Shri Rawatpura Sarkar University, Raipur

Examination Scheme & Syllabus

for

Master of Technology in

(Computer Science & Engineering)

Specialization

Networking and Internet Security

Semester - I

(Effective from the session: 2021-22)

Department of Computer Science & Engineering

Faculty of Engineering,
Shri Rawatpura Sarkar University, Raipur

Master of Technology (Network and Internet Security)

Semester-I

Examination Scheme

(Effective from the session: 2021-22)

S.N	Course Code	Th/Pr	Subject	Type of Course	Teaching hr. per week			TC	Examination Scheme				Total Marks
									Theory		Practical		
					L	T	P		EX	IN	EX	IN	
1	**EMT07101**	Th	Mathematical Foundations of Computer Science	Core	4	-	-	4	70	30	-	-	100
2	**EMT07102**	Th	Research Methodology for Engineers	Core	4	-	-	4	70	30	-	-	100
3	**EMT07103**	Th	Computer Architecture	Core	4	-	-	4	70	30	-	-	100
4	**EMT07104**	Th	Advance Data Structures and Analysis of Algorithms	Core	4	-	-	4	70	30	-	-	100
5	**EMT07105**	Th	Social Network Analysis and Mining	Core	4	-	-	4	70	30	-	-	100
6	**EMT07191**	Pr	Advanced Network Management Lab	Core	-	-	4	2	-	-	35	15	50
7	**EMT07192**	Pr	Advance Data Structures and Analysis of Algorithms Lab	Core	-	-	4	2	-	-	35	15	50
	Total Contact hr. per week: 26			**Total Credit: 24**					**Grand Total Marks:**				**600**

Master of Technology (Network and Internet Security)
Semester-I
2021-22

<table>
<tr><td>Course Title</td><td colspan="5">MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE</td></tr>
<tr><td>Course Code</td><td colspan="5">EMT07101</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>4</td><td>-</td><td>-</td><td>4</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Students are exposed to the concepts of Formal languages and Automata theory.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• Students are to be motivated to address the challenge of the relevance of Inference Theory to Engineering problems, Algebraic Theory to Computer Science problems.
• Students will have an understanding of the Discrete Mathematical concepts and develop problem solving skills like solving recurrence relations using generating functions.</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT – I
FUNDAMENTAL STRUCTURES: Set theory: - Relationships between sets - Operations on sets - Set identities - Principle of inclusion and exclusion – Min sets Relations – Binary relations - Partial orderings - Equivalence relations. Functions: Properties of functions - Composition of functions – Inverse functions - Permutation functions.
UNIT - II
LOGIC: Prepositional, logic – Logical connectives – Truth tables – Normal forms (conjunctive and disjunctive) - Predicate logic - Universal and existential quantifiers - Proof techniques – Direct and indirect – Proof by contradiction – Mathematical Induction.
UNIT - III
COMBINATORICS: Basics of counting – Counting arguments – Pigeonhole principle – Permutations and Combinations - Recursion and Recurrence relations – Generating functions.
UNIT - IV
ALGEBRAIC STRUCTURES :Introduction- Properties of an algebraic systems –Morphisms – Semi-groups – Monoids – Sub semi-groups and Submonoids – Groups-Order of a group – Order of an element-Permutation groups-Subgroups –Cyclic groups.
UNIT - V
MORPHISMS ON ALGEBRAIC STRUCTURES: orphisms of groups – Kernel of homomorphism - Cosets and Lagrange’s theorem – Normal sub groups – Rings and Fields.</td></tr>
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Master of Technology (Network and Internet Security)
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Course Outcomes	Students who complete this course will be able to apply the concepts of set theory, logic, combinatory, groups and finite state machines in their courses.
Text Books	1. Judith L.Gersting, "Mathematical Structures for Computer Science", 5th Edition, W.H. Freeman and Company, NY, 2003. 2. J.P. Tremblay and R. Manohar, "Discrete Mathematical Structures withApplications to Computer Science", Tata McGraw Hill, 1997.
Reference Books	1. Rosen K.H., "Discrete Mathematics and its Applications", 5th Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2003. 2. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, "Introduction to Automata Theory, Languages, and Computation", 3rd Edition, Pearson/Addison Wesley, 2007.

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Semester-I
2021-22

Course Title	**RESEARCH METHODOLOGY FOR ENGINEERS**				
Course Code	**EMT07102**				
Course Credits	**L**	**T**	**P**	**TC**	
	4	**-**	**-**	**4**	
Prerequisites	To discuss clearly the approaches for research through some case studies.				
Course Objectives	• To make the students well versed in Data analysis. • To describe the steps involved in research process. • To explain how to formalize research problems.				
Course Contents	**UNIT - I** RESEARCH PROBLEM: The research problem – Sources of research problem – Information, how to deal with it – Criteria / characteristics of a good research problem – Errors in selecting a good research problem – Types of research – Nature and use of arguments. **UNIT - II** SAMPLING DESIGN AND SCALING TECHNIQUES: Census and Sample survey – Steps in Sampling Design – Different types of Sample Designs – Complex Random Sampling Designs – Measurement scales – Techniques of Developing Measurement Tools – Scaling – Important Scaling Techniques. **UNIT - III** METHODS OF DATA COLLECTION AND ANALYSIS OF DATA: Collection of Primary Data – different types – Some other methods of Data Collection – Collection of Secondary Data – Processing Operations – Types of Analysis – Measures of Central tendency – Measures of Dispersion. **UNIT - IV** LINEAR PROGRAMMING: Basic of Operations Research(OR): Characteristics of Operations Research – OR and Decision making- Linear programming – Stimulation and Graphical solution of canonical and standard forms of Linear programming problem – Algebraic solution – Simplex method – Charne's method of penalties – Concept of duality – Properties of duality. **UNIT - V** TRANSPORTATION AND ASSIGNMENT MODELS: Transportation Problem – Assignment Problem – Travelling Salesman Problem.				
Course Outcomes	• Students who complete this course will be able to identify the research problem and become capable of analyzing the data using mathematical techniques. • Learn to apply the probability concepts in research and complete simple				

	problems on apply linear programming and transportation models.
Text Books	1. Kothari, C.R., "Research Methodology: Methods and Techniques", 2nd Edition, New Age International, New Delhi, 2012. 2. Nicholas Walliman, "Your Research Project", 2nd Edition, VistaarPublication, New Delhi, 2005.
References Books	1. Taha H.A., "Operations Research: An Introduction", 7th Edition, PearsonEducation Edition, Asia, New Delhi, 2002. 2. Richard A. Johnson, "Miller and Freund's Probability and Statistics for Engineers", 8th Edition, Pearson, Education, Asia, 2011.

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<table>
<tr><td>Course Title</td><td colspan="5">COMPUTER ARCHITECTURE</td></tr>
<tr><td>Course Code</td><td colspan="5">EMT07103</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>4</td><td>-</td><td>-</td><td>4</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">To understand the various parameters that contribute to the performance of a computer system and the technology of achieving the best performance through these parameters.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• To acquire essential knowledge to measure or predict system performance.
• To understand the approaches in designing a new system through instruction level parallel processing to improve the performance, meeting the functionality.
• To understand how the memory hierarchy and optimization contribute to the performance of the system.</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT – I
FUNDAMENTALS OF COMPUTER DESIGN :Measuring and reporting performance - Quantitative principles of computer design - Classifying instruction set architecture - Memory addressing - Addressing modes - Type and size of operands - Operations in the instruction set - Operands and operations for media and signal processing – Instructions for control flow - Encoding an instruction set - Example architecture – MIPS and TM32.
UNIT – II
INSTRUCTION LEVEL PARALLELISM-HARDWARE APPROACHES: Pipelining and hazards - Concepts of ILP - Dynamic scheduling – Dynamic hardware prediction - Multiple issues - Hardware based speculation – Limitations of ILP - Case studies: lP6 Micro architecture.
UNIT – III
INSTRUCTION LEVEL PARALLELISM-SOFTWARE APPROACHES: Compiler techniques for exposing ILP - Static branch prediction - Static multiple issues: VLIW - Advanced compiler support -Hardware Vs Software speculation - Case study - IA 64 and Itanium processor.
UNIT – IV
MEMORY HIERARCHY DESIGN: Memory Hierarchy - Cache performance Reducing cache miss penalty and miss rate - Reducing hit time - Main memory and performance – Memory technology-Virtual memory and Virtual Machine and protection.
UNIT – V
MULTIPROCESSORS MULTI-CORE PROCESSORS: Symmetric and</td></tr>
</table>

	distributed shared memory architectures - Performance issues - Synchronization - Models of memory consistency. Trends in processor design Need for multi-core processor-difference between multiprocessor and multi core processor-Thread level processing- Simultaneous multithreading – Memory Hierarchy and Cache Coherency in multi-core processor.
Course Outcomes	• Students who complete this course will be able to suggest methods of organization of various components of a computer system and instruction set, to meet the functional requirement and to contribute to performance. • Test the performance of a computer system and exploit instruction level parallel processing through software and improve the performance of the system. • Optimize the Memory Hierarchy and protection of memory and Compare multi-processing and multi-core processing to optimize cost performance.
Text Books	1. John L. Hennessey and David A. Patterson," Computer Architecture: A Quantitative Approach", 4thEdition, Morgan Kaufmann / Elsevier, 2007. 2. D.Sima, T. Fountain and P. Kacsuk, "Advanced Computer Architectures: and A Design Space Approach", Addison Wesley, 2000.
Reference Books	1. Kai Hwang, "Advanced Computer Architecture Parallelism Scalability Programmability", Tata McGraw Hill, 2001. 2. Vincent P. Heuring and Harry F. Jordan, "Computer System Design and Architecture", 2nd Edition, Addison Wesley, 2004.

Master of Technology (Network and Internet Security)
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2021-22

<table>
<tr><td>Course Title</td><td colspan="5">ADVANCE DATA STRUCTURES AND ANALYSIS OF ALGORITHMS</td></tr>
<tr><td>Course Code</td><td colspan="5">EMT07104</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>4</td><td>-</td><td>-</td><td>4</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">To develop proficiency in the specification, representation, and implementation of Data Types and Data Structures.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• To carry out the Analysis Time and Space Complexity in different algorithms.
• To explain the applications of Data Structures for various scenarios.
• To relate data structures and algorithms with advanced computer science topics.</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT - I
INTRODUCTION :The Need for Data Structures - Costs and Benefits - Abstract Data Types and Data Structures - Mathematical Preliminaries - Sets and Relations -Miscellaneous Notation - Logarithms -Summations and Recurrences -Recursion - Mathematical Proof Techniques - Direct Proof - Proof by Contradiction - Proof by Mathematical Induction – Algorithm Analysis – Best, Worst, and Average Cases - Asymptotic Analysis - Upper Bounds – Lower Bounds - Notation - Calculating the Running Time for a Program – Analyzing Problems - Empirical Analysis.
UNIT - II
ELEMENTARY DATA STRUCTURES: List – Stacks – Queues – Binary Trees – Binary Search Trees – Huffman Coding Trees – Non – Binary Trees.
UNIT - III
SORTING AND SEARCHING: Internal Sorting Techniques – Heap Sort – Quick sort – Merge Sort – Bin Sort and Radix Sort – Multi Way Merging - Time complexity Analysis of Sorting Techniques – Searching Unsorted and Sorted Arrays – Self – Organizing Lists – Hashing.
UNIT - IV
ADVANCED DATA STRUCTURES: Elementary Graph Algorithms – Minimum Spanning Tree – Single Source Shortest Path – All-Pairs shortest Path – Balanced Trees – AVL Trees- Red- Black Trees – Splay Trees – B-Trees – 1-2-3 Trees.
UNIT - V
ALGORITHMIC TECHNIQUES: Dynamic Programming – Greedy Algorithms – Number-Theoretic Algorithms – String Matching algorithms. Reductions - Hard Problems - The Theory of NP -Completeness – NP - Completeness Proofs - Coping with NP -Complete Problems – Impossible</td></tr>
</table>

	Problems – Unaccountability.
Course Outcomes	• Students who complete this course will be able to design correct and efficient algorithm for common computational tasks. • Analyze and design existing algorithms and data structures. • Apply amortized analysis on data structures, including binary search trees, mergable heaps and disjoint sets.
Text Books	1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", 3rdEdition, PHI Learning, 2009. 2. Clifford A. Shaffer, "Data Structures and Algorithm Analysis in C++", 3rdEdition, Dover Publications, 2011.
Reference Books	1. Mark Allen Weiss, "Data Structure and Algorithm Analysis in C++", 3rdEdition, Prentice Hall, 2006. 2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", 3rdEdition, PHI Learning, 2009.

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2021-22

<table>
<tr><td>Course Title</td><td colspan="5">SOCIAL NETWORK ANALYSIS AND MINING</td></tr>
<tr><td>Course Code</td><td colspan="5">EMT07105</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>4</td><td>-</td><td>-</td><td>4</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">To give an overview of social networks and its importance.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• To understand the social network concepts and various methods of analysis. To expose and train on various tools and techniques for analyzing and visualizing social media networks.</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT - I
INTRODUCTION TO SOCIAL NETWORKS and SNA: Connected World – Networks: Actors, Relations and Attributes - Networks as Information Maps - Networks as Conduits – Leaders and Followers –Psychological foundations of social networks – Basic building Blocks – Brief history of Social Network Analysis
UNIT – II
NETWORK CONCEPTS: Individual Members of the Network – Sociological Questions about Relationships– Whole Social Networks- Distributions – Multiplicity – Roles and Positions –Network Segmentation – Graph Theory – Notations for Social Network Data.
UNIT - III
SOCIAL NETWORK ANALYSIS FUNDAMENTALS: Points, Lines and Density – Centrality and Centralization – Components, Cores and Cliques – Positions, Roles and Clusters – Dimensions and Displays.
UNIT - IV
METHODS OF SOCIAL NETWORK ANALYSIS: Graphs – Matrices – Relationship Measures – Centrality and Prestige’s – Cliques– Structural Equivalence – Visual Displays – Book models – Network Position Measures – Legit Models – Affiliation networks – Lattices.
UNIT - V
LEVELS OF ANALYSIS: Actor Level in Complete Networks – Actor Level in Ego Networks – Dyad Level – Triad Level – Subgroups Level – Network Levels – Positions and Roles Analysis.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">• Students who complete this course will be able to describe the importance of social networks.
• Summarize the theories and concepts of social networks.
• Analyze the social networks by applying various methods of analysis, tools and techniques.</td></tr>
</table>

Text Books	1. Charles Kadushin, "Understanding Social Networks: Theories, Concepts,and Findings", Oxford University Press, USA, 2011. 2. David Knoke, Song Yang, "Social Network Analysis", 2nd Edition, SAGEPublications, 2007.
Reference Books	1. Christina Prell , "Social Network Analysis: History, Theory and 2. Methodology", 1stEdition, SAGE Publications Ltd, 2012.

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2021-22

<table>
<tr><td>Course Title</td><td colspan="5">ADVANCED NETWORK MANAGEMENT - LAB</td></tr>
<tr><td>Course Code</td><td colspan="5">EMT07191</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>-</td><td>-</td><td>4</td><td>2</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">To focus on understanding of fundamental concepts of modern computer network architecture (primarily the Internet) from a design perspective.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• To do systems/network programming and make use of simulation and measurement tools to gain an appreciation of current Internet.</td></tr>
<tr><td>Course Contents</td><td colspan="5">LIST OF EXPERIMENTS
1. Analyzing physical layer properties (Band width, power).
2. Analyzing MAC Layer properties (IEEE 802.3, IEEE 802.4, IEEE 802.5, and IEEE 802.11).
3. Analyzing various queuing models (FIFO, FAIR, and RED).
4. Analyzing Routing layer protocol properties (Distance Vector, Link State).
5. Analyzing Transport Layer Protocol (TCP, UDP).
6. Analyzing Application Layer protocol (TELNET, FTP, and Multimedia Applications).
7. Analyzing various security mechanisms.
8. Implementation of algorithms such as RSA, Daffy Hellman.
9. Analyzing wireless properties.
10. Comparison of performance of protocols in wired and wireless environments.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">• Students who complete this course will be able to use the TCP/IP protocol suite and develop some simple applications and identify network related projects.</td></tr>
<tr><td>Text Books</td><td colspan="5">1. Mani Subramanian, “Network Management: Principles and Practices”, 2nd Edition, Prentice Hall, 2012.
2. Alexander clammy, “Network Management Fundamentals”, 1st Edition, Cisco Press, 2006.</td></tr>
<tr><td>Reference Books</td><td colspan="5">1. Adrian Farrell, “Network Management Know It All”, 1st Edition, Elsevier India, 2008.
2. Richard Burke, “Network Management: Concepts & Practice, A Hands on Approach”, 1st Edition, Prentice Hall, 2003.</td></tr>
</table>

Master of Technology (Network and Internet Security)
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2021-22

<table>
<tr><td>Course Title</td><td colspan="5">ADVANCED DATASTRUCTURES AND ANALYSIS OF ALGORITHMS - LAB</td></tr>
<tr><td>Course Code</td><td colspan="5">EMT07192</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>-</td><td>-</td><td>4</td><td>2</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Basic knowledge about C programming language.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• To learn the Computer Fundamental concepts of Data Structure.
• To aware students about Problem Solving approach.
• To make them to use basic components of Data structure using Programming</td></tr>
<tr><td>Course Contents</td><td colspan="5">LIST OF EXPERIMENTS
1. Write a program to demonstrate the use of Output statements that draws any object of your choice e.g Christmas Tree using ‘*’
2. Write a program that reads in a month number and outputs the month name.
3. Write a program that demonstrate the use of various input statements like getchar(), getch(), scanf().
4. Write a program to demonstrate the overflow and underflow of various datatype and their resolution?
5. Write a program to demonstrate the precedence of various operators.
6. Write a function to find the GCD and LCM of two numbers.
7. Implement a swap() function which exchanges the values of two integers. Call the function from the main to test the function with different values.
8. Write a C function to remove duplicates from an ordered array. For example, if input array contains 10,10,10,30,40,40,50,80,80,100 then output should be 10,30,40,50,80,100.
9. Write a function to generate the Fibonacci series using recursions?
10. Write a recursive function that adds first ‘n’ natural numbers?
11. Write a recursive function that finds factorial of a number?
12. Write a program to demonstrate the use of recursion in Tower of Hanoi problem.
13. Write a program to find the number of occurrences of a word in a sentence?</td></tr>
</table>

	14. Write a program to concatenate two strings without using the inbuilt function? 15. Write a program to check if two strings are same or not? 16. Write a program to check whether a string is a palindrome or not? 17. Write a program to find the number of vowels and consonants in a sentence? 18. Write a program that reverses the contents of a string? 19. Write a program to implement a stack and it's operations. 20. Write a program to implement a linear queue, circular queue using an array. 21. Write a program to convert an infix expression into its equivalent postfix expression using a stack. 22. Write a program to evaluate a postfix expression using a stack. 23. Write a program to create and display a linked list of integers. 24. Write a program to create a linked list and define functions to add a node (at the beginning, end and middle), delete a node, search a node and display all the nodes. 25. Write a program to create two linked list and append one list at the end of another using function. 26. Write a program to implement a stack and queue of strings using a linked list. 27. Write a program to implement a priority queue using linked list. 28. Write a program to define functions to add a node (at the beginning, end and middle), delete a node, search a node and display all the nodes in a header circular linked list. 29. Write a program to implement a circular queue over a circular linked list. 30. Write a program to create and display a doubly linked list. 31. Write a program to define the following functions to add a node (at the beginning, end and middle), delete a node (from the beginning, end and middle) from a doubly linked list. 32. Write a program to create and display a doubly circular linked list. 33. Write programs to sort an array of integers using the techniques of Selection sort, Bubble sort, Insertion sort, Quick sort, Shell sort, Heap sort. 34. Write a program to search for a particular element in an unsorted array of integers using linear search technique. 35. Write a program to demonstrate the technique of Binary search on a sorted array of integers.

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2021-22

Course Outcomes	• Have a comprehensive knowledge of the data structures and algorithms on which file structures and databases are based.
Text Books	1. Aaron M. Tenenbaum, YedidyahLangsam and Moshe J. Augenstein "Data Structures Using C and C/C++" , PHI 2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication
Reference Books	1. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education 2. Lipschutz, "Data Structures" Schaum's Outline Series, TMH 3. G A V Pai, "Data Structures and Algorithms", TMH