**Department of Engineering Mathematics and Computing**

**Faculty Details**

Name of the Faculty: **Utkarsh Sharma**
Designation: Assistant Professor
Department: Computer Science and Business Systems

**Course Details**

**Name of the Program**: B.Tech. in Mathematics & Computing, July-Dec. 2024
**Branch**: Mathematics & Computing
**Semeste**r: Third Year (Fifth Semester)
**Title of the Subject**: Computer Networks **Subject Code**: 2250521
**Number of Students**: 78
**Recommended Books:**

R1. Behrouz A Forouzan: Data Communication and Networking, 4th edition.
R2. Peterson and Davie's "Computer Networks", 5th edition
R3: Tanenbaum A. S., "Computer Network",

**LECTURE PLAN (2250521)**

| S. No. | Content to be covered | COs | Blooms Level (BL) | % coverage | Book(s) followed |
|---|---|---|---|---|---|
| | **Unit-1: Computer Network** | | | | |
| 1 | Introduction to computer networks & their uses, | 1 | 1 | 2.63% | R1 |
| 2 | Different topologies | 1 | 1 | 2.63% | R1 |
| 3 | OSI Layered Architecture, Peer-to-Peer processes and encapsulation, Function and Services | 1 | 1 | 2.63% | R1 |
| 4 | The Physical layer: Digital Signals, Transmission Impairments and Maximum data rate of a channel | 1 | 1,2,3 | 2.63% | R1 |
| 5 | Shennons theorem, Nyquist theorem, | 1 | 1, 2,3 | 2.63% | R1 |
| 6 | Transmission media | 1 | 1,2 | 2.63% | R1 |
| 7 | Circuit, Packet and Message switching, virtual Circuit | 1 | 3, 4 | 2.63% | R1 |
| 8 | Introduction to ISDN & its components | 1 | 1, 2 | 2.63% | R1 |
| | **Unit 2: The data link layer** | | | | |
| 9 | Design issues & function, | 2 | 1,2 | 2.63% | R1 |
| 10 | Error detection & correction, Forward error correction Versus Retransmission | 2 | 2, 3, 4 | 2.63% | R1, R2 |
| 11 | Hamming code & CRC codes | 2 | 2,3 | 2.63% | R1, R2 |
| 12 | Framing, Bit stuffing and Byte stuffing | 2 | 2,3 | 2.63% | R1, R2 |
| 13 | Data link layer protocols | 2 | 1, 2,3 | 2.63% | R1 |
| 14 | The medium access sublayer | 2 | 1, 2 | 2.63% | R1 |
| 15 | Protocols: ALOHA, CSMA, Collision Free Protocol | 2 | 1, 2 | 2.63% | R1 |
| | **Unit 3: IEEE Standards** | | | | |
| 16 | IEEE 802 standards for LANs | 3 | 1,2 | 2.63% | R1, R3 |
| 17 | LAN Devices: HUB, Switches | 3 | 1, 3 | 2.63% | R1, R3 |

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|---|---|---|---|---|---|
| 18 | Bridges: IEEE 802.x to IEEE 802.y, | 3 | 1,2 | 2.63% | R1, R3 |
| 19 | Spanning Tree, Remote Bridge | 3 | 1, 2 | 2.63% | R1, R3 |
| 20 | Internetworking Devices: Routers & gateways | 3 | 1, 2, 3 | 2.63% | R2, R3 |
| 21 | The network layer | 3 | 1, 2 | 2.63% | R2, R3 |
| 22 | Internal organization | 3 | 1, 2 | 2.63% | R2, R3 |
| | **Unit 4: Rooting Algorithms** | | | | |
| 23 | Shortest path routing, Flooding | 4 | 1, 2, 3 | 2.63% | R2, R3 |
| 24 | LSR, Distance Vector Routing | 4 | 1,2, 3 | 2.63% | R2, R3 |
| 25 | Hierarchical Routing | 4 | 1,2 | 2.63% | R2, R3 |
| 26 | Introduction to TCP/IP Protocol | 4 | 1 | 2.63% | R2, R3 |
| 27 | ARP, RARP | 4 | 2, 3, 4 | 2.63% | R2, R3 |
| 28 | IP Datagram with options | 4 | 1,2 | 2.6% | R2, R3 |
| 29 | ICMP | 4 | 1, 2 | 2.63% | R2, R3 |
| | **Unit 5: Subnet** | | | | |
| 30 | Subnet, Supernet | 5 | 1,2 | 2.63% | R1 |
| 34 | CIDR Transport Layer: Congestion control | 5 | 1,2 | 2.63% | R1 |
| 35 | Load Shedding, Jitter control | 5 | 2,3 | 2.63 % | R1 |
| 36 | Addressing and Multiplexing | 5 | 2,3 | 2.63% | R1 |
| 37 | Connection establishment and connection release, Flow control | 5 | 1,2 | 2.63% | R1 |
| 38 | Application layer: Introduction to DNS and Email. | 5 | 1,2 | 2.63% | R1 |

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# Modes of Teaching

**Subject:** Computer Network (2250521)-Fifth Semester
**Name of the Program**: B. Tech. in Mathematics & Computing, **July-Dec. 2024**

| UNIT | CONTENT | MODE |
|---|---|---|
| Unit-1 | Introduction to computer networks & their uses, | Offline / Black Board Teaching |
| | Different topologies | Offline / Black Board Teaching |
| | OSI Layered Architecture, Peer-to-Peer processes and encapsulation, Function and Services | Offline / Black Board Teaching |
| | The Physical layer: Digital Signals, Transmission Impairments and Maximum data rate of a channel, | Offline / Black Board Teaching |
| | Shennons theorem, Nyquist theorem, | Offline & activity based learning |
| | Transmission media | Offline & activity based learning |
| | Circuit, Packet and Message switching, virtual Circuit | Teaching through video lecture |
| | Introduction to ISDN & its components | Group based Learning |
| Unit-2 | Design issues & function, | Offline / Black Board Teaching |
| | Error detection & correction, Forward error correction Versus Retransmission | Teaching through video lecture |
| | Hamming code & CRC codes | Offline / Black Board Teaching |
| | Framing, Bit stuffing and Byte stuffing | Activity & Project based learning |
| | Data link layer protocols | Offline / activity based learning |
| | The medium access sublayer | Teaching through demonstration |
| | Protocols: ALOHA, CSMA, Collision Free Protocol | Offline / Black Board Teaching |
| Unit-3 | IEEE 802 standards for LANs | Offline / Black Board Teaching |
| | LAN Devices: HUB, Switches | Group based Learning |
| | Bridges: IEEE 802.x to IEEE 802.y, | Offline / Black Board Teaching |
| | Spanning Tree, Remote Bridge | Group based Learning |
| | Internetworking Devices: Routers & gateways | Teaching through demonstration |
| | The network layer | Offline / Black Board Teaching |
| | Internal organization | Offline / Black Board Teaching |
| Unit-4 | Shortest path routing, Flooding | Offline / activity based learning |
| | LSR, Distance Vector Routing | Offline / activity based learning |
| | Hierarchical Routing | Offline / activity based learning |
| | Introduction to TCP/IP Protocol | Offline / Black Board Teaching |
| | ARP, RARP | Group based Learning |

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| | | |
|---|---|---|
| | IP Datagram with options | Offline / Black Board Teaching |
| | ICMP | Group based Learning |
| **Unit-5** | Subnet, Supernet | Offline / Black Board Teaching |
| | CIDR Transport Layer: Congestion control | Group based Learning |
| | Load Shedding, Jitter control | Group based Learning |
| | Addressing and Multiplexing | Activity & Project based learning |
| | Connection establishment and connection release, Flow control | Teaching through video lecture |
| | Application layer: Introduction to DNS and Email. | Offline / Black Board Teaching |

| Online | Offline | | | | | | |
|---|---|---|---|---|---|---|---|
| | Black Board Teaching | Group based Learning | Learning through projects | Learning through demonstration | Learning through experimentation | Activity based Learning | Onsite/field based learning |
| 7.89% | 39.47% | 18.42% | 5.26% | 5.26% | - | 21.05% | - |

Utkarsh Sharma
Assistant Professor
Department of CSBS
MITS, Gwalior

**Department of Engineering Mathematics and Computing**

**Faculty Details**

Name of the Faculty: **Dr. Divya Chaturvedi**
Designation: Assistant Professor
Department: Engineering Mathematics & Computing

**Course Details**

**Name of the Program**: B.Tech. in Mathematics & Computing, July-Dec. 2024
**Branch**: Mathematics & Computing
**Semester**: Third Year (Fifth Semester)
**Title of the Subject**: Real and Complex Analysis **Subject Code**: 2250522
**Number of Students**: 78

**Guidelines to study the subject:**

1. Fundamental knowledge of set theory.
2. Basic knowledge of continuity and differentiation.
3. Basic knowledge of integration
4. Basic knowledge of complex numbers and basic operations with complex numbers.

**Recommended Books:**

**R1** Walter Rudin. Principles of Mathematical Analysis (International Series in Pure and Applied Mathematics). 3rded. McGraw-Hill, 1976.
**R2** S C Malik and Savita Arora, Mathematical Analysis, 4th Edition, New Age International Publishers, 2010.
**R3** S. Ponnusamy, Foundation of Complex Analysis, Narosa Publishing House, 1997.
**R4** J. W. Brown and R. V. Churchill, Complex variables and applications, MC Graw Hill Higher Education, EighthEdition 2009.
**R5** Murray Spiegel, Seymour Lipschutz, John Schiller, Dennis Spellman, Schaum's Outlines: Complex variables, 2nd Edition, McGraw-Hill Education – Europe, 2009

## LECTURE PLAN (2250522)

| S. No. | Date | Content to be covered | COs | Blooms Level (BL) | % coverage (based on the total syllabus) | Book(s) followed |
|---|---|---|---|---|---|---|
| | | **Unit-1: Real System** | | | | |
| 1 | | The set of natural numbers, integers, rational numbers, set of real numbers as a complete Ordered fields, closed, open, semi-open and semi-closed intervals Real system and Real Field | 1 | 1,2 | 2.5% | R1, R2 |
| 2 | | Set bounded above and below, supremum, infimum, order completeness of the set of real numbers, Archimedean property of the real-number system | 1 | 1,2 | 2.5% | R1, R2 |
| 3 | | Cauchy-Schwarz inequality, Finite, Countable, and Uncountable Sets | 1 | 2,3 | 2.5% | R1, R2 |
| 4 | | Neighbourhood of a point, properties of neighbourhood of a point, Interior point | 1 | 1,2,3 | 2.5% | R1, R2 |

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|---|---|---|---|---|---|---|
| 5 | | Limit point, Existence of limit point, Open sets, Closed sets | 1 | 2,3 | 2.5% | R1, R2 |
| 6 | | Cover of a set , compact set and its properties | 1 | 1,2,3 | 2.5% | R1, R2 |
| 7 | | Heine Borel Theorem, Perfect Sets | 1 | 2,3,4 | 2.5% | R1, R2 |
| 8 | | Connected Sets, Bolzano-Weierstrass theorem | 1 | 2,3,4 | 2.5% | R1, R2 |
| | | **Unit 2: Continuity and Differentiability** | | | | |
| 9 | | Limits of Function, Algebra of limits, right hand and left hand limits | 2 | 1,2 | 2.5% | R1, R2 |
| 10 | | Continuous Functions, Discontinuity of a function, Algebra of continuous function | 2 | 1,2,3 | 2.5% | R1, R2 |
| 11 | | Limits at Infinity and infinite limits, Continuity of Derivatives | 2 | 1,2,3 | 2.5% | R1, R2 |
| 12 | | Cauchy Criterion for finite limits, Continuity at point | 2 | 2,3,4 | 2.5% | R1, R2 |
| 13 | | Properties of a continuity of a function at a point, Continuity in an interval | 2 | 2,3, 4 | 2.5% | R1, R2 |
| 14 | | Properties of a function continuous in a closed finite interval, Theorems in Continuity | 2 | 2,3,4 | 2.5% | R1, R2 |
| 15 | | Uniform continuity and examples | 2 | 2,3,4 | 2.5% | R1, R2 |
| 16 | | Theorems on Uniform continuity | 2 | 2,3,4 | 2.5% | R1, R2 |
| | | **Unit 3: Riemann and Riemann-Stieltjes Integral** | | | | |
| 17 | | Definition and existence of the integral | 3 | 1,2 | 2.5% | R1, R2 |
| 18 | | Refinement of Partitions, Darboux theorem | 3 | 1,2,3 | 2.5% | R1, R2 |
| 19 | | Condition of Integrability, Properties of Reimann Integral | 3 | 1,2,3 | 2.5% | R1, R2 |
| 20 | | Reimann Sums, Integrability of continuous | 3 | 2,3 | 2.5% | R1, R2 |
| 21 | | Integrability of monotonic function, Partitions | 3 | 1,2,3 | 2.5% | R1, R2 |
| 22 | | Sufficient and existence conditions for existence of Riemann-Stieltjes integrals, Upper and lower bounds | 3 | 2,3,4 | 2.5% | R1, R2 |
| 23 | | Upper and Lower integrals, fundamental theorems of calculus | 3 | 2,3,4 | 2.5% | R1, R2 |
| 24 | | Mean Value Theorems for Riemann-Stieltjes integrals | 3 | 2,3,4 | 2.5% | R1, R2 |
| | | **Unit 4: Functions of Complex Variables** | | | | |
| 25 | | Functions of Complex Variables, Limits | 4 | 1,2 | 2.5% | R3, R4, R5 |
| 26 | | Continuity and differentiability of functions of a complex variable | 4 | 1,2,3 | 2.5% | R3, R4, R5 |
| 27 | | Analytic functions, necessary condition for function to be analytic | 4 | 1,2,3 | 2.5% | R3, R4, R5 |
| 28 | | sufficient condition for function to be analytic, Cauchy-Reimann equations | 4 | 1,2,3 | 2.5% | R3, R4, R5 |
| 29 | | Harmonic functions, Milne-Thomson method to find conjugate function | 4 | 2,3,4 | 2.5% | R3, R4, R5 |

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|---|---|---|---|---|---|---|
| 30 | | Cauchy-Reimann equations in Polar coordinates, Conformal Mapping | 4 | 1,2,3,4 | 2.5% | R3, R4, R5 |
| 31 | | Conformal Mappings examples, Bilinear Transformation: magnification | 4 | 2,3,4 | 2.5% | R3, R4, R5 |
| 32 | | Bilinear Transformation: rotation, inversion and reflection | 4 | 2,3,4 | 2.5% | R3, R4, R5 |
| | | **Unit 5:** Integration in a complex plane | | | | |
| 33 | | Integration in a complex plane along a contour | 5 | 1,2,3 | 2.5% | R3, R4, R5 |
| 34 | | Integration of regular function | 5 | 1,2,3 | 2.5% | R3, R4, R5 |
| 35 | | Cauchy's theorem, Cauchy's integral formula | 5 | 2,3,4 | 2.5% | R3, R4, R5 |
| 36 | | Examples on Cauchy's integral formula | 5 | 2,3,4 | 2.5% | R3, R4, R5 |
| 37 | | Morera's theorem, Liouville Theorem | 5 | 1,2,3,4 | 2.5% | R3, R4, R5 |
| 38 | | Taylor's and Laurents series | 5 | 1,2,3,4 | 2.5% | R3, R4, R5 |
| 39 | | Isolated and non-isolated singularity, poles | 5 | 2,3,4 | 2.5% | R3, R4, R5 |
| 40 | | Residues, Cauchy's residue theorem and its applications | 5 | 2,3,4 | 2.5% | R3, R4, R5 |
| **TOTAL LECTURES= 40** | | | | | | |

**Department of Engineering Mathematics and Computing**

# Modes of Teaching

**Subject:** Real and Complex Analysis (2250522)-FIFTH Semester

**Name of the Program**: B.Tech. in Mathematics & Computing, **July-Dec. 2024**

| UNIT | CONTENT | MODE |
|---|---|---|
| UNIT-1 | Ordered Sets, Real Field and Archimedean property | Offline mode / Black Board Teaching |
| | Cauchy-Schwarz inequality, finite countable and uncountable set | Offline mode / Black Board Teaching |
| | Compact set and Heine Borel Theorem | Learning through seminar |
| | Perfect Set, Connected Set and Bolzano-Weierstrass Theorem | Offline mode / Black Board Teaching |
| UNIT-2 | Limit of function and continuous function | Offline mode / Black Board Teaching |
| | Continuity and Discontinuity, Limits at infinity, continuity of derivatives | Group based Learning |
| | Cauchy Criterion for finite limits, continuity at point and in an interval, Theorems in continuity | Online mode |
| | Functions continuous on closed interval, Uniform continuity, Theorems on Uniform Continuity | Group based Learning |
| UNIT-3 | Riemann integral existence, Refinement of partition and Darboux Theorem | Offline mode / Black Board Teaching |
| | Condition of integrability, properties of Riemann integral, Riemann Sum | Offline / Black Board Teaching |
| | Integrability of continuous and monotonic function | Offline mode / Black Board Teaching |
| | Sufficient condition for the existence of Riemann Stieltjes integral, upper and lower Riemann integral, Fundamental theorem of Calculus | Learning through seminar |
| | Mean value theorem for Riemann Stieltjes integral | Online mode |
| UNIT-4 | Functions of complex variables, Limits continuity and differentiability of function | Online mode |
| | Analytic function, necessary and sufficient condition for function to be analytic, Harmonic function | Offline / Black Board Teaching |
| | Milne- Thomson method to find conjugate function, Conformal mapping | Learning through seminar |
| | Bilinear Transformation: magnification and rotation, inversion and reflection | Offline / Black Board Teaching |
| UNIT-5 | Integration in a complex plane along a contour, integration of regular functions | Activity based learning |
| | Cauchy theorem and Cauchy integral formula | Offline / Black Board Teaching |

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|---|---|---|
| | Morera's theorem, Liouville theorem, Taylors and Laurents series | Learning through seminar |
| | Isolated and non-isolated singularity, poles | Offline / Black Board Teaching |
| | Residues, Cauchy residue theorem and its applications | Offline / Black Board Teaching |

| Online | Offline | | | | | | |
|---|---|---|---|---|---|---|---|
| | Black Board Teaching | Group based Learning | Learning through Seminar | Learning through demonstration | Learning through experimentation | Activity based Learning | Onsite/field based learning |
| 13.64% | 54.54% | 9.09% | 13.64% | - | - | 9.09% | - |

**Department of Engineering Mathematics and Computing**

**Faculty Details**

Name of the Faculty: Dr. Saumil Maheshwari
Designation: Assistant Professor
Department: CSBS

**Course Details**

**Name of the Program**: B.Tech. in Mathematics & Computing, July-Dec. 2024
**Branch**: Mathematics & Computing
**Semeste**r: Third Year (Fifth Semester)
**Title of the Subject**: Software Engineering **Subject Code**: 2250523
**Number of Students**: 78

**Lecture Plan**

**SUBJECT: SOFTWARE ENGINEERING (2250523)**

| Teaching Session | Date | Content to be covered | COs | Blooms Level (BL) | % Coverage (To be calculated based on the total syllabus) |
|---|---|---|---|---|---|
| 1. | | Introduction to Software Engineering:Definition | 1,4 | BL 1,2,3 | 1% |
| 2. | | Software Engineering-Layered Technology | 1,2 | BL 2,3 | 2% |
| 3. | | Software Characteristics and Component | 1,2 | BL 1,2 | 2% |
| 4. | | Software Model | 1.4 | BL 5,6 | 2% |
| 5. | | Software Development Life Cycle Model(SDLC) | 1,4 | BL 3,4 | 3% |
| 6. | | The Waterfall Model | 2,4 | BL 3,4 | 2% |
| 7. | | Iterative Waterfall Model | 2,4 | BL 3,4 | 2% |
| 8. | | Prototyping Model | 2,4 | BL 3,4 | 2% |
| 9. | | Spiral Model | 2,4 | BL 3,4 | 2% |
| 10. | | RAD Model | 2,4 | BL 3,4 | 2% |
| 11. | | Selection Criteria of Model: Characteristics ofRequirements | 1,4 | BL 3, 5, 6 | 1% |
| 12. | | Status of Development Team | 2,4 | BL 3, 5, 6 | 1% |
| 13. | | Users Participation | 2,4 | BL 3, 5, 6 | 1% |
| 14. | | Type of Project and Associated Risk | 2,4 | BL 3, 5, 6 | 1% |
| 15. | | Requirement Engineering: Definition | 1,5 | BL 1,2 | 1% |
| 16. | | Requirement Engineering Activity | 1,5 | BL 2,3 | 4% |
| 17. | | Types of Requirements | 1,5 | BL 2,3 | 1% |
| 18. | | Functional and Non-Functional Requirements | 1,5 | BL 3,4 | 2% |
| 19. | | User and System Requirements | 1,5 | BL 2,3,4 | 1% |

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|---|---|---|---|---|---|
| 20. | | Requirement Elicitation Methods | 1,5 | BL 2,3 | 2% |
| **21.** | | Requirement Analysis Methods | 2,5 | BL 3,4 | 2% |
| **22.** | | Requirement Documentation (SRS) | 1,2,5 | BL 4,5,6 | 1% |
| **23.** | | Requirement Validation | 1,2 | BL 3,4 | 1% |
| **24.** | | Requirement Management | 1,2 | BL 3,4,5 | 1% |
| **25.** | | Design Fundamentals | 1,2 | BL 1,2 | 2% |
| **26.** | | Design Principles | 1,2,5 | BL 3,4 | 1% |
| **27.** | | Effective Modular Designs | 2,5 | BL 2,3,4 | 2% |
| **28.** | | Design Representations | 2,5 | BL 1,2 | 1% |
| **29.** | | Architectural Design | 2, 5 | BL 3,4 | 2% |
| **30.** | | Procedural Design | 2, 5 | BL 3,4 | 2% |
| **31.** | | Data Directed Design | 2, 5 | BL 3,4 | 2% |
| **32.** | | Real Time Design | 2, 5 | BL 3,4,5 | 2% |
| **33.** | | Object Oriented Design | 2,5 | BL 3,4 | 2% |
| **34.** | | Coupling and Cohesion | 2,5 | BL 4,5 | 2% |
| **35.** | | Software Metrices, Project Management andEstimation | 1,3 | BL 1,2 | 2% |
| **36.** | | Metrics in Process and Project Domains | 1,3 | BL 1,2 | 2% |
| **37.** | | Software Measurement | 1,3 | BL 2,3 | 2% |
| **38.** | | Software Quality Metrices | 1,3 | BL 1,2,3 | 2% |
| **39.** | | Project Management: Basic-People Product,Process, Project | 1,3 | BL 1,2 | 1% |
| **40.** | | Software Project Estimation | 1,3 | BL 3,4 | 2% |
| **41.** | | Decomposition Techniques | 3,5 | BL 2,3 | 1% |
| **42.** | | Function Point Estimation | 3,5 | BL 2,3 | 1% |
| **43.** | | Line of Code (LOC) Based Estimation | 3,5 | BL 2,3 | 2% |
| **44.** | | Empirical Estimation | 3,5 | BL 2,3 | 2% |
| **45.** | | COCOMO Model | 3,4,5 | BL 3,4 | 2% |
| **46.** | | Project Scheduling Techniques | 1,3,5 | BL 3,4 | 2% |
| **47.** | | Software Testing: Definition | 1,6 | BL 1,2 | 1% |
| **48.** | | Software Testing Life Cycle (STLC) | 1,6 | BL 4,5 | 3% |
| **49.** | | Test Case Design | 2,5,6 | BL 5,6 | 2% |
| **50.** | | Strategic Approach to Software Testing- | 1,5,6 | BL 1,2 | 1% |
| **51.** | | Verification and Validation | 1,5,6 | BL 3,4 | 2% |
| **52.** | | Strategic Issues | 6 | BL 1,2 | 1% |
| **53.** | | Criteria for Completion of Testing | 6 | BL 1,2 | 1% |
| **54.** | | Unit Testing | 5,6 | BL 3,4,5 | 1% |
| **55.** | | Integration Testing | 5,6 | BL 3,4,5 | 1% |
| **56.** | | Validation Testing | 5,6 | BL 3,4,5 | 1% |
| **57.** | | System Testing | 5,6 | BL 3,4,5 | 1% |
| **58.** | | Black-Box Testing Techniques | 5,6 | BL 3,4,5 | 2% |
| **59.** | | White-Box Testing Techniques | 5,6 | BL 3,4,5 | 2% |

**Department of Engineering Mathematics and Computing**

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|---|---|---|---|---|---|
| **60.** | | Acceptance Testing | 5,6 | BL 3,4,5 | 2% |

## Modes of Teaching

**SUBJECT: SOFTWARE ENGINEERING (250523)**

| UNIT | CONTENT | MODES |
|---|---|---|
| **Unit-1** | Introduction to Software Engineering: Definition | Black Board Teaching |
| | Software Engineering-Layered Technology | Black Board Teaching |
| | Software Characteristics and Component | Black Board Teaching |
| | Software Model | Black Board Teaching |
| | Software Development Life Cycle Model (SDLC) | Activity based Learning |
| | The Waterfall Model | Learning through demonstration |
| | Iterative Waterfall Model | Learning through demonstration |
| | Prototyping Model | Learning through demonstration |
| | Spiral Model | Learning through demonstration |
| | RAD Model | Learning through demonstration |
| | Selection Criteria of Model: Characteristics ofRequirements | Group based Learning |
| | Status of Development Team | Group based Learning |
| | Users Participation | Group based Learning |
| | Type of Project and Associated Risk | Group based Learning |
| **Unit-2** | Requirement Engineering: Definition | Black Board Teaching |
| | Requirement Engineering Activity | Black Board Teaching |
| | Types of Requirements | Learning through projects |
| | Functional and Non-Functional Requirements | Learning through projects |
| | User and System Requirements | Learning through projects |
| | Requirement Elicitation Methods | Group based Learning |
| | Requirement Analysis Methods | Learning through demonstration |
| | Requirement Documentation (SRS) | Learning through projects |
| | Requirement Validation | Black Board Teaching |
| | Requirement Management | Black Board Teaching |

**Department of Engineering Mathematics and Computing**

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|---|---|---|
| **Unit-3** | Design Fundamentals | Black Board Teaching |
| | Design Principles | Black Board Teaching |
| | Effective Modular Designs | Learning through demonstration |
| | Design Representations | Black Board Teaching |
| | Architectural Design | Learning through experimentation |
| | Procedural Design | Learning through experimentation |
| | Data Directed Design | Learning through experimentation |
| | Real Time Design | Learning through experimentation |
| | Object Oriented Design | Learning through experimentation |
| | Coupling and Cohesion | Learning through demonstration |
| **Unit-4** | Software Metrices, Project Management and Estimation | Activity based Learning |
| | Metrics in Process and Project Domains | Black Board Teaching |
| | Software Measurement | Black Board Teaching |
| | Software Quality Metrices | Black Board Teaching |
| | Project Management: Basics-People Product, Process,Project | Group based Learning |
| | Software Project Estimation | Activity based Learning |
| | Decomposition Techniques | Black Board Teaching |
| | Function Point Estimation | Black Board Teaching |
| | Line of Code (LOC) Based Estimation | Black Board Teaching |
| | Empirical Estimation | Black Board Teaching |
| | COCOMO Model | Black Board Teaching |
| | Project Scheduling Techniques | Black Board Teaching |
| **Unit-5** | Software Testing: Definition | Black Board Teaching |
| | Software Testing Life Cycle (STLC) | Black Board Teaching |
| | Test Case Design | Activity based Learning |
| | Strategic Approach to Software Testing | Learning through experimentation |
| | Verification and Validation | Black Board Teaching |
| | Strategic Issues | Black Board Teaching |
| | Criteria for Completion of Testing | Black Board Teaching |
| | Unit Testing | Learning through demonstration |

**Department of Engineering Mathematics and Computing**

| | | |
|---|---|---|
| | Integration Testing | Learning through demonstration |
| | Validation Testing | Black Board Teaching |
| | System Testing | Black Board Teaching |
| | Black-Box Testing Techniques | Learning through demonstration |
| | White-Box Testing Techniques | Learning through demonstration |
| | Acceptance Testing | Learning through demonstration |

| Online | Offline | | | | | | |
|---|---|---|---|---|---|---|---|
| | Black Board Teaching | Group based Learning | Learning through projects | Learning through demonstration | Learning through experimentation | Activity based Learning | Onsite/field based learning |
| - | 45% | 10% | 6.66% | 21.66% | 10% | 6.66% | - |

Dr. Saumil Maheshwari
Assistant Professor
Department of CSBS
MITS, Gwalior

**Department of Engineering Mathematics and Computing**

**Faculty Details**

Name of the Faculty: **Ms. Manali Singh**
Designation: Assistant professor
Department: Department of Computer Science and Business Systems

**Course Details**

**Name of the Program**: B.Tech. in Mathematics & Computing, July-Dec. 2024
**Branch**: Mathematics & Computing
**Semeste**r: Third Year (Fifth Semester)
**Title of the Subject**: Data Science using Python **Subject Code**: 2250524
**Number of Students**: 78

**Guidelines to study the subject:**

1. Understand syntax, data structures, and practice coding regularly.
2. Focus on NumPy, Pandas, Matplotlib, Seaborn, and Scikit-Learn.
3. Use real-world datasets, build end-to-end projects, and document your work.
4. Join forums, take online courses, collaborate on projects, and participate in hackathons.

**Recommended Books:**

R1. Mastering python for data science, Samir Madhavan
R2. Data Analytics using Python Paperback, Bharti Motwani
R3: Data Analytics Essentials, Bianca Szasz

**LECTURE PLAN (2250524)**

| S. No. | Date | Content to be covered | COs | Blooms Level (BL) | % coverage (based on the total syllabus) | Book(s) followed |
|---|---|---|---|---|---|---|
| | | **Unit-1** | | | | |
| 1 | | Introduction of basics python tool | 1 | 1,2 | 2.5% | R1 |
| 2 | | Setting working Directory | 1 | 1,2 | 2.5% | R1 |
| 3 | | Creating and saving a script file | 1 | 2,3 | 2.5% | R1 |
| 4 | | File execution | 1 | 1,2 | 2.5% | R1 |
| 5 | | Clearing console | 1 | 2,3 | 2.5% | R1 |
| 6 | | Removing variables from environment | 1 | 1,2,3 | 2.5% | R1 |
| 7 | | Clearing environment | 1 | 1,2 | 2.5% | R1 |
| 8 | | Commenting script files | 1 | 1,2,3 | 2.5% | R1 |
| 9 | | Variable creation | 1 | 1,2 | 2.5% | R1 |
| 10 | | Arithmetic and logical operators | 1 | 1,2 | 2.5% | R1 |
| 11 | | Data types and associated operations | 1 | 1,2 | 2.5% | R1 |

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| | | | | | | |
|---|---|---|---|---|---|---|
| | | **Unit 2** | | | | |
| 12 | | Sequence data types and associated operations Strings | 2 | 1,2 | 2.5% | R1 |
| 13 | | Lists | 2 | 1,2 | 2.5% | R1 |
| 14 | | Arrays | 2 | 1,2 | 2.5% | R1 |
| 15 | | Tuples | 2 | 1,2 | 2.5% | R1 |
| 16 | | Dictionary | 2 | 1,2 | 2.5% | R1 |
| 17 | | Sets | 2 | 1,2 | 2.5% | R1 |
| 18 | | Range | 2 | 1,2 | 2.5% | R1 |
| 19 | | NumPy | 2 | 1,2 | 2.5% | R1 |
| 20 | | Array | 2 | 1,2 | 2.5% | R1 |
| | | **Unit 3** | | | | |
| 21 | | Pandas data frame and data frame related operations on different dataset | 3 | 1,2 | 2.5% | R2, R3 |
| 22 | | Reading files | 3 | 1,2 | 2.5% | R2, R3 |
| 23 | | Exploratory data analysis | 3 | 1,2,3 | 2.5% | R2, R3 |
| 24 | | Data preparation and preprocessing | 3 | 2,3 | 2.5% | R2, R3 |
| | | **Unit 4** | | | | |
| 25 | | Linear regression | 4 | 1,2 | 2.5% | R2, R3 |
| 26 | | Logistic regression | 4 | 1,2 | 2.5% | R2, R3 |
| 27 | | Decision tree | 4 | 1,2 | 2.5% | R2, R3 |
| 28 | | Tree creation with entropy and information gain | 4 | 1,2 | 2.5% | R2, R3 |
| 29 | | IDE3 algorithm | 4 | 2,3 | 2.5% | R2, R3 |
| 30 | | Random forest | 4 | 1,2,3 | 2.5% | R2, R3 |
| 31 | | Naïve bayes theorem | 4 | 2,3,4 | 2.5% | R2, R3 |
| 32 | | K-nearest neighbor and different ensemble methods for solving real world problems | 4 | 1,2,3 | 2.5% | R2, R3 |
| | | **Unit 5** | | | | |
| 33 | | Data visualization on different dataset using mat plotlib and sea born libraries | 5 | 1,2 | 2.5% | R3 |
| 34 | | Scatter plot | 5 | 1,2 | 2.5% | R3 |
| 35 | | Line plot | 5 | 1,2 | 2.5% | R3 |
| 36 | | Bar plot | 5 | 1,2 | 2.5% | R3 |
| 37 | | Histogram | 5 | 1,2 | 2.5% | R3 |
| 38 | | Box plot | 5 | 1,2 | 2.5% | R3 |
| 39 | | Pair plot | 5 | 1,2 | 2.5% | R3 |
| 40 | | Control structures using different dataset | 5 | 1,2 | 2.5% | R3 |
| 41 | | if-else family | 5 | 1,2 | 2.5% | R3 |
| 42 | | for loop | 5 | 1,2 | 2.5% | R3 |
| 43 | | for loop with if breaks | 5 | 1,2 | 2.5% | R3 |
| 44 | | while loop | 5 | 1,2 | 2.5% | R3 |
| 45 | | Functions | 5 | 1,2 | 2.5% | R3 |
| **TOTAL LECTURES= 45** | | | | | | |

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# Modes of Teaching

**Subject:** Data Science using Python (2250524)-Fifth Semester
**Name of the Program**: B.Tech. in Mathematics & Computing, **July-Dec. 2024**

| UNIT | CONTENT | MODE |
|---|---|---|
| Unit-1 | Introduction of basics python tool | Offline / Black Board Teaching |
| | Setting working Directory | Offline & Open discussions |
| | Creating and saving a script file | Offline / Black Board Teaching |
| | File execution | Offline / Black Board Teaching |
| | Clearing console | Offline / Black Board Teaching |
| | Removing variables from environment | Offline & activity-based learning |
| | Clearing environment | Offline / Black Board Teaching |
| | Commenting script files | Offline / Black Board Teaching |
| | Variable creation | Teaching through video lecture |
| | Arithmetic and logical operators | Offline / Black Board Teaching |
| Unit-2 | Sequence data types and associated operations Strings | Offline / Black Board Teaching |
| | Lists | Offline / Black Board Teaching |
| | Arrays | Offline / Black Board Teaching |
| | Tuples | Offline / Black Board Teaching |
| | Dictionary | Offline & activity-based learning |
| | Sets | Offline / Black Board Teaching |
| | Range | Offline / Black Board Teaching |
| | NumPy | Offline / Black Board Teaching |
| | Array | Offline & activity-based learning |
| Unit-3 | Pandas data frame and data frame related operations on different dataset | Offline / Black Board Teaching |
| | Reading files | Offline & activity-based learning |
| | Exploratory data analysis | Offline / Black Board Teaching |
| | Data preparation and preprocessing | Group based Learning |
| Unit-4 | Linear regression | Offline & activity-based learning |
| | Logistic regression | Offline / Black Board Teaching |
| | Decision tree | Learning through demonstration |
| | Tree creation with entropy and information gain | Offline / Black Board Teaching |

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| | | |
|---|---|---|
| | IDE3 algorithm | Offline / Black Board Teaching |
| | Random forest | Activity based Learning |
| | Naïve bayes theorem | Offline / Black Board Teaching |
| | K-nearest neighbor and different ensemble methods for solving real world problems | Teaching through demonstration by students |
| **Unit-5** | Data visualization on different dataset using mat plotlib and sea born libraries | Offline / Black Board Teaching |
| | Scatter plot | Group based Learning |
| | Line plot | Offline / Black Board Teaching |
| | Bar plot | Offline / Black Board Teaching |
| | Histogram | Offline / Black Board Teaching |
| | Box plot | Offline / Black Board Teaching |
| | Pair plot | Offline / Black Board Teaching |
| | Control structures using different dataset | Offline / Black Board Teaching |
| | if-else family | Offline & activity-based learning |
| | for loop | Teaching through video lecture |
| | for loop with if breaks | Offline / Black Board Teaching |
| | while loop | Teaching through demonstration by students |
| | Functions | Offline / Black Board Teaching |

| Online | Offline | | | | | | |
|---|---|---|---|---|---|---|---|
| | Black Board Teaching | Group based Learning | Learning through projects | Learning through demonstration | Learning through experimentation | Activity based Learning | Onsite/field-based learning |
| - | 62.22% | 4.44% | - | 2.22% | - | 15.55% | - |

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CSBS Dept.

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**LECTURE PLAN**

**Name of Course with Code:** Optimization Techniques (2250525)

**Class: 3rd Year 1st Sem (MAC)** **Session:July-December2024**

| Session | Date | Content to be covered | COs | BL | % Coverage |
|---|---|---|---|---|---|
| 1. | | Linear Programming Problem (LPP): Historical development, models and modeling | CO1 | 1 | 1.5 |
| 2. | | Classification, general methods for solving OR models | CO1 | 1 | 1.5 |
| 3. | | Formulation of LPP, Graphical method | CO1 | 2,3 | 2.0 |
| 4. | | Simplex method | CO1 | 3,4 | 2.5 |
| 5. | | Duality theory in linear programming and applications | CO1 | 2,3 | 2.6 |
| 6. | | Assignment problems | CO1 | 3,4 | 2.5 |
| 7. | | Transportation problem for BFS | CO2 | 2,3 | 2.6 |
| 8. | | Optimal solution of Transportation problem | CO2 | 3 | 2.4 |
| 9. | | Introduction of NLPP, | CO2 | 2 | 2.7 |
| 10. | | Unconstraints problems of maxima and minima | CO2 | 1,2 | 2.5 |
| 11. | | constraints problems of maxima and minima | CO2 | 2,3 | 2.5 |
| 12. | | constraints in the form of equations (Lagrangian method), | CO2 | 3,4 | 2.6 |
| 13. | | Hassian Matrix | CO2 | 1,2 | 2.6 |
| 14. | | constraints in the form of inequalities | CO2 | 3 | 2.5 |
| 15. | | Dynamic Programming: Basic concepts | CO2 | 4,5 | 2.6 |
| 16. | | Bellman's optimality principle | CO2 | 3 | 2.6 |
| 17. | | dynamic programming approach in decision making problems | CO2 | 2,3 | 2.6 |
| 18. | | optimal subdivision problems | CO2 | 3,4 | 2.7 |
| 19. | | Introduction of queueing model | CO3 | 1,2 | 2.5 |
| 20. | | Basic of queueing process | CO3 | 1,2 | 2.6 |
| 21. | | state of the system, Poisson process | CO3 | 2,3 | 2.7 |
| 22. | | Inter arrival time | CO3 | 3 | 2.8 |
| 23. | | Some distribution, Classification of queueing models | CO3 | 2,3 | 2.8 |
| 24. | | (M/M/1): (∞/FCFS) model and it s problem | CO3 | 3,4 | 2.7 |
| 25. | | (M/M/1): (N/FCFS ) model and it s problem | CO3 | 4,5 | 2.6 |
| 26. | | (M//M/S): (∞/FCFS) model and it s problem | CO3 | 4,5 | 2.5 |
| 27. | | Introduction to game theory, competitive games | CO4 | 1,2 | 2.5 |
| 28. | | finite and infinite games, two persons zero sum game, pure and mixed strategies | CO4 | 2,3 | 2.6 |
| 29. | | saddle point, maxmin and minimax principle | CO4 | 1,2 | 2.4 |
| 30. | | solution of a rectangular game in terms of mixed strategies | CO4 | 2,3 | 2.4 |
| 31. | | Dominance rule | CO4 | 3,4 | 2.7 |

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| | | | | | |
|---|---|---|---|---|---|
| 32. | | Graphical method of (2xm) games | CO4 | 3,4 | 2.5 |
| 33. | | Graphical method of (nx2) games | CO4 | 3,4 | 2.6 |
| 34. | | Introduction to inventory problems, | CO5 | 1,2 | 2.4 |
| 35. | | Basic Characteristic of Inventory models | CO5 | 2,3 | 2.5 |
| 36. | | Basic of Deterministic models | CO5 | 2,3 | 2.6 |
| 37. | | Classical EOQ (Economic Order Quantity) models | CO5 | 2,3 | 2.4 |
| 38. | | Inventory models with deterministic demand (No shortage and shortage allowed), | CO5 | 4,5 | 2.6 |
| 39. | | Multi item deterministic models, Price break models | CO5 | 4,5 | 2.6 |
| 40. | | Inventory models with probabilistic demand | CO5 | 4,5 | 2.5 |

BLOOMS LEVEL

1. REMEMBER, 2.UNDERSTAND, 3.APPLY, 4.ANALYSE, 5.EVALUATE, 6.CREATE

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## Modes of Teaching Subject: Optimization Techniques (2250525)

| UNIT | CONTENT | MODE |
|---|---|---|
| Unit-1 | Linear Programming Problem (LPP): Historical development, models and modeling | Offline/Black Board Teaching |
| | Classification, general methods for solving OR models | Offline/Black Board Teaching |
| | Formulation of LPP, Graphical method | Learning through Demonstration |
| | Simplex method | Offline/Black Board Teaching |
| | Duality theory in linear programming and applications | Offline/Black Board Teaching |
| | Transportation and Assignment problems | Offline/Black Board Teaching |
| Unit-2 | Introduction of NLPP, constraints problems of maxima and minima, | Learning through demonstration |
| | Constraints in the form of equations (Lagrangian method) | Offline/BlackBoardTeaching |
| | Constraints in the form of inequalities | Offline/BlackBoardTeaching |
| | Dynamic Programming: Basic concepts, Bellman's optimality principle | Offline/Black Board Teaching |
| | Dynamic programming approach in decision making problems | Offline/Black Board Teaching |
| | Optimal subdivision problems | Offline/Black Board Teaching |
| Unit-3 | Introduction of queueing model, basic of queueing process | Offline/Black Board Teaching |
| | State of the system, Poisson process | Offline/BlackBoardTeaching |
| | Some distribution, Inter arrival time, | Offline/BlackBoardTeaching |
| | Classification of queueing models, | Learning through demonstration |
| | (M/M/1): (∞/FCFS), (M/M/1): (∞/FCFS ), (M//M/S): (∞/FCFS) | Offline/Black Board Teaching |
| Unit-4 | Introduction to game theory | Offline/Black Board Teaching |
| | Competitive games, finite and infinite games | Offline/BlackBoardTeaching |
| | Two persons zero sum game, pure and mixed strategies, saddle point, maxmin and minimax principle | Offline/Black Board Teaching |
| | Solution of a rectangular game in terms of mixed strategies | Offline/BlackBoardTeaching |
| | Graphical method of (2xm) and (nx2) games | Learning through demonstration |
| Unit-5 | Introduction to inventory problems | Offline/Black Board Teaching |
| | Deterministic models, classical EOQ (Economic Order Quantity) models | Offline/BlackBoardTeaching |
| | Inventory models with deterministic demand (No shortage and shortage allowed) | Offline/BlackBoardTeaching |

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| | | |
|---|---|---|
| | Multi item deterministic models, Price break models | Offline/Black Board Teaching |
| | Inventory models with probabilistic demand | Offline/Black Board Teaching |

| Online | Offline | | | | | | |
|---|---|---|---|---|---|---|---|
| | BlackBoard Teaching | Group based Learning | Learning through projects | Learning through demonstration | Learning through experimentation | Activity based Learning | Onsite/field based learning |
| - | 90.00% | - | 8.00% | 2.00% | - | - | - |