Annexure- IV

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	Understand 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.

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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	Understand 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	Understand 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

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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.

Department of Engineering Mathematics and Computing

B. Tech. (Fifth Semester)

DATA SCIENCE USING PYTHON

(MAC-250504)

L	T	P	C
2	0	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: Understand 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.

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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