the existing object
11.	Develop a program in Java to demonstrate single inheritance, multilevel inheritance and hierarchical inheritance.



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12.	Develop a program in Java in which a subclass constructor invokes the constructor of the super class and instantiate the values.
13.	Develop an application that illustrates method overriding in the same package and different packages. Also demonstrate accessibility rules in inside and outside packages
14.	Describe abstract class called Shape which has three subclasses say Triangle, Rectangle, Circle. Define one method area() in the abstract class and override this area() in these three subclasses to calculate for specific object i.e. area() of Triangle subclass should calculate area of triangle etc. Same for Rectangle and Circle
15.	Develop a program in Java to demonstrate use of final class.
16.	Develop a program in Java to develop user defined exception for 'Divide by Zero' error.
17.	Develop an small application in Java to develop Banking Application in which user deposits the amount Rs 1000.00 and then start withdrawing of Rs 400.00, Rs 300.00 and it throws exception "Not Sufficient Fund" when user withdraws Rs. 500 thereafter
18.	Develop a program that executes two threads. One thread displays "Thread1" every 2,000 milliseconds, and the other displays "Thread2" every 4,000 milliseconds. Create the threads by extending the Thread class
19.	Develop a program that executes two threads. One thread will print the even numbers and another thread will print odd numbers from 1 to 50.
20.	Java Program to Compare Elements in a Collection.
21.	Java Program to Remove a Specific Element from a Collection
22.	Develop a program to sort HashSet in Java




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23AD2405	PCC	Operating System Laboratory	0-0-2	1 Credits
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Teaching Scheme	Evaluation Scheme
Practical: 2hrs/week	CA I: 15 Marks CA II: 15 Marks End Semester Exam: 20 Marks

Pre-Requisites: Basics of Programming

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the basic concept of operating system & their types.
CO2	Illustrate the flow of process with its states and different process scheduling policies.
CO3	Explain concepts of Mutual exclusion and IPC
CO4	Make use the concept of deadlocks
CO5	Illustrate concept of memory management policies.
CO6	Illustrate the concepts of Unix and Linux OS.

List of Experiment:

1.	Study of different Operating System.
2.	Hands on UNIX/LINUX commands.
3.	Shell programming for file handling.
4.	Shell script programming using the commands grep, awk and sed.
5.	Implementation of different scheduling algorithms.
6.	Write a program to implement Producer consumer problem
7.	Write a program to simulate Bankers Algorithm for the purpose of Deadlock avoidance.
8.	Implementation of various page replacement policies.
9.	Implementation of synchronization primitives-semaphores, locks and conditional variables.
10.	Implementation of various memory allocation algorithms.



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23AD2406	VSEC	Application development I	0-0-4	2 Credits
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Teaching Scheme	Evaluation Scheme
Practical: 2hrs/week	CA I: 25 Marks CA II: 25 Marks

Pre-Requisites:

Course Outcomes: At the end of the course, students will be able to:

CO1	Learn how to control an LED using Arduino
CO2	Measure temperature using the LM35 sensor and display the value on the Serial Monitor.
CO3	Learn how to control a servo motor using PWM
CO4	Measure temperature and humidity using the DHT11/DHT22 sensor
CO5	Use an infrared remote to control various components.
CO6	Measure the distance of an object using an ultrasonic sensor (HC-SR04).

List of Experiment:

1.	Write a program to make the LED blink at regular intervals.
2.	Turn an LED on or off when the button is pressed.
3.	Read the temperature data from the sensor and print it via the Serial Monitor.
4.	Use the potentiometer to vary the brightness of an LED by reading the analog input.
5.	Turn an LED on or off based on the light intensity detected by the LDR.
6.	Write code to control the angle of a servo motor using different inputs (e.g., potentiometer).
7.	Use the ultrasonic sensor to measure distance and display the result on the Serial Monitor.
8.	Display temperature and humidity readings on the Serial Monitor.
9.	Sound an alarm when the button is pressed.
10.	Mix different colors by controlling the brightness of the Red, Green, and Blue channels.
11.	Write code to decode signals from the IR remote and use them to control an LED.
12.	Vary the motor speed using a potentiometer as input.
13.	Display sensor data or messages on the LCD.




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23AD2407	EEM	Patents and IPR	1-0-0	1 Credits
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Teaching Scheme	Evaluation Scheme
Lecture: 3 hrs/week	CA I: 25 Marks CA II: 25 Mark

Pre-Requisites:

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand that today's world is controlled by Computer, Information Technology; but tomorrow world will be ruled by ideas, concept, and creativity.
CO2	Understand research problem formulation & Analyze research related information and Follow research ethics
CO3	Correlate the results of any research article with other published results. Write a review article in the field of engineering.
CO4	After completing this course, students will have enough knowledge of patents and copyright for their unique research projects.
CO5	Throughout their research careers, the information obtained from this course will give important insights into the uniqueness of their concept based on a state-of-the art patent search. This gives an additional avenue for developing their ideas or breakthroughs.

Course Contents:

Unit I-Introduction to Research Methodology: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, Plagiarism, Research ethics	[4]
Unit II- Technical writing: Effective technical writing, how to write a manuscript/ responses to reviewers comments, preparation of research article/ research report, Writing a Research Proposal - presentation and assessment by a review committee	[4]
Unit III-Introduction and the need for intellectual property right (IPR): Types of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varieties and Layout Design Genetic Resources and Traditional Knowledge – Trade Secrets	[4]
Unit IV- IPR in India and Abroad : Genesis and development, IPR in abroad - Major International Instruments concerning Intellectual Property Rights: Paris Convention, 1883, the Berne Convention, 1886, the Universal Copyright Convention, 1952, the WIPO Convention, 1967, the Patent Co-operation Treaty, 1970, the TRIPS Agreement, 1994	[4]



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Unit V- Patents: Elements of Patentability: Novelty , Non Obviousness (Inventive Steps) Industrial Application - Non - Patentable Subject Matter – Registration. Procedure, Rights and Duties of Patentee, Assignment and license , Restoration of lapsed Patents, Surrender and Revocation of Patents Patent Infringement, Remedies & Penalties – Patent Office and Appellate Board. Patent/Prior art search: Types and tools of patent search Patent drafting: Elements in patent drafting	[4]
Unit VI- Copyrights: Nature of Copyright - Subject matter of copyright: original literary, dramatic, musical, artistic works; cinematograph films and sound recordings, Registration Procedure, Term of protection, Ownership of copyright, Assignment and license of copyright Copyright Infringement, Remedies & Penalties – Related Rights -Distinction between related rights and copyrights	[4]
Reference 1. 1. Kothari, C. R. Research Methodology - Methods and Techniques, New Age International publishers, New Delhi, 2004. 2. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students", Juta & Company, 1996. 3. B.L. Wadera, Patents, trademarks, copyright, Designs and Geographical Judications. 4. P. Narayanan (Eastern Law House), Intellectual Property Law. 5. Nithyananda, K V. (2019). Intellectual Property Rights: Protection and Management. India, IN: Cengage Learning India Private Limited. 6. Neeraj, P., &Khusdeep, D. (2014). Intellectual Property Rights. India, IN: PHI learning Private Limited. 7. Ahuja, V K. (2017). Law relating to Intellectual Property Rights. India, IN: Lexis Nexis. 8. Subramanian, N., & Sundararaman, M. (2018). Intellectual Property Rights – An Overview. Retrieved from http://www.bdu.ac.in/cells/ipr/docs/ipr-eng-ebook.pdf 9. World Intellectual Property Organisation. (2004). WIPO Intellectual property Handbook. Retrieved from https://www.wipo.int/edocs/pubdocs/en/intproperty/489/wipo_pub_489.pdf 10. Journal of Intellectual Property Rights (JIPR): NISCAIR	




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23AD2408	CEP	Mini Project III	0-0-2	1 Credit
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Teaching Scheme	Evaluation Scheme
Practical: 2hrs/week	CA I: 25 Marks CA II: 25 Mark

Pre-Requisites: Mini Project, Mini Project II

About Hackathon

The project is a part of addressing societal and industrial needs. Hackathon is one of the platforms where students will solve real world challenges. This Course focuses on the selection of methods/engineering tools/analytical techniques for problem solving.

Through this course, students will gain the understanding of engineering basics and ideas, gain practical experience, have the opportunity to display their skills and learn about teamwork, financial management, communication skills and responsibility

Course Outcomes: At the end of the course, students will be able to:

CO1	Select the appropriate method for solving the problem
CO2	Make use of various engineering techniques and tools to give a solution
CO3	Justify the methods /tools used to develop the solution
CO4	Design / simulate the model/ project work
CO5	Describe the solution with help of a project report and presentation
CO6	Conclude the outcomes of project.

Course Contents:

Week 1: Survey Design-1 - Ensure case study group students have made necessary communication and done a preparatory visit. - Watch the lecture on survey design and study the notes. - Prepare a questionnaire and try it out with your group members as mock.	[2]
Week 2: Survey Design-2 - Review survey questionnaire prepared by case study groups. - Decide sampling strategy. - Prepare a detailed schedule for fieldwork	[2]
Week 3: Fieldwork - Data Collection: Collect quantitative data (e.g., statistics, usage metrics) and qualitative data (e.g., user stories, testimonials). - Use data collection tools like questionnaires, observation checklists, and digital analytics. - Ensure data accuracy and reliability through proper sampling and recording methods.	[2]
Week 4: Trails and Experimentation-1	[2]



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- Initial Setup and Configuration - Concept Validation - Feasibility Testing	
Week 5: Trails and Experimentation-2 - Prototyping - Functionality Testing	[2]
Week 6: Trails and Experimentation-3 - Bug Identification and Fixing - Integration Testing - Security Testing 75% Presentation has to be conducted by mentor/guide based on above activity.	[2]
Week 7: Results - Coordinator has to check and verify below points in term of result: - Functional Performance - Accuracy and Precision - Efficiency - Safety	[2]
Week 8: Validation - Coordinator has to check and verify below points in term of validation: - Testing and Verification - Compliance with Standards	[2]
Week 9: Integration Testing - Validate that the hardware integrates seamlessly with other systems or components as intended - Perform compatibility tests with software, other hardware, and network systems.	[2]
Week 10: Documentation and Reporting - Maintain comprehensive documentation of design, development, testing, and validation processes - Provide detailed reports on test results, issues found, and corrective actions taken.	[2]
Week 11: Final Presentation 100% Presentation has to be conducted by mentor/guide based on above activity. - Prototype/Final Software solution is mandatory at the time of final presentation along with report	[2]
Week 12: Exhibition Mini project exhibition will be schedule with interdepartmental evaluation.	[2]




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23MILE01	AEC	Modern Indian Language- Marathi	2-0-0	2 Credits
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Teaching Scheme	Evaluation Scheme
Lecture: 2hrs/week	CA I: 25 Marks CA II: 25 Marks

Pre-Requisites: Nil

Course Outcomes: At the end of the course, students will be able to:

CO1	Develop the knowledge of local language/mother tongue and relate the same to daily life and social media.
CO2	Make use of rhetoric and verb to form sentences in Marathi Language
CO3	Identify Infinitive compounds in the given Marathi sentence.
CO4	Make use of Phrases and proverbs and form a sentence and Solve Prose Assessment/Summary Writing
CO5	Model a letter to appropriate end user in Marathi Language
CO6	Identify writing type of Marathi stanza and write appropriate writing.

Course Contents:

अध्याय 01: भाषापरीचय भाषा आणि व्यक्तिमत्त्वसहसंबंध, भाषा, जीवनव्यवहार आणि नवमाध्यमे व समाजमाध्यमे, चिन्हव्यवस्था-विरामचिन्हे, संवादकौशल्य (तोंडीपरीक्षा), सर्वनाम-पुरुषात्मक, दर्शक, संबंधी, प्रश्नार्थक, सामान्यव आत्मवाचक सर्वनाम, विशेषण-गुणविशेषण, संख्याविशेषण, सार्वनामीकविशेषण	[5]
अध्याय 02: मराठी व्याकरण नाम, सर्वनाम, विशेषणे, क्रियापद, क्रियाविशेषण अव्यय, शब्दयोगी अव्यय, उभयान्वयी अव्यय, केवलप्रयोगी अव्यय, विभक्तीवत्याचे प्रकार, काळवप्रकार	[5]




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अध्याय 03: अलंकारवक्रियापदे अलंकार-शब्दलांकर- अनुप्रास, यमक, श्लेषउदाहरणे, अर्थालंकार-उपमा, उत्प्रेक्षा, व्यक्तिरेक, अपदुनती, रूपक, व्यक्तिरेक, अननव्य, अतिशयोक्तीउदाहरणे प्रयोग-कर्तरी, कर्मणी, भावे वाक्यप्रकार-केवलवाक्य, मिश्रवाक्य, संयुक्तवाक्य समास-अव्ययीभाव, तत्पुरुष, द्वंद्व, बह्वृही क्रियापदे- कर्तावकर्म, क्रियापदाचेप्रकार- अकर्मक, सकर्मक, उभयविध, संयुक्त, क्रियाविशेषण- कालवाचक, स्थळवाचक, रितीवाचक, संख्यावाचक, प्रश्नार्थक, निषेधार्थक	[4]
अध्याय 04: वाक्प्रचारवम्हणीवगद्यआकलन/सारांशलेखन अर्थसांगूनवाक्यातउपयोगकरणे (कमीतकमी३०वाक्यप्रचारवम्हणी), गद्यआकलन- अपठितगद्यउतारावत्यावरीलप्रश्नउत्तरे (कमीतकमी०५उतारेवत्यावरीलप्रश्नउत्तरे), सारांशआकलन	[5]
अध्याय 05: लेखनप्रकार पत्रलेखनवत्याचेप्रकार-निमंत्रण, आभार, अभिनंदन, मागणी, कोटुंबिक, विनंती, तक्रार संधी-स्वरसंधी, व्यंजनसंधी, विसर्गसंधी, वृत्तलेखन, जाहिरातलेखन, कथालेखन, अहवाललेखन, आवेदनपत्र, अभिप्रायलेखन	[4]
अध्याय 05: कल्पनाविस्तार व मुलखात कल्पनाविस्तार, मुलाखतकौशल्ये, मुलाखतीचेवैशिष्ट्ये, मुलाखतीचेस्वरूप, मुलाखतघेतानाध्यावयाचीकाळजी, मुलाखतदेतानाआवश्यकबाबीउदा.आत्मविश्वास, व्यक्तिमत्वविकास, भाषाकौशल्येइ.	[4]
Text Books: 1. व्यावहारिकमराठी, डॉ.ल.रा.नसिराबादकर, फडकेप्रकाशन, कोल्हापूर. 2. व्यावहारिकमराठी, डॉ.लीलागोविलकर, डॉ.जयश्रीपाटणकर, सेहवर्धनप्रकाशन, पुणे 3. सुगममराठीव्याकरणलेखन, मो.रा. वाळंबे, नितीनप्रकाशनपुणे	
Reference Books: 1. अनिवार्यमराठीव्याकरण, लेखनवआकलन, डॉ. प्रल्हादलुलेकर, केदारकाळवणे, Pearson पब्लिकेशन्स 2. मराठीवइंग्रजीअत्यावश्यकनिबंध, प्रा.विजयकुमारवेधपाठक, K'Sagarपब्लिकेशन 3. उपयोजितलेखन, मराठी, प्राचीशेंडे, सावलीम्हात्रे, टागेटपब्लिकेशन्स	



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23ADMDA2	MDM	Introduction to AI for Finance & Management	3-0-0	3 Credits
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Teaching Scheme	Evaluation Scheme
Lecture: 3 hrs/week	CA I: 10 Marks CA II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Fundamentals of Finance and Management

Course Outcomes: At the end of the course, students will be able to:

CO1	To identify the importance of Artificial Intelligence evolution
CO2	To understand the uninformed search algorithms
CO3	To understand the informed search algorithms
CO4	To understand the advanced search algorithms for solving problems
CO5	Structuring Artificial neural networks (ANN) for Financial Management
CO6	To design Financial Forecasting model using AI for management

Course Contents:

Unit 1: Introduction to AI History of AI before 90S, History of AI after 90S, The present state of AI, Definition of AI thinking Vs acting	[02]
Unit 2: Uninformed searching algorithms Depth First Search, Depth Limited Search, Iterative Deepening DFS, Breadth First Search, Cost First Search,	[06]
Unit 3: Informed searching algorithms Best First Search, A* Search, AO* Search	[03]
Unit 4: Beyond Classical Search Hill Climbing, Beam Search, Genetic Algorithm, N-Queens Problem	[04]
Unit 5: Artificial neural networks (ANN) Simple Neurons and Networks, The Backpropagation Network, Single-layer Neural Networks, Multi-layer Neural Network	[04]
Unit 6: Financial Forecasting & Management Portfolio Management: Alpha & Sigma, Algorithmic trading, Banking chatbots and robo-advisors	[04]



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