Syllabus

(OC- II)

B. Tech. (VII- Sem.)

in

Mathematics and Computing

(July- Dec. -2023)

Department of Engineering Mathematics and Computing

Madhav Institute of Technology & Science, Gwalior-474005

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE GWALIOR

(A Govt. Aided UGC Autonomous &NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Department of Engineering Mathematics and Computing

B. Tech. (Seventh Semester)

Advanced Discrete Mathematics

(OC-II)

MAC- 910213

L	T	P	C
3	0	0	3

Objective of Course

- To provide the understanding of combinatorics and Basics principle of Permutations and combinations.
- To obtain a foundational knowledge of Pigeonhole principles and generating permutation and combinations
- Provide students with concepts of Linear homogenous and non-homogeneous recurrence relations
- To understand the Boolean algebra and their uses in different problems.

Unit 1:

Introduction: Combinartorics, Perfect cover of Chessboard, Magic Square, Basic Counting principles, Permutations of Set, Combinations of sets, Permutation of Multisets, Combinations of Multisets

Unit 2:

Pigeonhole Principle: Pigeonhole principle Simple and Strong Form, a theorem of Ramsey, Generating Permutations, Inversion in Permutations, Generating Combinations, Generating r-subsets, Partial orders and equivalence relation

Unit 3:

Binomial Coefficients: Pascal's Triangle, The binomial Theorem, Unimodality of Binomial Coefficients, Multinomial theorem and Newton's Binomial Theorem, Principle of Inclusion and Exclusion

Unit 4:

Recurrence Relation and Generating Function: Some Number Sequences, generating functions, Exponential Generating Function, Solving Linear Homogeneous Recurrence relations, Non-homogeneous recurrence relations.

Unit 5:

Boolean Algebra, Properties of Boolean Algebra, Switching network, Partial Ordering, Lattice, Sub- Boolean algebra, Boolean expression, sum of products, product of sums, Logic gates and Boolean function, Circuits and Gating Networks

Course Outcomes

After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Apply the knowledge of fundamental counting principle
CO2	Evaluate pigeonhole principle to solve different problems
CO3	Implement combinatorics to establish properties of binomial coefficients
CO4	Deal with the knowledge of set theory to combinatorial problems and Recurrence Relation
CO5	Apply the knowledge of Boolean functions and simplify expression using the properties of Boolean algebra; apply Boolean algebra to circuits and gating networks

Recommended Books:

a. Introductory Combinatorics by Richard A. Brualdi, Fifth Edition, Pearson India

b. Introduction to Lattices and order by B. A Davey and H. A. Priestley, Cambridge University

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE GWALIOR

(A Govt. Aided UGC Autonomous &NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Department of Engineering Mathematics and Computing

B. Tech. (Seventh Semester)

Optimization Techniques

(OC-II)

MAC-910214

L	T	P	C
3	0	0	3

Objective of Course

- To know how to formulate and solve Linear Programming problem and Non Linear Programming problems
- To familiarize with PERT/CPM techniques
- To explore the Game Theory
- To make the student acquire sound knowledge of inventory models

Linear Programming:

Linear Programming Problem (LPP): Historical development, models and modeling, classification, general methods for solving OR models, Formulation of LPP, Graphical method, Simplex method, Duality theory in linear programming and applications, Dual simplex method, Transportation and Assignment problems.

Non Linear Programming:

Non Linear Programming Problems (NLPP): Introduction of NLPP, constraints problems of maxima and minima, constraints in the form of equations (Lagrangian method), constraints in the form of inequalities. Dynamic Programming: Basic concepts, Bellman's optimality principle, dynamic programming approach in decision making problems, optimal subdivision problems.

Project management PERT and CPM:

Project management, Origin and use of PERT, origin and use of CPM, project network, diagram representation, Critical Path calculation by linear program, Critical Path calculation by network analysis and Critical Path calculation (CPM), determination of floats, construction of time charts and resource labeling, project cost curve and crashing in project management, project evaluation and review techniques (PERT).

Game Theory:

Introduction to game theory, competitive games, finite and infinite games, two persons zero sum game, pure and mixed strategies, saddle point, maxmin and minimax principle, solution of a rectangular game in terms of mixed strategies, Graphical method of (2xm) and (nx2) games.

Inventory models:

Introduction to inventory problems, deterministic models, classical EOQ (Economic Order Quantity) models, inventory models with deterministic demand (No shortage and shortage allowed), Multi item deterministic models, Price break models, and Inventory models with probabilistic demand.

Course Outcomes

After completing of this course, the students will be able to:

CO's	Description of CO's
CO1	Determine the solution of Linear Programming Problem
CO2	Express the solution of Non Linear Programming Problem
CO3	Find the Optimal solution using PERT/CPM
CO4	Acquire the knowledge of Game theory.
CO5	Evaluate the different models of inventory.

Recommended Books:

1. B. E. Gillet: Introduction to Operation Research, Computer Oriented Algorithmic Approach, McGraw Higher Ed, 1st Edition 1984.
2. A. Ravindran and J. J. Solberg: Operations Research Principles, Wiley, 2nd Edition 1987.
3. P. R. Thie and G. E. Keough: An Introduction to Linear Programming & Game Theory, Wiley, 3rd Edition 2008.
4. H. A. Taha: Operations Research an Introduction, Pearson, 9th Edition 2014.
5. I. Griva, S. G. Nash and A. Sofer: Linear and Non Linear Optimization, Taylor & Francis Group, 2014

Syllabus

(DE- II)

B. Tech. (VII- Sem.)

in

Mathematics and Computing

(July- Dec. -2023)

Department of Engineering Mathematics and Computing

Madhav Institute of Technology & Science, Gwalior-474005

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE GWALIOR

(A Govt. Aided UGC Autonomous &NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Department of Engineering Mathematics and Computing

B. Tech. (Seventh Semester)

Engineering Reliability

(DE –II)

MAC -250731

L	T	P	C
3	0	NIL	3

Course Objectives:

- To understand the concept of Reliability.
- To evaluate measures of reliability
- To determine the maintainability and availability
- To explore Software reliability growth model

Unit-I

Introduction to reliability, define failure/ hazard rate, network modelling and reliability evaluation basic concepts, evaluation of network liability systems, parallel systems, series parallel systems, partially redundant systems, k- out- of- m systems, types of redundancies, evaluation of network reliability using conditional probability method, paths based and cut set based approach, complete event tree and reduced event tree methods.

Unit-II

Time dependent probability basic concepts, reliability functions f(t), F(t), R(t), h(t) relationship between this functions bath tubs curve, exponential, Gama Weibull's and Rayleigh's failure density and distribution functions expected value and standard deviation of distribution, measures of reliability MTTF and MTTR MTBF,MTTF for series and parallel systems

Unit-III

Discrete Markov chains and continuous Markov processes, basic concepts of stochastic transitional probability Matrix, time dependent probability evaluation, limiting state probability evaluation, Markov processes-modelling concepts state space diagrams, time dependent reliability evaluation of single component repairable model evaluation of limiting state probability of one-two component repairable models.

Unit - IV

Concept of maintainability, availability, availability function, type of system availability, economies of reliability engineering, replacement of items, standby system maintenance costing and budgeting preventive maintenance.

Unit - V

Software reliability growth model, Classification of Software Reliability Models, Analytical Model, Dynamic or Probabilistic Model- Discrete Time Models and Continuous Time Models and their testing.

Course Outcomes

After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Determine the reliability of system
CO2	Evaluation of measure for system reliability
CO3	Apply Markov process to carried out system reliability
CO4	Acquire the knowledge of maintainability and availability of system
CO5	Describe Software reliability growth model

Text Books:

1. Mathematical Statistics by C.E.Weatherbum.
2. Fundamentals of Mathematical Statistics by S C Gupta and V K Kapoor- S. Chand & Sons, New Delhi.
3. Fundamentals of Applied Statistics by S C Gupta and V K Kapoor, S Chand & Sons, New Delhi.

Reference Books:

1. An outline of Statistical Theory by Goon, Gupta and Dasgupta.
2. Fundamentals of Statistics by Goon, Gupta Dasgupta

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE GWALIOR

(A Govt. Aided UGC Autonomous &NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Department of Engineering Mathematics and Computing

B. Tech. (Seventh Semester)

Distributed Computing

(DE- II)

MAC-250732

L	T	P	C
3	0	NIL	3

COURSE OBJECTIVES

- To provide students contemporary knowledge of distributed systems.
- To equip students with skills to analyze and design distributed applications.
- To gain experience in the design and testing of a large software system, and to be able to communicate that design to others.

Unit - I

Introduction to Distributed Systems: Architecture for Distributed System, Goals of Distributed System, Hardware and Software Concepts, Distributed Computing Model, Advantages & Disadvantage Distributed System, Issues in Designing Distributed System.

Unit -II

Distributed Share Memory: Basic Concept of Distributed Share Memory (DSM), DSM Architecture & Its Types, Design & Implementations Issues in DSM System, Structure of Share Memory Space, Consistency Model and Thrashing.

Unit - III

Distributed File System: Desirable Features of Good Distributed File System, File Model, File Service Architecture, File Accessing Model, File Sharing Semantics, File Catching Scheme, File Application & Fault Tolerance.

Unit - IV

Inter Process Communication and Synchronization: Data Representation & Marshaling, Group Communication, Client Server Communication, RPC Implementing, RPC Mechanism, Stub Generation, RPC Messages. Synchronization: - Clock Synchronization, Mutual Exclusion, Election Algorithms - Bully & Ring Algorithms.

Unit - V

Distributed Scheduling and Deadlock Distributed Scheduling- Issues in Load Distributing, Components for Load Distributing Algorithms, Different Types of Load Distributing Algorithms, Task Migration and its issues. Deadlock- Issues in deadlock detection & Resolutions, Deadlock Handling Strategy, Distributed Deadlock Algorithms. Case Study of Distributed System: Amoeba, Mach, Chorus.

COURSE OUTCOMES After completion of this course, the students would be able to:

CO's	Description of CO's
CO1	Tell the basic elements and concepts related to distributed system technologies
CO2	Demonstrate knowledge of the core architectural aspects of distributed systems
CO3	Identify how the resources in a distributed system are managed by algorithm
CO4	Examine the concept of distributed file system and distributed shared memory
CO5	Compare various distributed system algorithms for solving real world problems

RECOMMENDED BOOKS:

1. Distributed Operating System Concept & Design, Sinha, PHI
2. Distributed System Concepts and Design, Coulouris & Dollimore, Pearson Publication
3. Distributed Operating System, Andrew S. Tanenbaum, Pearson.

Syllabus

(DE- III)

B. Tech. (VII- Sem.)

in

Mathematics and Computing

(July- Dec. -2023)

Department of Engineering Mathematics and Computing

Madhav Institute of Technology & Science, Gwalior-474005

Ethical Hacking

(DE-III)
MAC- 250761

L	T	P	C
3	0	0	3

Week 1: Introduction to ethical hacking. Fundamentals of computer networking. TCP/IP protocol stack.

Week 2: IP addressing and routing. TCP and UDP. IP subnets.

Week 3: Routing protocols. IP version 6.

Week 4: Installation of attacker and victim system. Information gathering using advanced google search, archive.org, netcraft, whois, host, dig, dnsenum and NMAP tool**.**

Week 5: Vulnerability scanning using NMAP and Nessus. Creating a secure hacking environment. System Hacking: password cracking, privilege escalation, application execution. Malware and Virus. ARP spoofing and MAC attack.

Week 6: Introduction to cryptography, private-key encryption, public-key encryption.

Week 7: Cryptographic hash functions, digital signature and certificate, applications.

Week 8: Steganography, biometric authentication, network-based attacks, DNS and Email security.

Week 9: Packet sniffing using wireshark and burpsuite, password attack using burp suite. Social engineering attacks and Denial of service attacks.

Week 10: Elements of hardware security: side-channel attacks, physical inclinable functions, hardware trojans.

Week 11: Different types of attacks using Metasploit framework: password cracking, privilege escalation, remote code execution, etc.Attack on web servers: password attack, SQL injection, cross site scripting.

Week 12: Case studies: various attacks scenarios and their remedies.

Books and References

1. Data and Computer Communications -- W. Stallings.
2. Data Communication and Networking -- B. A. Forouzan
3. TCP/IP Protocol Suite -- B. A. Forouzan
4. UNIX Network Programming -- W. R. Stallings
5. Introduction to Computer Networks and Cybersecurity -- C-H. Wu and J. D. Irwin
6. Cryptography and Network Security: Principles and Practice -- W. Stallings

Computational Complexity

(DE-III)
MAC-250762

L	T	P	C
3	0	0	3

Week 1: Introduction to the course, Polynomial time reductions, P and NP classes, Review of NP Completeness, P vs NP

Week 2: NP Complete problems, Cook-Levin Theorem, Polynomial Hierarchy

Week 3: Time Hierarchy Theorem, Space Complexity, Savitch's Theorem, NL-Completeness, NL = coNL

Week 4: PSPACE Completeness, Space Hierarchy Theorem, Ladner Theorem, Oracles

Week 5: Baker-Gill-Solovay Theorem, Randomized Complexity Classes

Week 6: Randomized Complexity Classes(contd.), BPP is in polynomial hierarchy, Circuit Complexity

Week 7: Circuit Hierarchy Theorem, P/poly complexity class, NC and AC classes, Karp-Lipton Theorem

Week 8: Parity not in AC^0, Adleman's Theorem, Polynomial Identity Testing, Perfect Matching is in RNC^2

Week 9: Bipartite Perfect Matching is in RNC (contd.), Isolation Lemma, Valiant Vazirani Theorem, #P and #P Completeness.

Week 10: Permanent is #P Complete, Toda's Theorem

Week 11: Communication Complexity, Lower bound techniques, Monotone depth lower bound for matching.

Week 12: Introduction to Interactive Proofs, #3-SAT is in IP, Private and Public Coin Interactive proofs, Course summary.

Books and references

1. Computational Complexity, by Christos Papadimitriou

2. Computational Complexity: A Modern Approach, by Sanjeev Arora and Boaz Barak.

3. Introduction to the Theory of Computation by Michael Sipser

Syllabus

(DE- IV)

B. Tech. (VII- Sem.)

in

Mathematics and Computing

(July- Dec. -2023)

Department of Engineering Mathematics and Computing

Madhav Institute of Technology & Science, Gwalior-474005

Department of Engineering Mathematics and Computing

B. Tech. (Seventh Semester)

Deep Learning
(DE-IV)
MAC- 250764

Week 1: Introduction to Deep Learning, Bayesian Learning, Decision Surfaces

Week 2: Linear Classifiers, Linear Machines with Hinge Loss

Week 3: Optimization Techniques, Gradient Descent, Batch Optimization

Week 4: Introduction to Neural Network, Multilayer Perceptron, Back Propagation Learning

Week 5: Unsupervised Learning with Deep Network, Autoencoders

Week 6: Convolutional Neural Network, Building blocks of CNN, Transfer Learning

Week 7: Revisiting Gradient Descent, Momentum Optimizer, RMSProp, Adam

Week 8: Effective training in Deep Net- early stopping, Dropout, Batch Normalization, Instance Normalization, Group Normalization

Week 9: Recent Trends in Deep Learning Architectures, Residual Network, Skip Connection Network, Fully Connected CNN etc.

Week 10: Classical Supervised Tasks with Deep Learning, Image Denoising, Semanticd Segmentation, Object Detection etc.

Week 11: LSTM Networks

Week 12: Generative Modeling with DL, Variational Autoencoder, Generative Adversarial Network Revisiting Gradient Descent, Momentum Optimizer, RMSProp, Adam

Books and References

1.Deep Learning- Ian Goodfelllow, Yoshua Benjio, Aaron Courville, The MIT Press
2.Pattern Classification- Richard O. Duda, Peter E. Hart, David G. Stork, John Wiley & Sons Inc.

Department of Engineering Mathematics and Computing

B. Tech. (Seventh Semester)

Digital Image Processing

(DE- IV)

MAC- 250765

Week 1: Introduction and signal digitization

Week 2: Pixel relationship

Week 3: Camera models & imaging geometry

Week 4: Image interpolation

Week 5: Image transformation

Week 6: Image enhancement I

Week 7: Image enhancement II

Week 8: Image enhancement III

Week 9: Image restoration I

Week 10: Image restoration II & Image registration

Week 11: Colour image processing

Week 12: Image segmentation

Week 13: Morphological image processing

Week 14: Object representation ,description and recognition

Books and References

1. Digital Image Processing by Rafael C Gonzalez & Richard E Woods, 3rd Edition
2. Fundamentals of Digital Image Processing by Anil K Jain
3. Digital Image Processing by William K Pratt

Syllabus

(LAB)

B. Tech. (VII- Sem.)

in

Mathematics and Computing

(July- Dec. -2023)

Department of Engineering Mathematics and Computing

Madhav Institute of Technology & Science, Gwalior-474005

Department of Engineering Mathematics and Computing

B. Tech. (VII- Sem.)

Analytics Using R Programming

(DLC-250704)

L	T	P	C
0	0	4	2

COURSE OBJECTIVES

- To understand the critical programming language concepts.
- To perform data analysis using R commands.
- To make use of R loop functions and debugging tools.

Unit-I

Introduction to R: Basic Syntax in R Programming, Packages, Comments in R, Operators, Keywords, Datatypes, Variables, Input/Output, Control Flow.

Unit-II

Functions: Types of function in R Language, Recursive Functions, Conversion Functions. Data Structures: String, Vector, Lists, Array, Matrices, Factors, Data Frames.

Unit-III

Graphics in R: Basic Plots, Labelling and Documenting Plots, Adjusting the Axes, Specifying Colour, Fonts and Sizes, Plotting symbols, Customized Plotting.

Unit-IV

Object-Oriented Programming in R: Introduction, S3 Classes, S4 Classes, References Classes, Data Munging, Importing Data, Exporting Data.

Unit-V

Analysis & Modeling: Time Series Analysis, Classification, Regression, and Machine Learning: Supervised and Unsupervised Learning.

Course Outcomes

After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Define basic programming constructs used in R
CO2	Explain the various commands used in R
CO3	Apply various concept of programming for controlling the flow of data using R.
CO4	Analyze the concept of concept of object oriented programming in R.
CO5	Choose and predict appropriate packages of R programming for dealing various tasks

Recommended Books:

- "R for Beginners", Sandip Rakshit, Tata Mc Graw HillEducation.
- "R programming for Data Science", Roger D. Peng, Learnpublishing.

Syllabus

B. Tech. (Vth Sem.)

(2021- 2022)

Department of Engineering Mathematics and Computing

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE GWALIOR

(A Govt. Aided UGC Autonomous &NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Department of Engineering Mathematics and Computing

B. Tech. (Fifth Semester)

Computer Networks

(MAC-250501)

COURSE OBJECTIVES

L	T	P	C
3	0	NIL	3

- To understand the architecture of networks.
- To understand the issues and solution to access shared medium.
- To understand the existing protocols at network and transport layer for design and implementation of computer network.
- To understand the reliability & efficiency related issue in a packet switched networks.

UNIT 1:

Introduction to computer networks & their uses, Different topologies. ISO-OSI model: Layered Architecture, Peer-to-Peer processes and encapsulation, Function and Services of OSI layers; The Physical layer: Digital Signals, Transmission Impairments and Maximum data rate of a channel, Shennons theorem, Nyquist theorem. Transmission media: Guided and Unguided medias. Circuit, Packet and Message switching, virtual Circuit. Introduction to ISDN & its components.

UNIT 2:

The data link layer: Design issues & function, Error detection & correction, Forward error correction Versus Retransmission, Hamming code & CRC codes, Framing: Fixed size and Variable size Frame, Bit stuffing and Byte stuffing. Data link layer protocols: Simplest, Stop and Wait, Sliding window protocols, PPP, SLIP, HDLC. The medium access sublayer: Static and Dynamic Channel Allocation, Protocols: ALOHA Protocol, CSMA (CSMA/CD, CSMA/CA), Collision Free Protocol- Bit Map.

UNIT 3:

IEEE 802 standards for LANs (IEEE 802.3, IEEE 802.4, IEEE 802.5), LAN Devices: HUB, Switches-Learning, Cut-Through and store and forward switches, Bridges: IEEE 802.x to IEEE 802.y, Spanning Tree, Remote Bridge. Internetworking Devices: Routers & gateways. The network layer: Design issues and functions, Internal organization (Virtual Circuit & Datagrams).

UNIT 4:

Routing algorithms: Shortest path routing, Flooding, LSR, Distance Vector Routing, Hierarchical Routing. Introduction to TCP/IP Protocol stack: Protocol Architecture, Classful IP addressing, ARP, RARP, IP Datagrams with options and its delivery, ICMP.

UNIT 5:

Subnet, Supernet, CIDR. Transport Layer: Congestion control, Load Shedding, Jitter control, addressing and multiplexing, Connection establishment and connection release, flow control. Application layer: Introduction to DNS and Email.

CO's	Description of CO's
CO1	Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.
CO2	Acquire the knowledge of network layers.
CO3	Specify and identify deficiencies in existing protocols, and then go onto formulate new and better protocols
CO4	Analyze, specify and design the topological and routing strategies for an IP based networking infrastructure
CO5	Know the issues and solution to access shared medium

RECOMMENDED BOOKS:

1. Tanenbaum A. S., "Computer Networks", Pearson Education, 5th edition, 2011.
2. Behrouz A Forouzan, "Data communication and networking", 4th edition, McGraw- Hill Education, 2017.
3. Comer, "Internetworking with TCP/ IP Vol-1", Pearson education, 6th Edition, 2015.
4. Peterson & Davie, "Computer Networks", 5th Edition, Morgan Kaufmann, 2011.
5. W. Richard Stevens, "TCP/IP Illustrated Vol-1 ", 2nd Edition, Addison-Wesley, 2011.
6. Craig Zacker, "Networking The Complete Reference", 2nd Edition, TMH, 2001.

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE GWALIOR

(A Govt. Aided UGC Autonomous &NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Department of Engineering Mathematics and Computing

B. Tech. (Fifth Semester)

Real and Complex Analysis

(MAC-250502)

L	T	P	C
3	1	0	4

Course Objectives:

- To develop understanding of real analysis and to introduce the classical results of complex variable analysis.
- Acquire knowledge about continuity and differentiability of function
- To explain basic concept of Riemann integrals
- Develop the skills to apply complex variable functions in real world problems
- Evaluation of definite integrals by using contour integration techniques.

UNIT 1:

Real System: Introduction, Ordered Sets, Real system and Real Field, Archimedean property of the real-number system, Cauchy-Schwarz inequality, Finite, Countable, and Uncountable Sets, Compact Sets, Heine Borel Theorem, Perfect Sets, Connected Sets, Bolzano-Weierstrass theorem.

UNIT 2

Continuity and Differentiability: Limits of Functions, Continuous Functions, Continuity and Discontinuities, Limits at Infinity, Continuity of Derivatives, Cauchy Criterion for finite limits, Continuity at point and in an interval, Theorems in Continuity, Function continuous on closed interval, Uniform continuity, Theorems on Uniform continuity.

UNIT 3

Riemann and Riemann-Stieltjes Integral: Definition and existence of the integral, Refinement of Partitions, Darboux theorem, Condition of Integrability, Properties of Reimann Integral, Reimann Sums, Integrability of continuous and monotonic function, Definition, Partitions, Sufficient and existence conditions for existence of Riemann-Stieltjes integrals, Upper and lower bounds, Upper and Lower integrals, fundamental theorems of calculus, Mean Value Theorems for Riemann-Stieltjes integrals.

Unit:4

Functions of Complex Variables, Limits, Continuity and differentiability of functions of a complex variable, Analytic functions, necessary and sufficient condition for function to be analytic, Cauchy-Reimann equations, Harmonic functions, Milne-Thomson method to find conjugate function, Conformal Mappings, Bilinear Transformation: magnification and rotation, inversion and reflection.

Unit:5

Integration in a complex plane along a contour, integration of regular function, Cauchy's theorem, Cauchy's integral formula, Morera's theorem, Liouville Theorem, Taylor's and Laurents series, Isolated and non-isolated singularity, poles, residues, Cauchy's residue theorem and its applications.

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

CO's	Description of CO's
CO1	Grasp basic concept of real number system and their applications in engineering problems.
CO2	Analyse various properties of continuity and uniform continuity and compare them.
CO3	Apply concepts of Riemann Integral to solve engineering problems.
CO4	Recognize and Analyse the applications of complex valued function in real world engineering problems.
CO5	Classify various forms of singularities of complex valued functions and their expansion in valid region of convergence.

Recommended Books:

1. Walter Rudin. Principles of Mathematical Analysis (International Series in Pure and Applied Mathematics). 3rd ed. McGraw-Hill, 1976.
2. S C Malik and Savita Arora, Mathematical Analysis, 4th Edition, New Age International Publishers, 2010.
3. S. Ponnusamy, Foundation of Complex Analysis, Narosa Publishing House, 1997.
4. J. W. Brown and R. V. Churchill, Complex variables and applications, MC Graw Hill Higher Education, Eighth Edition 2009.
5. Murray Spiegel, Seymour Lipschutz, John Schiller, Dennis Spellman, Schaum's Outlines: Complex variables, 2nd Edition, McGraw-Hill Education – Europe, 2009

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE GWALIOR

(A Govt. Aided UGC Autonomous &NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Department of Engineering Mathematics and Computing

B. Tech. (Fifth Semester)

Software Engineering

(MAC-250503)

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.
- To understand project management and risk management associated with various types of projects.
- To know basics of testing and understanding concept of software quality assurance and software configuration management process.

Unit - I

Introduction to Software Engineering: Definition, software engineering-layered Technology, Software Characteristics and Components, **Software model:** Software Development of Life Cycle Model (SDLC), The Waterfall Model, Iterative Waterfall Model, Prototyping Model, Spiral Model, RAD Model. **Selection criteria of model**: Characteristics of Requirements, Status of Development Team, Users participation, Type of Project and Associated Risk.

Unit - II

Requirement Engineering: Definition, Requirement Engineering Activity, **Types of Requirement-** Functional and Non-functional Requirements, User and System Requirements, Requirement Elicitation Methods, Requirement Analysis Methods, Requirement Documentation (SRS), Requirement Validation, Requirement Management.

Unit - III

Design Concept, Principle and Methods: Design Fundamentals, Design Principles, Effective Modular Design, Design Representations, Architectural design, Procedural design, data Directed design, Real Time Design, Object Oriented Design, Coupling and Cohesion.

Unit - IV

Software Metrics, Project Management and Estimation: Metrics in Process and Project domains, Software Measurement, Software Quality Metrics, **Project Management-** Basics-People, Product, Process, Project, **Estimation-** Software Project Estimation, Decomposition Techniques- Function Point Estimation, Line of Code (LOC) based estimation, Empirical Estimation, COCOMO Model, Project Scheduling Techniques.

Unit - V

Software Testing: Definitions, Software Testing Life Cycle (STLC), Test Case Design, Strategic Approach to Software Testing- Verification & Validation , Strategic issues, Criteria for completion of Testing, Unit Testing, Integration Testing, Validation Testing, System Testing, Black Box Testing Techniques, White Box Testing Techniques, Acceptance Testing.

Course Outcomes

After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Explain the various fundamental concepts of software engineering.
CO2	Develop the concepts related to software design & analysis.
CO3	Compare the techniques for software project management & estimation
CO4	Choose the appropriate model for real life software project.
CO5	Test the software through different approaches.

RECOMMENDED BOOKS:

1. Software Engineering, Sommerville, Pearson, 2016.
2. Software Engineering: A Practitioner's Approach, Roger S. Pressman, McGraw Hill, 2001.
3. Software Engineering, K.K. Agrawal & Yogesh Singh, New Age Publication, 2007.
4. Fundamentals of Software Engineering**,** Rajib Mall, PHI, 2014.

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE GWALIOR

(A Govt. Aided UGC Autonomous &NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Department of Engineering Mathematics and Computing

B. Tech. (Fifth Semester)

DATA SCIENCE USING PYTHON

(MAC-250504)

L	T	P	C
2	1	2	4

COURSE OBJECTIVES:

- To provide the fundamental knowledge of Data Science.
- To present the basic representation and exploratory data analysis used in Data Science.
- To understand the working of techniques used in Data Science.

Unit 1:Introduction of basics python tool, Setting working Directory, Creating and saving a script file, File execution, clearing console, removing variables from environment, clearing environment, Commenting script files, Variable creation, Arithmetic and logical operators, Data types and associated operations

Unit 2: Sequence data types and associated operations Strings, Lists, Arrays, Tuples, Dictionary, Sets, Range, NumPy, ndArray

Unit 3:Pandas dataframe and dataframe related operations on different dataset, Reading files, Exploratory data analysis, Data preparation and preprocessing

Unit 4: Linear regression, logistic regression, decision tree, tree creation with entropy and information gain, IDE3 algorithm, random forest, naïve bayes theorem, K-nearest neighbor and different ensemble methods for solving real world problems.

Unit 5:Data visualization on different dataset using matplotlib and seaborn libraries, Scatter plot, Line plot, Bar plot, Histogram, Box plot. Pair plot, Control structures using different dataset, if-else family, for loop, for loop with if breaks, while loop, Functions

BOOKS AND REFERENCES

1. Mastering python for data science, Samir Madhavan

COURSE OUTCOMES:

After completing the course, the student will be able to:

CO1: Define different Data Science techniques.

CO2: Apply different TOOL used for Data Science technique.

CO3: Apply data visualization techniques to solve real world problems.

CO4: Build exploratory data analysis for Data Science methods.

CO5: Build Data Science techniques for solving real world problems.

Department of Engineering Mathematics and Computing

B. Tech. (Fifth Semester)

Optimization Techniques

(MAC-250505)

L	T	P	C
3	1	0	4

Objective of Course

- To know how to formulate and solve Linear Programming problem and Non Linear Programming problems
- To familiarize with PERT/CPM techniques
- To explore the Game Theory
- To make the student acquire sound knowledge of inventory models

Linear Programming:

Linear Programming Problem (LPP): Historical development, models and modeling, classification, general methods for solving OR models, Formulation of LPP, Graphical method, Simplex method, Duality theory in linear programming and applications, Dual simplex method, Transportation and Assignment problems.

Non Linear Programming:

Non Linear Programming Problems (NLPP): Introduction of NLPP, constraints problems of maxima and minima, constraints in the form of equations (Lagrangian method), constraints in the form of inequalities. Dynamic Programming: Basic concepts, Bellman's optimality principle, dynamic programming approach in decision making problems, optimal subdivision problems.

Project management PERT and CPM:

Project management, Origin and use of PERT, origin and use of CPM, project network, diagram representation, Critical Path calculation by linear program, Critical Path calculation by network analysis and Critical Path calculation (CPM), determination of floats, construction of time charts and resource labeling, project cost curve and crashing in project management, project evaluation and review techniques (PERT).

Game Theory:

Introduction to game theory, competitive games, finite and infinite games, two persons zero sum game, pure and mixed strategies, saddle point, maxmin and minimax principle, solution of a rectangular game in terms of mixed strategies, Graphical method of (2xm) and (nx2) games.

Inventory models:

Introduction to inventory problems, deterministic models, classical EOQ (Economic Order Quantity) models, inventory models with deterministic demand (No shortage and shortage allowed), Multi item deterministic models, Price break models, and Inventory models with probabilistic demand.

Course Outcomes

After completing of this course, the students will be able to:

CO's	Description of CO's
CO1	Determine the solution of Linear Programming Problem
CO2	Express the solution of Non Linear Programming Problem
CO3	Find the Optimal solution using PERT/CPM
CO4	Acquire the knowledge of Game theory.
CO5	Evaluate the different models of inventory.

Recommended Books:

1. B. E. Gillet: Introduction to Operation Research, Computer Oriented Algorithmic Approach, McGraw Higher Ed, 1st Edition 1984.
2. A. Ravindran and J. J. Solberg: Operations Research Principles, Wiley, 2nd Edition 1987.
3. P. R. Thie and G. E. Keough: An Introduction to Linear Programming & Game Theory, Wiley, 3rd Edition 2008.
4. H. A. Taha: Operations Research an Introduction, Pearson, 9th Edition 2014.
5. I. Griva, S. G. Nash and A. Sofer: Linear and Non Linear Optimization, Taylor & Francis Group, 2014

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE GWALIOR
(A Govt. Aided UGC Autonomous &NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Syllabus

B. Tech. (Vth Sem.)

(Experiment List / Skill Based Mini- Project)

(2021-2022)

Department of Engineering Mathematics and Computing

Department of Engineering Mathematics and Computing

B. Tech. (Fifth Semester)

Java Programming Technologies (MAC-250506)

List of Experiments

1. JAVA program to create a class to read and add two distance.
2. JAVA program to create a class for student to get and print details of a student.
3. JAVA program to create a class for student to get and print details of N students.
4. JAVA program to demonstrate example of array of objects.
5. JAVA program to create class to read and add two times.
6. JAVA program to create class to read time in seconds and convert into time in (HH:MM:SS) format.
7. JAVA program to create class to read time in HH:MM:SS format and display into seconds.
8. JAVA program to demonstrate example of friend function with class.
9. Count the created objects using static member function in JAVA.
10. Create an object of a class inside another class declaration in JAVA.
11. Example of private member function in JAVA.
12. Local Class with Example in JAVA.
13. Structure with private members in JAVA.
14. Member Functions in JAVA.
15. Demonstrate Example of public data members in JAVA.
16. Create a class Point having X and Y Axis with getter and setter functions in JAVA.
17. Passing an object to a Non-Member function in JAVA.
18. Access the reference of an object using 'this' in JAVA.
19. Create a class with public data members only in JAVA
20. JAVA program Input list of candidates and find winner of the Election based on received votes
21. JAVA program to design applets.
22. JAVA program to create a file.
23. JAVA program to read a text file.
24. JAVA program to write and read text in/from file.
25. JAVA program to write and read values using variables in/from file.
26. JAVA program to write and read object using read and write function.

Skill Based Project

1. **Notes & Password Manager**
Note taking is a very good habit to organize our daily life. This is an online android application which helps to take notes at anytime and helps to generate a very strong password for your account security and makes the same available whenever you need. Basically it's a two-in-one app.

2. **Library Management System**
A Library Management System is an enterprise resource planning system for a library, used to track items owned, orders made, bills paid, and patrons who have borrowed. Most used System in School & Colleges, isn't it? Here, we will make our own Library Management System which can perform all CRUD operations along with various advanced functionalities.

3. QuizUp - A Quiz Application
This application will provide convenience in MCQ mode of examinations and screening tests. This application will eliminate paperwork and will be able to effectively store all the information in the database. The purpose of this application is to save student data, to measure the marks obtained by each student and to point out their mistakes.

4. Customer Relationship Manager
Developing a web application with help of Spring, Hibernate and HTML/CSS. The journey is about how to create a backend web application.Customer Relationship Manager will keep track of all the customers. Adding new customers, editing their information and deleting them when needed.

5. Airline reservation system
6. Course management system
7. Data visualization software
8. Electricity billing system
9. e-Healthcare management system
10. Email client software
11. Library management system
12. Online bank management system
13. Online medical management system
14. Online quiz management system
15. Online Survey System
16. Smart city project
17. Stock management system
18. Supply chain management system

Syllabus
of
B.Tech.
in
Mathematics and Computing

Department of Engineering Mathematics and Computing

Madhav Institute of Technology & Science
Gwalior-474005

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Department of Engineering Mathematics and Computing

B. Tech. (Third Semester)
Stochastic Process and Financial Mathematics
(MAC-250321)

L	T	P	C
3	0	0	3

Objective of Course

- To perceive the mathematical techniques in financial sector
- To explore the concept of free and risky assets
- To understand mathematical models and risk management
- To know stochastic differential and integral equations

Unit I:
Basic Notions and Assumptions, No-Arbitrage Principle, One-Step Binomial Model, Risk and Return, Forward Contracts, Call and Put Options, Growth and decay curves, Managing Risk with Options, Credit and loan, Cost of credit and amortization

Unit II
Time Value of Money, Simple Interest, Periodic Compounding, Streams of Payments, Discrete and Continuous Compounding, how to Compare Compounding Methods, Money Market, Discrete Time Model: Stock and Money Market Models, Investment Strategies, The Principle of No Arbitrage, Fundamental Theorem of Asset Pricing,

Unit III
Dynamics of Stock Prices, Expected Return, Binomial Tree Model, Risk-Neutral Probability, Martingale Property, Numerical Techniques in Finance: Continuous-Time Limit, Monte-Carlo methods, Lattice Method.

Unit IV
Portfolio Management: Risk and Expected Return on a Portfolio, Numerical and Combinatorial Optimization: Dynamic programming and allocating investments MarKov chains and sequential decision making, Linear programming and the simple method, The theory of games.

UNIT-V Stochastic Differential Equations
Random Walks and Brownian Motion, Concept of Stochastic Differential Equations (SDEs) - drift, diffusion, Ito calculus: Ito's Lemma, Ito Integral and Ito Isometry.

Course Outcomes

After successfully completing this course, the students will have skill and knowledge to:

CO's	Description of CO's
CO1	Define and describe market models, growth and decay curve
CO2	Analyze free risk assets in financial sector
CO3	Deal with the market risk measurement and management
CO4	Employ discrete market models and able to manage portfolio.
CO5	Explore stochastic differential equations

Recommended Books:

1. Marek Capinski and Tomasz Zastawniak, "Mathematics for Finance", Springer (2011).
2. Kannoo Ravindran, The Mathematics of Financial Models: Solving Real-World Problems with Quantitative Methods, Wiley Finance, (2014)
3. Ambad Nazri Wahidudin, "Financial Mathematics and its Applications", Ventus Publishing ApS (2011).
4. Ales Cerny: "Mathematical techniques in Finance: Tools for incomplete markets", Princeton University Press (2011).

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Department of Engineering Mathematics and Computing

B. Tech. (Third Semester)

Discrete Mathematical Structures

(MAC – 250322)

L	T	P	C
3	0	0	3

Objective of Course

- To have knowledge of basic algebra and discrete numeric function.
- To describe function and its relation
- To familiarize propositional logic
- To know about the graph theory and its application in computer
- To familiarize the discrete numeric function and generating function

UNIT 1:

Sets, Subsets, Power sets, Complement, Union and Intersection, Demorgan's law Cartesian products, Relations, relational matrices, properties of relations, equivalence relation, functions, Injection, Surjection and Bijective mapping, Composition of functions, Permutations, the characteristic functions and Mathematical induction.

UNIT 2:

Partial order set, Hasse diagrams, upper bounds, lower bounds, Maximal and minimal element, first and last element, Lattices, sub lattices, Isotonicity, distributive inequality, Lattice homomorphism, lattice isomorphism ,complete lattice ,complemented lattice distribution lattice .

UNIT 3:

Group axioms, permutation group, sub group, co-sets, normal subgroup, semi group, Lagrange theorem, fields, minimal polynomials, reducible polynomials, primitive polynomial, polynomial roots, applications.

UNIT 4:

Finite graphs, incidence and degree, isomorphism, sub graphs and union of graphs, connectedness, walk, paths and circuits, Eulerian and Hamiltonian graphs. Trees: properties of trees, pendant vertices in tree, Center of tree, spanning trees and cut vertices, binary tree ,matrix representation of graph, incidence and adjacency matrix and their properties, applications of graphs in computer science.

UNIT 5:

Introduction to discrete numeric functions and generating functions, introduction to recurrence relations and recursive algorithms, linear recurrence relations with constant coefficients, homogeneous solutions, particular solutions and total solutions

Course Outcomes

After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Acquire Knowledge of set theory
CO2	Analyse the concept of Lattices
CO3	Identify the concept of Group Theory
CO4	Derive the Inferences from Graph theory
CO5	Illustrate the Discrete numeric function and recursive relation

Recommended Books:

1. J.P Tremblay and Manohar: Discrete Mathematical Structures with Application to Computer science, McGraw-Hill, 1st Edition 2017.
2. NersinghDeo: Graph Theory, PHI Learning, 2014.
3. C.L Liu: Discrete Mathematics.4th Edition 2012.
4. Rosen: Discrete Mathematics and its Applications, McGraw Higher Ed, 7th Edition 2008.
5. N. Herstein: Topics in Algebra, Wiley, 2nd Edition 2006.

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Department of Engineering Mathematics and Computing

B. Tech. (Third Semester)

Operating System Concepts

(MAC - 250323)

L	T	P	C
3	0	0	3

Course Objectives

- Recognize the concepts and principles of operating systems.
- Provide comprehensive introduction to understand the underlying principles, techniques and approaches which constitute a coherent body of knowledge in operating systems.
- To teach understanding how the various elements that underlie operating system interact and provides services for execution of application software.

Unit-1:

Introduction: Evolution of operating systems, Types of operating systems, Different views of operating system, operating system concepts and structure.

Processes: The process concept, systems programmer's view of processes, operating system services for processes management, scheduling algorithms, Performance evaluation.

Unit-2:

Memory Management: Memory management without swapping or paging, swapping, virtual memory, page replacement algorithms, modelling paging algorithms, design issues for paging system, segmentation, Thrashing.

Unit-3:

Interprocess communication and synchronization: The need for interprocess synchronization, mutual exclusion, semaphores, hardware support for mutual exclusion, queuing implementation of semaphores, classical problems in concurrent programming, critical region and conditional critical region, monitors messages.Deadlocks:Deadlock prevention, deadlock avoidance.

Unit-4:

Mass Storage system – Overview of Mass Storage Structure, Disk Structure, Disk Scheduling and Management, swap space management; File-System Interface – File concept, Access methods, Directory Structure, Directory organization, File system mounting, File Sharing and Protection; FileSystem Implementation-File System Structure, Directory implementation, Allocation Methods,Free Space Management, Efficiency and Performance, Recovery.

Unit-5:

Performance measurement: Monitoring and evaluation introduction, important trends affecting performance issues, why performance monitoring and evaluation are needed, performance measures, evaluation techniques, bottlenecks and saturation, feedback loops.

Case study: Unix Operating System.

Course Outcomes

After completion of this course, the students would be able to:

CO's	Description of CO's
CO1	Outline the basic concept of operating systems
CO2	Analyze the working of operating system
CO3	Examine the working of various scheduling/allocation approaches
CO4	Measure the performance of various scheduling/allocation approaches
CO5	Compare the various operating system problems/issues

Recommended Books:

1. Silberschatz, Galvin:Operating System Concepts, Wiley, 9/E, 2013.
2. StallingWilliam: Operating Systems, Pearson Education, 5/E, 2006.
3. Andrew S. Tanenbaum: Modern Operating Systems, 3/E, PHI, 2006.
4. J. BachMaurice: The Design of Unix Operating System, Pearson,First Edition, 2015.
5. Bovet &Cesati:Understanding the Linux Kernel, O'Reily, 3/E, 2005.
6. Peter Norton: Complete Guide to Windows XP, SAMS, 2002.

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Department of Engineering Mathematics and Computing

B. Tech. (Third Semester)

Data Structures and Algorithms

(MAC - 250324)

L	T	P	C
2	0	2	3

Course Objectives

- To be familiar with the use of data structures as the foundational base for computer solutions to problems.
- To understand various techniques of searching and sorting.
- To understand basic concepts about stacks, queues, lists, trees and graphs.

Unit-1:

Prerequisites: Array, Structure, pointers, pointer to structure, functions, parameter passing, recursion.
Stack and Queue: Contiguous implementations of stack, various operations on stack, various polish notations-infix, prefix, postfix, conversion from one to another-using stack; evaluation of post and prefix expressions. Contiguous implementation of queue: Linear queue, its drawback; circular queue; various operations on queue.

Unit-2:

General List: list and it's contiguous implementation, it's drawback; singly linked list-operations on it; doubly linked list-operations on it; circular linked list; linked list using arrays. Linked implementation of stack and queue,various applications of Linked List, like polynomial representation, Josephus Problem.

Unit-3:

Trees: Definitions-height, depth, order, degree, parent and children relationship etc;Binary Trees- various theorems, complete binary tree, almost complete binary tree;Tree traversals-preorder, pre order and post order traversals, their recursive and non-recursive implementations; expression tree- evaluation; Linked representation of binary tree-operations. Threaded binary trees; forests, conversion of forest into tree. Heap-definition.AVL tree- definition, insertion & deletion operations; Basic idea of B tree and B+ Tree: definition, order, degree, operations and comparison.

Unit-4:

Searching, Hashing and Sorting: Requirements of a search algorithm; sequential search, binary search, indexed sequential search, interpolation search; hashing-basics, methods, collision, resolution of collision, chaining; Internal sorting- Bubble sort, selection sort, insertion sort, quick sort, merge sort on linked and contiguous list, shell sort, heap sort, tree sort.

Unit-5:

Graphs: Related definitions: Graph representations- adjacency matrix, adjacency lists, adjacency multi-list; traversal schemes- Depth first search, Breadth first search; Minimum spanning tree; Shortest path algorithm; Prim's,Kruskal&Dijkstra algorithm. Sparse Matrix.

Course Outcomes

After completion of this course, the students would be able to:

CO's	Description of CO's
CO1	Outline the basics of Algorithms and their performance criteria's.
CO2	Explain the working of linear/Non Linear data structures.
CO3	Identify the appropriate data structure to solve specific problems
CO4	Analyze the performance of various data structures & their applications
CO5	Evaluate the time/space complexities of various data structures & their applications.

Recommended Books:

1. AM Tanenbaum, Y Langsam& MJ Augustein: Data structure using C, PHI, 2007.
2. Robert Kruse, Bruse Leung: Data structures & Program Design in C, Pearson Education, 2007.
3. Richard, GilbergBehrouz, Forouzan: Data structure – A Pseudocode Approach with C, Thomson press, 2005.
4. Jean – Paul Trembly, Paul Sorenson: An Introduction to Structure with application, TMH, 2007.
5. A. H. Ullman: Data Structures and Algorithms, Pearson Education, 2002.
6. N. Wirth: Algorithms + Data Structure = Programs, Prentice Hall, 1978.
7. SartajSahni : Data Structures,Algorithms and Applications in C++, Universities Press, 2014.

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Department of Engineering Mathematics and Computing

B. Tech. (Third Semester)

Numerical Techniques

(MAC – 250325)

L	T	P	C
2	1	0	3

Course Objective

- To perceive the Errors, Algebraic & Transcendental
- To expose the concept of Interpolation, Extrapolation, Numerical differential and Integration
- To understand Numerical solution of Ordinary Differential Equation
- To explore the Finite Difference Methods

Unit 1: Errors, Algebraic & Transcendental

Problem solving on computer. Algorithms and flow charts. Introduction to numerical computing, approximations and errors in numerical computations. Useful rules for estimating Errors, Truncation and round off errors, propagation of errors, Error in the Approximation of function, Error in Approximation

Bisection method, Regula Falsi method, Iteration method, Newton Raphson method, Secant method, convergence of iterative methods.

Unit 2: Simultaneous Equations & Finite Difference

Matrix algebra, Solution of simultaneous linear algebraic equations: Gauss elimination, Gauss Jordan method, LU decomposition, Jacobi method, Gauss Seidel method, SOR method, Ill and well condition of equations, Condition of a system and stability issues., Finite Differences, forward, backward and central operators, Shifting operators, Averaging Operators, Differences of a polynomial, Factorial Notation, Relation between operators.

Unit 3: Interpolation, Extrapolation, Numerical differential and Integration

Newton's forward and backward interpolation formula, Lagrange interpolation formula, Divided differences and Newton's divided difference formula, Inverse Interpolation, Numerical differentiationNumerical integration: Newton-Cotes integration formulas, Trapezoidal, Simpson's rules (1/3 & 3/8)and Weddle rules.

Unit 4:Numerical solution of Ordinary Differential Equation

Taylor series method, Picard's method, Euler's method, Modified Euler's method, Runge Kutta methods fourth order. Multistep methods: Milne's Predictor corrector method, Numerical solution of the simultaneous linear differential equation, Second order differential equation.

Unit 5: Finite Difference Methods

Classification of partial differential equation, Finite difference method, Numerical solution of Partial Differential equations, five-point formula, Laplace and Poisson equation.

Course Outcomes

After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Identify the concepts Algebraic & Transcendental Equations
CO2	Acquire the knowledge of finite difference
CO3	Describe numerical integration and differentiation
CO4	Illustrate the problems of ordinary differential equation
CO5	Analyze the Partial differential equations

Recommended Books:

1. E. Kreyszig: Advance Engineering Mathematics, John Wiley & Sons, 10th Edition (2011).
2. R. K. Jain, S. R. K. Iyengar: Advance Engineering Mathematics, Narosa Publishing House Pvt. Ltd., 5th Edition, 2016.
3. B. S. Grewal: Higher Engineering Mathematics, Khanna Publisher, 43rd Edition, 2015.
4. B.V. Ramanna: Higher Engineering Mathematics, McGraw Hill,1st Edition, 2017.
5. S.S. Sastry: Introductory Methods of Numerical Analysis, PHI Learning Private Limited, 4th edition, 2007.
6. J. H. Mathews and K. D. Fink: Numerical Methods using MATLAB, PHI, 4th edition, 2007.
7. C.F. Gerald and P.O. Wheatley: Applied Numerical Analysis, Pearson Education, 6th edition, 2006.
8. H. K. Dass: Advance Engineering Mathematics, S. Chand& Company, Publisher, 2018.