SHRI VENKATESHWARA UNIVERSITY

Syllabus

M.TECH (Computer Science & Engineering)

(Two Years Post Graduation Programme)

(w.e.f. 2019-20)

SCHOOL OF ENGINEERING & TECHNOLOGY

Evaluation for M.Tech (Computer Science & Engineering)

SEMESTER-I													
Sl. No.	**Subject Codes**	**Subject**	**Periods**			**Evaluation Scheme**				**End Semester**		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	MCS-101	Mathematical Foundation of Computer Science	3	0	0	20	10	30		70		100	3
2	MCS-102	Advanced Data Structures	3	0	0	20	10	30		70		100	3
3	MCS-012	Wireless Sensor Networks	3	0	0	20	10	30		70		100	3
4	MCS-022	Distributed Systems	3	0	0	20	10	30		70		100	3
5	MCS-110	Advanced Data Structures Lab	0	0	2				25		25	50	2
6	MCS-112	Wireless Sensor Networks LAB	0	0	2				25		25	50	2
7	MLC-101	Research Methodology and IPR	2	0	0	20	10	30		70		100	2
8	AUD-101	English for Research Paper Writing	2	0	0	20	10	30		70		100	0
		Total										700	18

Course Code	MCS-101		
Course Name	Mathematical Foundation of Computer Science		
Credits	3	Total No. of lecture	48

COURSE OBJECTIVE
To understand the mathematical fundamentals that is prerequisites for a variety of courses like Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machine learning.
To develop the understanding of the mathematical and logical basis to many modern techniques in information technology like machine learning, programming language design, and concurrency.
To study various sampling and classification problems.

LECTURE WITH BREAKUP	**NO. OF LECTURES**

Unit 1 Probability mass, density, and cumulative distribution functions, Parametric families of distributions, Expected value, variance, conditional expectation, Applications of the univariate and multivariate Central Limit Theorem, Probabilistic inequalities, Markov chains	7
Unit 2 Random samples, sampling distributions of estimators**,** Methods of Moments and Maximum Likelihood**,**	7
Unit 3 Statistical inference**,** Introduction to multivariate statistical models: regression and classification problems, principal components analysis**,** The problem of over fitting model assessment.	8
Unit 4 Graph Theory: Isomorphism, Planar graphs, graph colouring, Hamilton circuits and Euler cycles. Permutations and Combinations with and without repetition. Specialized techniques to solve combinatorial enumeration problems	**11**
Unit 5 Computer science and engineering applications Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machine learning.	10
Unit 6 Recent Trands in various distribution functions in mathematical field of computer science for varying fields like bioinformatics, soft computing, and computer vision.	5

COURSE OUTCOMES
After completion of course, students would be able to:
To understand the basic notions of discrete and continuous probability.
To understand the methods of statistical inference, and the role that sampling distributions play in those methods.
To be able to perform correct and meaningful statistical analyses of simple to moderate complexity.

References

1. John Vince, Foundation Mathematics for Computer Science, Springer.
2. K. Trivedi.Probability and Statistics with Reliability, Queuing, and Computer Science Applications. Wiley.
3. M. Mitzenmacher and E. Upfal.Probability and Computing: Randomized Algorithms and Probabilistic Analysis.
4. Alan Tucker, Applied Combinatory, Wiley

Course Code	MCS-102	
Course Name	Advanced Data Structures	
Credits	3	Total Number of Lectures:48

COURSE OBJECTIVE
The student should be able to choose appropriate data structures, understand the ADT/libraries, and use it to design algorithms for a specific problem.
Students should be able to understand the necessary mathematical abstraction to solve problems.
To familiarize students with advanced paradigms and data structure used to solve algorithmic problems.
Student should be able to come up with analysis of efficiency and proofs of correctness.

LECTURE WITH BREAKUP	**NO. OF LECTURES**
Unit 1 Dictionaries: Definition, Dictionary Abstract Data Type, Implementation of Dictionaries. Hashing: Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.	7
Unit 2 Skip Lists: Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists	5
Unit 3 Trees: Binary Search Trees, AVL Trees, Red Black Trees, 2-3 Trees, B-Trees, Splay Trees	9
Unit 4	12
Text Processing: Sting Operations, Brute-Force Pattern Matching, The Boyer-Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman Coding Algorithm, The Longest Common Subsequence Problem (LCS), Applying Dynamic Programming to the LCS Problem.	
Unit 5 Computational Geometry: One Dimensional Range Searching, Two Dimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quadtrees, k-D Trees.	10

Unit 6 Recent Trands in Hashing, Trees, and various computational geometry methods for efficiently solving the new evolving problem	5

COURSE OUTCOMES
After completion of course, students would be able to:
Understand the implementation of symbol table using hashing techniques.
Develop and analyze algorithms for red-black trees, B-trees and Splay trees.
Develop algorithms for text processing applications.
Identify suitable data structures and develop algorithms for computational geometry problems.

References:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson, 2004.
2. M T Goodrich, Roberto Tamassia, Algorithm Design, John Wiley, 2002.

Course Code	MCS- 022
Course Name	Distributed Systems
Credits	3

COURSE OBJECTIVE
To introduce the fundamental concepts and issues of managing large volume of shared data in a parallel and distributed environment, and to provide insight into related research Problems.

LECTURE WITH BREAKUP	**NO. OF LECTURES**
Unit 1: INTRODUCTION Distributed data processing; What is a DDBS; Advantages and disadvantages of DDBS; Problem areas; Overview of database and computer network concepts **DISTRIBUTED DATABASE MANAGEMENT SYSTEM ARCHITECTURE** Transparencies in a distributed DBMS; Distributed DBMS architecture; Global directory issues	8
Unit 2: **DISTRIBUTED DATABASE DESIGN** Alternative design strategies; Distributed design issues; Fragmentation; Data allocation **SEMANTICS DATA CONTROL** View management; Data security; Semantic Integrity Control **QUERY PROCESSING ISSUES** Objectives of query processing; Characterization of query processors; Layers of query processing; Query decomposition; Localization of distributed data	**11**

Unit 3: **DISTRIBUTED QUERY OPTIMIZATION** Factors governing query optimization; Centralized query optimization; Ordering of fragment queries; Distributed query optimization algorithms **TRANSACTION MANAGEMENT** The transaction concept; Goals of transaction management; Characteristics of transactions; Taxonomy of transaction models **CONCURRENCY CONTROL** Concurrency control in centralized database systems; Concurrency control in DDBSs; Distributed concurrency control algorithms; Deadlock management	**11**
UNIT 4: **RELIABILITY** Reliability issues in DDBSs; Types of failures; Reliability techniques; Commit protocols; Recovery protocols	8
Unit 5: **PARALLEL DATABASE SYSTEMS** Parallel architectures; parallel query processing and optimization; load balancing	6
Unit 6: **ADVANCED TOPICS** Mobile Databases, Distributed Object Management, Multi-databases	4

COURSE OUTCOMES
After completion of course, students would be:
Design trends in distributed systems.
Apply network virtualization.
Apply remote method invocation and objects.

References:

1. Principles of Distributed Database Systems, M.T. Ozsu and P. Valduriez, Prentice-Hall, 1991.
2. Distributed Database Systems, D. Bell and J. Grimson, Addison-Wesley, 1992.

Course Code	MCS-012	
Course Name	Wireless Sensor Networks	
Credits	3	Total Number of Lectures: 48

COURSE OBJECTIVE
Architect sensor networks for various application setups.
Devise appropriate data dissemination protocols and model links cost.
Understanding of the fundamental concepts of wireless sensor networks and have a basic knowledge of the various protocols at various layers.

• Evaluate the performance of sensor networks and identify bottlenecks.	
LECTURE WITH BREAKUP	**NO. OF LECTURES**
Unit 1: **Introduction to Wireless Sensor Networks:** Course Information, Introduction to Wireless Sensor Networks: Motivations, Applications, Performance metrics, History and Design factors **Network Architecture:** Traditional layered stack, Cross-layer designs, Sensor Network Architecture **Hardware Platforms:** Motes, Hardware parameters	9
Unit 2: **Introduction to ns-3: I**ntroduction to Network Simulator 3 (ns-3), Description of the ns-3 core module and simulation example.	9
Unit 3: **Medium Access Control Protocol design:** Fixed Access, Random Access, WSN protocols: synchronized, duty-cycled **Introduction to Markov Chain:** Discrete time Markov Chain definition, properties, classification and analysis **MAC Protocol Analysis:** Asynchronous duty-cycled. X-MAC Analysis (Markov Chain)	8
Unit 4: **Security:** Possible attacks, countermeasures, SPINS, Static and dynamic key distribution	8
Unit 5: **Routing protocols:** Introduction, MANET protocols **Routing protocols for WSN:** Resource-aware routing, Data-centric, Geographic Routing, Broadcast, Multicast **Opportunistic Routing Analysis:** Analysis of opportunistic routing (Markov Chain) Advanced topics in wireless sensor networks.	10
Unit 6: **ADVANCED TOPICS** Recent development in WSN standards, software applications.	4

COURSE OUTCOMES
After completion of course, students would be able to:
• Describe and explain radio standards and communication protocols for wireless sensor networks.

Explain the function of the node architecture and use of sensors for various applications.
Be familiar with architectures, functions and performance of wireless sensor networks systems and platforms.

References:

1. W. Dargie and C. Poellabauer, "Fundamentals of Wireless Sensor Networks – Theory and Practice", Wiley 2010
2. KazemSohraby, Daniel Minoli and TaiebZnati, "wireless sensor networks -Technology, Protocols, and Applications", Wiley Interscience 2007
3. Takahiro Hara,Vladimir I. Zadorozhny, and Erik Buchmann, "Wireless Sensor Network Technologies for the Information Explosion Era", springer 2010

esearch Methodology and IPR	**SUBJ. CODE - MLC-101**
Teaching Scheme	Lectures: 1hrs/week

Course Outcomes:

At the end of this course, students will be able to

- Understand research problem formulation.
- Analyze research related information
- Follow research ethics
- Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

LECTURE WITH BREAKUP

Unit 1: INTRODUCTION

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

Unit 2: Effective literature studies approaches, analysis Plagiarism, and Research ethics
Unit 3: Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee
UNIT 4: Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.
Unit 5: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent

information and databases. Geographical Indications.
Unit 6: New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

References:

i. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"

ii. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"

iii. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"

iv. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd, 2007.

v. Mayall, "Industrial Design", McGraw Hill, 1992.

vi. Niebel, "Product Design", McGraw Hill, 1974.

vii. Asimov, "Introduction to Design", Prentice Hall, 1962.

viii. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.

ix. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008