EVALUATION SCHEME
M. TECH. COMPUTER SCIENCE & ENGINEERING
I-YEAR (I-SEMESTER)
(Effective from session: 2018-19)

S.No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME					
						SESSIONAL EXAM			ESE	Subject Total	Credits
			L	T	P	CT	TA	Total			
THEORY											
1.	TCS-511	ADAVANCED DATA STRUCTURES	3	1	0	40	40	80	120	200	4
2.	TCS-512	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE	3	1	0	40	40	80	120	200	4
3.	ECS-51X	ELECTIVE-I	3	1	0	40	40	80	120	200	4
4.	ECS-51X	ELECTIVE-II	3	1	0	40	40	80	120	200	4
5.	TRM-511	RESEARCH METHODOLOGY AND IPR	2	0	0	20	20	40	60	100	2
6.	TAC-51X	AUDIT COURSE-I*	2	0	0	20	20	40	60	100	0
PRACTICAL											
7.	PCS-511	LAB-I ADAVANCED DATA STRUCTURES	0	0	2	10	15	25	25	50	1
8.	PCS-51X	LAB-II (BASED ON ELECTIVES)	0	0	2	10	15	25	25	50	1
9.	GPP-511	GENERAL PROFICIENCY *	0	0	0	0	50	50	0	50	0
SEMESTER TOTAL			**16**	**4**	**4**	**200**	**210**	**410**	**590**	**1000**	**20**

ELECTIVE-I
ECS-510 MACHINE LEARNING
ECS-511 WIRELESS SENSOR NETWORK
ECS-512 INTRODUCTION TO INTELLIGENT SYSTEMS
ECS-513 ADVANCE JAVA PROGRAMMING

ELECTIVE-II
ECS-515 DATA SCIENCE
ECS-516 DISTRIBUTED SYSTEMS
ECS-517 ADVANCED WIRELESS AND MOBILE NETWORKS
ECS-518 DIGITAL IMAGE PROCESSING
ECS-519 ADVANCED OPERATING SYSTEM

AUDIT COURSE-I
TAC -511 ENGLISH FOR RESEARCH PAPER WRITING
TAC-512 SANKRIT FOR TECHNICAL KNOWLEDGE
TAC-513 VALUE EDUCATION
TAC-514 CONSTITUTION OF INDIA

EVALUATION SCHEME
M. TECH. COMPUTER SCIENCE & ENGINEERING
I-YEAR (II-SEMESTER)
(Effective from session: 2018-19)

S.No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME					
						SESSIONAL EXAM			ESE	Subject Total	Credits
			L	T	P	CT	TA	Total			
THEORY											
1.	TCS-521	ADVANCE ALGORITHMS	3	0	0	30	30	60	90	150	3
2.	TCS-522	SOFT COMPUTING	3	0	0	30	30	60	90	150	3
3.	ECS-52X	ELECTIVE-III	3	1	0	40	40	80	120	200	4
4.	ECS-52X	ELECTIVE-IV	3	1	0	40	40	80	120	200	4
5.	TAC-52X	AUDIT COURSE-II*	2	0	0	20	20	40	60	100	0
PRACTICAL											
6.	PCS-52X	LAB-III (BASED ON CORE)	0	0	2	10	15	25	25	50	1
7.	PCS-52X	LAB-IV (BASED ON ELECTIVES)	0	0	2	10	15	25	25	50	1
8.	PCS-523	MINI PROJECT WITH SEMINAR	0	0	4	0	0	50	50	100	2
9.	GPP-521	GENERAL PROFICIENCY *	0	0	0	0	50	50	0	50	0
SEMESTER TOTAL			**14**	**2**	**8**	**160**	**170**	**380**	**520**	**900**	**18**

ELECTIVE-III
ECS-520 CRPTOGRAPHY AND COMPUTER SECURITY
ECS-521 SECURE SOFTWARE DESIGN & ENTERPRISE COMPUTING
ECS-522 DATA ENCRYPTION & COMPRESSION
ECS-523 MOBILE COMPUTING NETWORKS

ELECTIVE-IV
ECS-525 HUMAN AND COMPUTER INTERACTION
ECS-526 ADVANCED COMPUTER ARCHITECTURE
ECS-527 MEDICAL IMAGING
ECS-528 CLOUD COMPUTING

AUDIT COURSE-II
TAC -521 DISASTER MANAGEMENT
TAC-522 PEDAGOGY STUDIES
TAC-523 STRESS MANAGEMENT BY YOGA
TAC-524 PERSONLITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

EVALUATION SCHEME
M. TECH. COMPUTER SCIENCE & ENGINEERING
II-YEAR (III-SEMESTER)
(Effective from session: 2019-20)

S.No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME					
						SESSIONAL EXAM			ESE	Subject Total	Credits
			L	T	P	CT	TA	Total			
THEORY											
1.	ECS-63X	ELECTIVE-V	3	1	0	40	40	80	120	200	4
2.	TOE-63X	OPEN ELECTIVE	3	0	0	30	30	60	90	150	3
PRACTICAL											
3.	PCS-631	DISSERTAION-I	0	0	20	0	0	200	300	500	10
4.	GPP-631	GENERAL PROFICIENCY*	0	0	0	0	50	50	0	50	0
SEMESTER TOTAL			**6**	**1**	**20**	**70**	**70**	**340**	**510**	**850**	**17**

ELECTIVE-V
ECS-630 MOBILE APPLICATIONS AND SERVICES
ECS-631 BIG DATA ANALYTICS
ECS-632 OPTIMIZATION TECHNIQUES
ECS-633 NETWORK PROGRAMMING

OPEN ELECTIVE
TOE-630 BUSINESS ANALYTICS
TOE-631 INDUSTRIAL SAFETY
TOE-632 OPERATIONS RESEARCH
TOE-633 COST MANAGEMENT OF ENGINEERING PROJECTS
TOE-634 COMPOSITE MATERIALS
TOE-635 WASTE TO ENERGY

EVALUATION SCHEME
M. TECH. COMPUTER SCIENCE & ENGINEERING
II-YEAR (IV-SEMESTER)
(Effective from session: 2019-20)

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME					
						SESSIONAL EXAM			ESE	Subject Total	Credits
			L	T	P	CT	TA	Total			
PRACTICAL											
1.	PCS-641	DISSERTAION-II	0	0	28	0	0	300	400	700	14
2.	PCS-642	SEMINAR	0	0	4	0	0	100	0	100	2
3.	GPP-641	GENERAL PROFICIENCY*	0	0	0	0	50	50	0	50	0
SEMESTER TOTAL			**0**	**0**	**32**	**0**	**0**	**400**	**400**	**800**	**16**

TCS 511: Advanced Data Structures
M.Tech. Semester –I (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

UNIT I:
Dictionaries: Definition, Dictionary Abstract Data Type, and 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.

UNIT II:
Skip Lists: Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists.

UNIT III
Trees: Binary Search Trees, AVL Trees, Red Black Trees, 2-3 Trees, B-Trees, Splay
Trees 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 IV
Computational Geometry: One Dimensional Range Searching, Two Dimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quad trees, k-D Trees.
UNIT V
Recent Trends in Hashing, Trees, and various computational geometry methods for efficiently solving the new evolving problem.

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.

TCS-512 Mathematical Foundations of Computer Science
M.Tech. Semester –I (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

UNIT I

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

UNIT II

Random samples, sampling distributions of estimators, Methods of Moments and Maximum Likelihood, Statistical inference, Introduction to multivariate statistical models: regression and classification problems, principal components analysis, The problem of overfitting model assessment.

UNIT III

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

UNIT IV

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.

UNIT V

Recent Trands in various distribution functions in mathmatical field of computerscience for varying fields like bioinformatic, soft computing, and computer vision.

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 Combinatorics, Wiley

ECS-510 Machine Learning
M.Tech. Semester –I (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

UNIT I

Supervised Learning (Regression/Classification): Basic methods: Distance-based methods, Nearest-Neighbours, Decision Trees, Naive Bayes Linear models: Linear Regression, Logistic Regression, Generalized Linear Models Support Vector Machines, Nonlinearity and Kernel Methods Beyond Binary Classification: Multi-class/Structured Outputs, Ranking.

UNIT II

Unsupervised Learning

Clustering: K-means/Kernel K-means , Dimensionality Reduction: PCA and kernel PCA, Matrix Factorization and Matrix Completion , Generative Models (mixture models and latent factor models)

UNIT III

Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests)

UNIT IV

Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning. Recent trends in various learning techniques of machine learning and classification methods for IOT applications. Various models for IOT applications.

UNIT V

Scalable Machine Learning (Online and Distributed Learning) A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference.

References

1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009 (freely available online)
3. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.

ECS-511 Wireless Sensor Network
M.Tech. Semester –I (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

UNIT I
Introduction to Wireless Sensor Networks: Course Information, Introduction to Wireless Sensor Networks: Motivations, Applications, Performance metrics, History and Design factors Network Architecture: Tradit ional layered stack, Cross-layer designs, Sensor Network Architecture Hardware Platforms: Motes, Hardware parameters.

UNIT II
Introduction to ns-3: Introduction to Network Simulator 3 (ns-3), Description of the ns-3 core module and simulation example.

UNIT III
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)

UNIT IV
Security: Possible attacks, countermeasures, SPINS, Static and dynamic key Distribution, Recent development in WSN standards, software applications.

UNIT V
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.

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

ECS-512 Introduction to Intelligent Systems
M.Tech. Semester –I (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

UNIT I
Biological foundations to intelligent systems I: Artificial neural networks, Back-propagation networks, Radial basis function networks, and recurrent networks.

UNIT II
Biological foundations to intelligent systems II: Fuzzy logic, knowledge Representation and inference mechanism, genetic algorithm, and fuzzy neural networks. Recent trends in Fuzzy logic, Knowledge Representation.

UNIT III
Search Methods Basic concepts of graph and tree search. Three simple search methods: breadth-first search, depth-first search, iterative deepening search.
Heuristic search methods: best-first search, admissible evaluation functions, hill-climbing search. Optimisation and search such as stochastic annealing and genetic algorithm.

UNIT IV
Knowledge representation and logical inference Issues in knowledge representation. Structured representation, such as frames, and scripts, semantic networks and conceptual graphs. Formal logic and logical inference. Knowledge-based systems structures, its basic components. Ideas of Blackboard architectures.

UNIT V
Reasoning under uncertainty and Learning Techniques on uncertainty reasoning such as Bayesian reasoning, Certainty factors and Dempster-Shafer Theory of Evidential reasoning, A study of different learning and evolutionary algorithms, such as statistical learning and induction learning.

References

1. Luger G.F. and Stubblefield W.A. (2008). Artificial Intelligence: Structures and strategies for Complex Problem Solving. Addison Wesley, 6th edition.
2. Russell S. and Norvig P. (2009). Artificial Intelligence: A Modern Approach. Prentice-Hall, 3rd edition.

ECS-513 Advance Java Programming
M.Tech. Semester –I (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

UNIT - |
Java Basics, Java streaming, Networking, Event handling, Multithreading, Byte code Interpretation, Customizing application, Data Structures, Collection classes.

UNIT II
Distributed Computing: Custom sockets, Remote Method Invocation Activation, Object serialization CORBA Distributed, JINI, GARBAGE, RMI.

UNIT -III
JAVA Beans and Swing, Bean concepts, Events in bean box, Bean customization, Persistence, Application, deployment using swing, Advanced swing techniques, JAR file handling. '

UNIT - IV
JAVA e-Applications,JNI, Servlets, Java Server Pages, JDBC, Session Beans, Entity Beans, Programming and deploying enterprise Java Beans, Java transactions.

UNIT -V
Related JAVA Techniques, Java Media Frame work, 3D graphics, Internationalization, Case study, Deploying n-tier application, E- commerce applications.

References

1. Deitel & Dietel, "Java: How to Program", Prentice Hall, 8" Edition, 2009.
2. Gary Cornell and Cay S. Horstmann, "Core Java®, Vol. 1 and Vol. 2, Sun Microsystems Press, 1999.
3. Stephen Asbury and Scott R. Weiner, "Developing Java Enterprise Applications", Wiley, 1998. -

ECS-515 Data Science
M.Tech. Semester –I (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

UNIT I
Introduction to core concepts and technologies: Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications.

UNIT II
Data collection and management: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, using multiple data sources

UNIT III
Data analysis: Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT, Basic machine learning algorithms, Linear regression, SVM, Naive Bayes.

UNIT IV
Data visualisation: Introduction, Types of data visualisation, Data for visualisation: Data types, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings.

UNIT V
Applications of Data Science, Technologies for visualization, Bokeh (Python) , Recent trends in various data collection and analysis techniques, various visualization techniques, application development methods of used in data science.

References

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly.
2. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press.

ECS-516 Distributed Systems
M.Tech. Semester –I (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

UNIT I

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.

UNIT II

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

UNIT III

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

UNIT IV

RELIABILITY: Reliability issues in DDBSs; Types of failures; Reliability techniques; Commit protocols; Recovery protocols

UNIT V

PARALLEL DATABASE SYSTEMS: Parallel architectures; parallel query processing and optimization; load balancing, Mobile Databases, Distributed Object Management, Multi-databases.

ECS-517 Advanced Wireless and Mobile Networks
M.Tech. Semester –I (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

UNIT I

INTRODUCTION: Wireless Networking Trends, Key Wireless Physical Layer Concepts, Multiple Access Technologies -CDMA, FDMA, TDMA, Spread Spectrum technologies, Frequency reuse, Radio Propagation and Modelling, Challenges in Mobile Computing: Resource poorness, Bandwidth, energy etc.

WIRELESS LOCAL AREA NETWORKS: IEEE 802.11 Wireless LANs Physical & MAC layer, 802.11 MAC Modes (DCF & PCF) IEEE 802.11 standards, Architecture & protocols, Infrastructure vs. Ad-hoc Modes, Hidden Node & Exposed Terminal Problem, Problems, Fading Effects in Indoor and outdoor WLANs, WLAN Deployment issues.

UNIT II

WIRELESS CELLULAR NETWORKS:

1G and 2G, 2.5G, 3G, and 4G, Mobile IPv4, Mobile IPv6, TCP over Wireless Networks, Cellular architecture, Frequency reuse, Channel assignment strategies, Handoff strategies, Interference and system capacity, Improving Coverage and capacity in cellular systems, Spread spectrum Technologies.

UNIT III

WiMAX (Physical layer, Media access control, Mobility and Networking), IEEE 802.22 Wireless Regional Area Networks, IEEE 802.21 Media Independent Handover
Overview

WIRELESS SENSOR NETWORKS: Introduction, Application, Physical, MAC layer and Network Layer, Power Management, Tiny OS Overview.

UNIT IV

WIRELESS PANs Bluetooth AND Zigbee, Introduction to Wireless Sensors, IEEE 802.11x and IEEE 802.11i standards, Introduction to Vehicular Ad-hoc Networks

UNIT V

SECURITY: Security in wireless Networks Vulnerabilities, Security techniques, Wi-Fi Security, DoS in wireless communication.

References

1. Schiller J., Mobile Communications, Addison Wesley 2000
2. Stallings W., Wireless Communications and Networks, Pearson Education 2005
3. Stojmenic Ivan, Handbook of Wireless Networks and Mobile Computing, John Wiley and Sons Inc 2002
4. Yi Bing Lin and Imrich Chlamtac, Wireless and Mobile Network Architectures, John Wiley and Sons Inc 2000
5. Pandya Raj, Mobile and Personal Communications Systems and Services, PHI 200

ECS-518 Digital Image Processing
M.Tech. Semester –I (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

UNIT I
Systems and signal processing, classifications of signals, concept of frequency in continuous time and discrete time signals. Analog to digital and digital-to-analog conversion, Discrete time signals, Discrete time systems, LTI systems, difference equations, implementation of discrete time systems.

UNIT II
Z- transform and its Applications: Z Transform, properties of Z-transform, Inversion of Z transform, applications of Z transform.

UNIT III
Discrete Fourier Transform(DFT), properties of DFT, Linear filtering methods based on the DFT, frequency analysis of signals using the DFT.

UNIT IV
Fast Fourier transform and its applications: FFT algorithms (Radix 2 FFT) algorithm, Implementation of Discrete time systems, Structures for FIR systems, direct form structure, Cascade form structure, parallel form, structures for IIR systems, cascade, direct form and parallel form structures.

UNIT V
Design of Digital Filters: Design of IIR filters, Bilinear transformation and impulse invariance method, Matched Z transformation design of FIR filters with different methods. Design of FIR filters using windows.

References

1. John G. Proakis and Dimitris G. Manolakis, Digital Signal Processing, PHI
2. Oppenheim & Schaffer, Digital Signal Processing, PHI.
3. Rabiner & Gold, Digital Signal Processing applications.
4. S.K., Mitra, Digital Signal Processing, TMH.
5. S. Salivayhan, A Vallavraj, C. Gnanapriya, Digital Signal Processing , TMH.

ECS-519 Advanced Operating System
M.Tech. Semester –I (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

UNIT I
Review of Operating Systems principles: Synchronization mechanisms, Process deadlocks.

UNIT II
Architecture of Distributed Operating system: Motivation, System Architecture types, issues in distributed operating system, Communication primitives.

UNIT III
Inherent limitations of distributed operating systems: Event ordering. Timestamps. Distributed mutual exclusion. Token and non-token based algorithms. Comparative performance analysis.

UNIT IV

Distributed deadlock detection: Deadlock handling strategies, issues in deadlock detection & reevaluation, Control Organization: Centralized distributed & Hierarchical detection algorithms.

UNIT V
Concurrency control: Shared Memory. File Systems. Agreement protocols for handling processor failures. Coordination of processes and related algorithms, Interprocess Communications, Failure handling and recovery mechanisms.

Books

1. Peterson, J.L. & Silbersehatz, A: Operating System Concepts, Addison, Wesley-Reading. . .
2. Brineh, Hansen: Operating System Principles, Prentice Hall of India.
3. Haberman, A.N: Introduction to Operating System Design Galgotia Publication, New Delhi.
4. Hansen, P.B: Architecture of Concurrent Programs, PHI.
5. Shaw, A.C: Logic Design of Operating Systems, PHI.
6. Silberschatz, P. Galving, G. Gahne : Applied operating system concepts, Wiley.
7. Mukesh Singhal & N.G. Shivaratri: Advanced concepts in operating systems, TMH 2001.
8. A S Tanenbaum : Modern Operating Systems, PHI.

TRM-511 Research Methodology and IPR
M.Tech. Semester –I (Computer Science &Engg.)

L	T	P		
2	-	-	**Class Work**	**:40 Marks**
			Exam.	**:60 Marks**
			Total	**:100 Marks**
			Duration of Exam	**: 2 Hrs.**

UNIT 1: 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, Research ethics,

UNIT 3: Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation andassessment 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. 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**.**

Books

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
3. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
4. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
5. Mayall, "Industrial Design", McGraw Hill, 1992.
6. Niebel, "Product Design", McGraw Hill, 1974.
7. Asimov, "Introduction to Design", Prentice Hall, 1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.

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

TAC -511 English for Research Paper Writing
M.Tech. Semester –I (Computer Science & Engg.)

L	T	P
2	-	-

Class Work	**:40 Marks**
Exam.	**:60 Marks**
Total	**:100 Marks**
Duration of Exam	**: 3 Hrs.**

TAC-512 Sankrit For Technical Knowledge
M.Tech. Semester –I (Computer Science & Engg.)

L	T	P
2	-	-

Class Work	**:40 Marks**
Exam.	**:60 Marks**
Total	**:100 Marks**
Duration of Exam	**: 3 Hrs.**

TAC-513 Value Education
M.Tech. Semester –I (Computer Science & Engg.)

L	T	P		
2	-	-	**Class Work**	**:40 Marks**
			Exam.	**:60 Marks**
			Total	**:100 Marks**
			Duration of Exam	**: 3 Hrs.**

AC-514 Constitution of India
M.Tech. Semester –I (Computer Science & Engg.)

L	T	P		
2	-	-	**Class Work**	**:40 Marks**
			Exam.	**:60 Marks**
			Total	**:100 Marks**
			Duration of Exam	**: 3 Hrs.**

PCS 511: Advanced Data Structures Lab
M.Tech. Semester –I (Computer Science & Engg.)

L	T	P		
-	-	2	**Class Work**	**:25 Marks**
			Exam.	**:25 Marks**
			Total	**:50 Marks**
			Duration of Exam	**: 3 Hrs**

Prerequisites: Knowledge of C/C++/ Data Structures Programming is essential.

The experiments will be based on the following paper: TCS 511 **Advanced Data Structures**

PCS 51X: Based on Electives Lab
M.Tech. Semester –I (Computer Science & Engg.)

L	T	P		
-	-	2	**Class Work**	**:25 Marks**
			Exam.	**:25 Marks**
			Total	**:50 Marks**
			Duration of Exam	**: 3 Hrs**

Prerequisites: Knowledge of C/C++/ java and other Programming is essential.

The experiments will be based on the following paper: TCS 51X **Based on Electives**

TCS-521 Advance Algorithms
M.Tech. Semester –II (Computer Science & Engg.)

L	T	P		
3-	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

UNIT I
Sorting: Review of various sorting algorithms, topological sorting Graph:
Definitions and Elementary Algorithms: Shortest path by BFS, shortest path in edge-weighted case (Dijkasra's), depth-first search and computation of strongly connected components, emphasis on correctness proof of the algorithm and time/space analysis, example of amortized analysis.

UNIT II
Matroids: Introduction to greedy paradigm, algorithm to compute a maximum weight maximal independent set. Application to MST.
Graph Matching: Algorithm to compute maximum matching. Characterization of maximum matching by augmenting paths, Edmond's Blossom algorithm to compute augmenting path.

UNIT III
Flow-Networks: Maxflow-mincut theorem, Ford-Fulkerson Method to compute maximum flow, Edmond-Karp maximum-flow algorithm.
Matrix Computations: Strassen's algorithm and introduction to divide and conquer paradigm, inverse of a triangular matrix, relation between the time complexities of basic matrix operations, LUP-decomposition.

UNIT IV
Shortest Path in Graphs: Floyd-Warshall algorithm and introduction to dynamic programming paradigm. More examples of dynamic programming.
Modulo Representation of integers/polynomials: Chinese Remainder Theorem, Conversion between base-representation and modulo-representation. Extension to polynomials. Application: Interpolation problem.
Discrete Fourier Transform (DFT): In complex field, DFT in modulo ring. Fast Fourier Transform algorithm. Schonhage-Strassen Integer Multiplication algorithm

UNIT V
Linear Programming: Geometry of the feasibility region and Simplex algorithm,NP-completeness: Examples, proof of NP-hardness and NP-completeness. One or more of the following topics based on time and interest Approximation algorithms, Randomized Algorithms, Interior Point Method, Advanced Number Theoretic Algorithm. UnitRecent Trands in problem solving paradigms using recent searching and sorting techniques by applying recently proposed data structures.

References:

1. "Introduction to Algorithms" by Cormen, Leiserson, Rivest, Stein.
2. "The Design and Analysis of Computer Algorithms" by Aho, Hopcroft, Ullman.
3. "Algorithm Design" by Kleinberg and Tardos.

TCS-522 Soft Computing
M.Tech. Semester –II (Computer Science & Engg.)

L	T	P		
3-	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

UNIT I

INTRODUCTION TO SOFT COMPUTING AND NEURAL

NETWORKS: Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics.

UNIT II

FUZZY LOGIC: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making

UNIT III

NEURAL NETWORKS: Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks : Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks

UNIT IV

GENETIC ALGORITHMS: Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning : Machine Learning Approach to Knowledge Acquisit ion. Matlab/Python Lib: Introduction to Matlab/Python, Arrays and array operations, Functions and Files, Study of neural network toolbox and fuzzy logic toolbox, Simple implementation of Artificial Neural Network and Fuzzy Logic.

UNIT V

Recent Trands in deep learning, various classifiers, neural networks and genetic algorithm. Implementation of recently proposed soft computing techniques.

References

1. Jyh:Shing Roger Jang, Chuen:Tsai Sun, EijiMizutani, Neuro:Fuzzy and Soft Computing, Prentice:Hall of India, 2003.
2. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic:Theory and Applications, Prentice Hall, 1995.
3. MATLAB Toolkit Manual

ECS-520 Cryptography and Computer Security
M.Tech. Semester –II (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

UNIT I

Introduction and Mathematical Tools: Ciphers and Secret Messages, Security Attacks and Services, Substitutions and Permutations, Modular Arithmetic, Euclid's Algorithm, Finite Fields, Polynomial Arithmetic, Discrete Logarithms.

UNIT II

Symmetric Encryption Algorithms: Theory of Block Cipher Design, Feistel Cipher Network Structures, DES and Triple DES, Modes of Operation (ECB, CBC, OFB, CFB), Strength (or Not) of DES, IDEA, CAST, Blowfish, Twofish, RC2, RC5, Rijndael (AES), Key Distribution, Pseudo-random sequences, Linear Congruential Generators, Cryptographic Generators, Design of Stream Cipher, One Time Pad

UNIT III

Asymmetric Key Cryptography: Prime Numbers and Testing for Primality, Factoring Large Number, RSA, Diffie-Hellman, ElGamal, Key Exchange Algorithms, Public-Key Cryptography Standards, Message Authentication, MD5, SHA, RIPEMD, HMAC, Digital Signatures, Certificates, User Authentication, Digital Signature Standard (DSS and DSA), Security Handshake Pitfalls, Elliptic Curve Cryptosystems

UNIT IV

Authentication, E-mail and Web Security: Kerberos V4 and V5, X.509 Authentication Service, Pretty Good Privacy (PGP), S/IMIME, X.400, IPSec and Virtual Private Networks, Secure Sockets and Transport Layer (SSL and TLS), Electronic Payment Systems, Secure Electronic Transaction (SET), Cyber Cash, i-Key Protocols, E-cash (DigiCash)

UNIT V

Digital Watermarking and Steganography.

References

1. Wenbo Mao, "Modern Cryptography: Theory and Practice", Prentice Hall, 2004
2. Wiliam Stallings, "Cryptography and Network Security", 3" edition, Prentice Hall PTR, 2003.
3. Richard A. Mollin, "An Introduction to Cryptography", Chapman and Hall/CRC, 2001.
4. B. Schneier, "Applied Cryptography", John Wiley and Sons, NY, 1996.
5. Menezes, P. Oorshcot, and S. Vanstone, "Handbook of Applied Cryptography",CRC Press, Boca Raton, FL, 1997.
6. Thomas H. Barr, "Invitation to Cryptography", Prentice Hall, 2002.
7. Richard J. Spillman, "Classical and Contemporary Cryptology", Prentice Hall, 2005.
8. D. Stinson, "Cryptography: Theory and Practice", Second Edition, Chapman & Hall, 2002.
9. Dorothy E. Denning, "Information Warfare and Security", Addison-Wesley, 1999.

ECS-521 Secure Software Design & Enterprise Computing
M.Tech. Semester –II (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

UNIT I

Secure Software Design: Identify software vulnerabilities and perform software security analysis, Master security programming practices, Master fundamental software security design concepts, Perform security testing and quality assurance.

UNIT II

Enterprise Application Development : Describe the nature and scope of enterprise software applications, Design distributed N-tier software application, Research technologies available for the presentation, business and data tiers of an enterprise software application, Design and build a database using an enterprise database system, Develop components at the different tiers in an enterprise system, Design and develop a multi-tier solution to a problem using technologies used in enterprise system, Present software solution.

UNIT III

Enterprise Systems Administration: Design, implement and maintain a directory-based server infrastructure in a heterogeneous systems environment, Monitor server resource utilization for system reliability and availability, Install and administer network services (DNS/DHCP/Terminal Services/Clustering/Web/Email).

UNIT IV

Obtain the ability to manage and troubleshoot a network running multiple services, understand the requirements of an enterprise network and how to go about managing them.

UNIT V

Handle insecure exceptions and command/SQL injection, Defend web and mobile applications against attackers, software containing minimum vulnerabilities and flaws. Case study of DNS server, DHCP configuration and SQL injection attack.

References:

1. Theodor Richardson, Charles N Thies, Secure Software Design, Jones & Bartlett
2. Kenneth R. van Wyk, Mark G. Graff, Dan S. Peters, Diana L. Burley, Enterprise Software Security, Addison Wesley.

ECS-522 Data Encryption & Compression
M.Tech. Semester –II (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

UNIT I

Introduction to Security: Need for security, Security approaches, Principles of security, Types of attacks.
Encryption Techniques: Plaintext, Cipher text, Substitution & Transposition techniques, Encryption & Decryption, Types of attacks, Key range & Size.

UNIT II

Symmetric & Asymmetric Key Cryptography: Algorithm types & Modes, DES, IDEA, Differential & Linear Cryptanalysis, RSA, Symmetric & Asymmetric key together, Digital signature, Knapsack algorithm.
User Authentication Mechanism: Authentication basics, Passwords, Authentication tokens, Certificate based & Biometric authentication, Firewall.

UNIT III

Case Studies Of Cryptography: Denial of service attacks, IP spoofing attacks, Secure inter branch payment transactions, Conventional Encryption and Message Confidentiality, Conventional Encryption Principles, Conventional Encryption Algorithms, Location of Encryption Devices, Key Distribution. Public Key Cryptography and Message Authentication: Approaches to Message Authentication, SHA-1, MD5, Public-Key Cryptography Principles, RSA, Digital, Signatures, Key Management.

UNIT IV

Introduction: Need for data compression, Fundamental concept of data compression & coding, Communicat ion model, Compression ratio, Requirements of data compression, Classification.Methods of Data Compression: Data compression--Loss less &Lossy

UNIT V

Entropy encoding-- Repetitive character encoding, Run length encoding, Zero/Blank encoding; Statistical encoding--Huffman, Arithmetic & Lempel-Ziv coding; Source encoding-- Vector quantization (Simple vector quantization & with error term); Differential encoding—Predictive coding, Differential pulse code modulat ion, Delta modulat ion, Adaptive different ial pulse code modulation; Transform based coding : Discrete cosine transform & JPEG standards; Fractal compression , Recent trends in encryption and data compression techniques.

References:

1. Cryptography and Network Security by B. Forouzan, McGraw-Hill.
2. The Data Compression Book by Nelson, BPB.
3. Cryptography & Network Security by AtulKahate, TMH.

ECS-523 Mobile Computing Networks
M.Tech. Semester –II (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

Unit 1: Overview of Ad Hoc Networks: Why Ad Hoc Networks?, Challenges, and benefits of Mobile Computing, Breakthrough Technology, Wireless Computing, Nomadic Computing, Mobile Computing, Ubiquitous Computing, Pervasive Computing, Invisible Computing, Applications of mobile computing, Wireless and Mobile Computing Models, LAN Protocols: IEEE 802.11/a/g/n & Bluetooth, Data Management Issues. Sensor Networks- Challenges, Architecture, and Applications.

Unit 2: Routing: Taxonomy, Applications, Challenges in Mobile Environments, Hidden and exposed terminal problems, Routing Protocols- Proactive, Reactive, and Hybrid protocols, Dynamic State Routing (DSR), Ad hoc On-Demand Distance Vector (AODV), Destination Sequenced Distance – Vector Routing (DSDV), and Cluster Based Routing Protocol (CBRP), and Temporally Ordered Routing algorithm (TORA).

Unit 3: Distributed location Management: Pointer forwarding strategies, Process communication techniques, socket programming, Remote Procedure Call (RPC), Remote Method Invocation (RMI), client/server programming.

Unit 4: Mobile IP- Problem with Mobility, Terminology, Operation, Tunneling, Data transfer to the mobile system, Transport Control Protocol (TCP) Over wireless- Indirect TCP (I-TCP), Snoop TCP, Mobile TCP (M-TCP), Case Study of Client/Server architecture.

Unit 5: Fault tolerance and Security: Mobile Agents Computing, Security- Issues and Mechanisms, Certificate, Secure Agent Transfer, Timestamp Tamper-proofing, Secure Agent Reception, Host Protection, Providing Security and Integrity to Agent Data and State, Securing Agent Itineraries, Security Architecture, fault tolerance- Issues and Mechanisms, Agent Failure Scenarios, Node (host) Failure Detection and Recovery, Agent Failure Detection and Recovery, Communication Failure Detection and Recovery, Fault Tolerant System-3-Layered Monitor System, transaction processing in Mobile computing environment. Mobile Agent Systems: Aglets, PMADE and Case Study.

Books

1. Charles E. Perkins, Ad hoc Networks, Addison Wesley, 2008.
2. Kazem Sohraby, Daniel Minoli, Taieb Znati, Wireless Sensor Networks: Technology, Protocols, and Applications, Wiley, 2007.
3. Mazliza Othman, Principles of mobile computing and communications, Auerbach Publications, 2007.
4. Uwe Hansmann, Lothar Merk, Martin Nicklous, Thomas Stober, Principles of Mobile computing, 2nd Ed., Wiley, 2006.
5. Daniel Minoli, A Networking Approach to Grid Computing, Wiley, 2004.
6. W. Richard Stevens, Bill Fenner, Andrew M. Rudoff UNIX Network Programming: The Sockets Networking API, Volume 1, Third Edition: Addison Wesley, 2003.
7. Lange, D.B. and Oshima, M., Programming and Deploying Java Mobile Agents with Aglets, 1st Ed., Addison Wesley, 2001.
8. William T. Cockayne, Michal Zyda, Mobile agents, Manning Publication, 2000.
9. Milojicic, D., Douglis, F. and Wheeler R., (ed.), Mobility Processes, Computers and Agents, Addison Wesley, 1999.

ECS-525 Human and Computer Interaction
M.Tech. Semester –II (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

UNIT I
Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.

UNIT II
Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules – principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.

UNIT III
COGNITIVE MODELS –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.

UNIT IV
Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.

UNIT V
Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies. Recent Trends: Speech Recognition and Translation, Multimodal System

References

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition, Pearson Education, 2004 (UNIT I , II & III)
2. Brian Fling, "Mobile Design and Development", First Edition , O

ECS-526 Advanced Computer Architecture
M.Tech. Semester –II (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

UNIT I

Overview of von Neumann architecture: Instruction set architecture; The Arithmetic and Logic Unit, The Control Unit, Memory and I/O devices and their interfacing to the CPU; Measuring and reporting performance; CISC and RISC processors.

UNIT II

Pipelining: Basic concepts of pipelining: A Pipelined Data path, data hazards, control hazards, and structural hazards; Techniques for reducing the effects of various hazards.

UNIT III

Hierarchical Memory Technology: Inclusion, Coherence and locality properties; write policies, Cache memory organizations, Techniques for reducing cache misses; Virtual memory organization, mapping and management techniques, memory replacement policies.

UNIT IV

Instruction-level parallelism: Concepts of instruction-level parallelism (ILP), Techniques for increasing ILP; Superscalar, superpipelined and VLIW processor architectures; Vector and symbolic processors.

UNIT V

Multiprocessor Architecture: Taxonomy of parallel architectures; Centralized shared-memory architecture, synchronization, memory consistency, interconnection networks; Distributed shared-memory architecture, Cluster computers.

Non von Neumann Architectures: Data flow Computers, Systolic Architectures.

References

1. W. Stallings, Computer Organization and Architecture: Designing for performance, 4th Ed. PHI, 1996.
2. J. H. Hennessy and D. A. Patterson, Computer Architecture: A Quantitative Approach, 2nd Ed., Morgan Kaufmann, 1996.
3. Kai Hwang, Advanced Computer Architecture: Parallelism, Scalability and Programmability, McGraw-Hill Inc, 1993.
4. D. E. Culler, J. Pal Singh, and A. Gupta, Parallel Computer Architecture: A Hardware/Software Approach, Harcourt Asia Pvt. Ltd., 1999.
5. J. P. Hayes, Computer Architecture and Organization, McGraw Hill.
6. Harvey G. Cragon, Memory Systems and Pipelined Processors, Narosa Publication.
7. V. Rajaraman & C.S.R. Murthy, Parallel Computers, PHI.
8. R. K. Ghose, Rajan Moona & Phalguni Gupta, Foundation of Parallel Processing, Narosa Publications.
9. Kai Hwang and Zu, Scalable Parallel Computers Architecture, McGraw Hill.
10. Stallings W., Computer Organization & Architecture, PHI.

ECS-527 Medical Imaging
M.Tech. Semester –II (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

UNIT I

BASIC CONCEPTS

Introduction to Medical Imaging: The Modalities and image Properties, Image Quality, Spatial Resolution, Convolution, Frequency Domain, Contrast, Physical mechanisms of Blurring, Medical Imaging Informatics.

UNIT II

DIAGNOSTIC RADIOLOGY

Ray Computed Tomography: Introduction, Rays detectors in CT, imaging, Cardiac CT, Dual energy CT, Biological affects and safety. Ultrasound Imaging: Introduction, Physics of Acoustic waves, Generation and Detection of Ultrasound, Doppler Imaging, Biological effects and safety.

UNIT III

MAGNETIC RESONANCE IMAGING (MRI) &NUCLEARIMAGING

MRI: Advanced image Acquisition Methods, Artifacts, Spectroscopy, Quality. Control, Siting, Bioeffects and Safety. Nuclear Imaging: Positron Emission Tomography and Dual Modality Imaging- SPECT/CT, PET/CT.

UNIT IV

MEDICAL IMAGE ANALYSIS AND VISUALIZATION

Introduction, Manual Analysis, Automated Analysis, Computational strategies for Automated Medical Image Analysis, Pixel Classification, Geometric model matching using a Transformation Matrix, Flexible Geometric Model Matching. Visualization for Diagnosis and Therapy: Introduction- 2D Visualization-User Interaction-intraoperative Navigation.

UNIT V

RADIATION BIOLOGY AND PROTECTION

Radiation Biology: Overview, Interaction of radiation with tissue, Whole body response to radiation: The acute radiation syndrome, Hereditary Effects of Radiation Exposure, Radiation Protection: Sources of exposure to ionizing radiation, Radiation detection equipment in radiation safety, Medical emergencies involving ionizing radiation.

References

1. Paul Suetens, "Fundamentals of Medical Imaging", 2nd Edition, Cambridge University Press, UK, 2009.
2. Jerrold. T. Bushberg, J. Anthony Seibert, Edwin M. Leidholdt, Jr. John M. Boone, "Essential Physics of Medical imaging", 3rd Edition, Lippincott Williams & Wilkins,.USA, 2012.
3. Steve Webb, "The Physics of Medical Imaging", Adam Hilger, Philadelphia, 2012.
4. Jerry L. Prince, Jonathan M. Links, "Medical Imaging Signals and Systems", Pearson El, 2006.

ECS-528 Cloud Computing
M.Tech. Semester –II (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

UNIT I

Foundations: Introduction to Cloud Computing, Migrating into a Cloud Enriching the 'Integration as a Service' Paradigm for the Cloud Era, Cloud Computing for Enterprise Applications. - :

UNIT II

Infrastructure as a Service (laaS): Virtual Machines Provisioning and Migration Services, On the Management of Virtual Machines for Cloud Infrastructures, Enhancing Cloud Computing Environments using a Cluster as a Service, Secure Distributed Data Storage in Cloud Computing.

UNIT III

Platform and Software as a Service (PaaS/laaS): Aneka - Integration of Private and Public Clouds, CometCloud: An Autonomic Cloud Engine, T-Systems'' Cloud-Based Solutions for Business Applications, Workflow Engine for Clouds, Understanding Scientific Applications for Cloud Environments, The MapReduce Programming Model and Implementations. : :

UNIT IV

Monitoring and Management: An Architecture for Federated Cloud Computing, SLA Management in Cloud Computing: A Service Provider's Perspective, Performance Prediction for HPC on Clouds.

UNIT V

Applications: Architecting Applications for the Amazon Cloud, Massively Multiplayer Online Game Hosting on Cloud Resources, Building Content Delivery Networks Using Clouds, Resource Cloud Mashups

References

1. "Cloud Computing: Principles and Paradigms", Rajkumar Buyya, James Broberg, Andrzej Goscinski, Wiley, New York, USA

TAC -521 Disaster Management
M.Tech. Semester –II (Computer Science & Engg.)

L	T	P		
2	-	-	Class Work	:40 Marks
			Exam.	:60 Marks
			Total	:100 Marks
			Duration of Exam	: 3 Hrs

TAC-522 Pedagogy Studies
M.Tech. Semester –II (Computer Science & Engg.)

L	T	P		
2	-	-	Class Work	:40 Marks
			Exam.	:60 Marks
			Total	:100 Marks
			Duration of Exam	: 3 Hrs

TAC-523 Stress Management by Yoga
M.Tech. Semester –II (Computer Science & Engg.)

L	T	P		
2	-	-	Class Work	:40 Marks
			Exam.	:60 Marks
			Total	:100 Marks
			Duration of Exam	: 3 Hrs

TAC-524 Personality Development through Life Enlightenment Skills
M.Tech. Semester –II (Computer Science & Engg.)

L	T	P		
2	-	-	Class Work	:40 Marks
			Exam.	:60 Marks
			Total	:100 Marks
			Duration of Exam	: 3 Hrs

PCS-52X LAB-III (Based on Core)

M.Tech. Semester –II (Computer Science & Engg.)

L	T	P		
-	-	2	**Class Work**	**:25 Marks**
			Exam.	**:25 Marks**
			Total	**:50 Marks**
			Duration of Exam	**: 3 Hrs**

PCS-52X LAB-IV (Based on Electives)
M.Tech. Semester –II (Computer Science & Engg.)

L	T	P		
-	-	2	**Class Work**	**:25 Marks**
			Exam.	**:25 Marks**
			Total	**:50 Marks**
			Duration of Exam	**: 3 Hrs**

PCS-521 Mini Project with Seminar
M.Tech. Semester –II (Computer Science & Engg.)

L	T	P		
-	-	4	**Class Work**	**:50 Marks**
			Exam.	**:50 Marks**
			Total	**:100 Marks**
			Duration of Exam	**: 3 Hrs**

Concerned Teachers/Experts in the selected area must be identified by a student for approval of the problem. A student is required to submit Three copies of bound report One week before the presentation to office of Head/Concerned faculty (examiner) appointed by the Head.

ECS-630 Mobile Applications and Services
M.Tech. Semester –III (Computer Science & Engg.)

L	T	P		
3-	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs**

UNIT I

Introduction: Introduction to Mobile Computing, Introduction to Android Development Environment, Factors in Developing Mobile Applications, Mobile Software Engineering, Frameworks and Tools, Generic UI Development Android User.

UNIT II

More on Uis: VUIs and Mobile Apps, Text-to-Speech Techniques, Designing the Right UI, Multichannel and Multimodal Uis, . Storing and Retrieving Data, Synchronization and Replication of Mobile Data, Getting the Model Right, Android Storing and Retrieving Data, Working with a Content Provider.

UNIT III

Communications via Network and the Web: State Machine, Correct Communications Model, Android Networking and Web, Telephony Deciding Scope of an App, Wireless Connectivity and Mobile Apps, Android Telephony Notifications and Alarms: Performance, Performance and Memory Management, Android Notifications and Alarms, Graphics, Performance and Multithreading, Graphics and UI Performance, Android Graphics.

UNIT IV

Putting It All Together: Packaging and Deploying, Performance Best Practices, Android Field Service App, Location Mobility and Location Based Services Android Multimedia: Mobile Agents and Peer-to-Peer Architecture, Android Multimedia.

UNIT V

Platforms and Additional Issues : Development Process, Architecture, Design, Technology Selection, Mobile App Development Hurdles, Testing, Security and Hacking , Active Transactions, More on Security, Hacking Android, Recent trends in Communication protocols for IOT nodes, mobile computing techniques in IOT, agents based communications in IOT

References

1. Wei-Meng Lee, Beginning Android™ 4 Application Development, 2012 by John Wiley & Sons

ECS-631 Big Data Analytics
M.Tech. Semester –III (Computer Science & Engg.)

L	T	P		
3-	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs**

UNIT I
What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowd sourcing analytics, inter and trans firewall analytics.

UNIT II
Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schemaless databases, materialized views, distribution models, sharding, master-slave replication, peer-peer replication, sharding and replication, consistency, relaxing consistency,
version stamps, map-reduce, partitioning and combining, composing map-reducecalculations.

UNIT III
Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro, file-based data structures

UNIT IV
MapReduce workflows, unit tests with MRUnit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output formats

UNIT V
Hbase, data model and implementations, Hbase clients, Hbase examples, praxis.Cassandra, Cassandra data model, Cassandra examples, Cassandra clients, Hadoop integration, Pig, Grunt, pig data model, Pig Latin, developing and testing Pig Latin scripts. Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation, HiveQL queries.

References

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
2. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
3. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
4. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
5. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
6. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
7. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.
8. Alan Gates, "Programming Pig", O'Reilley, 2011

ECS-632 Optimization Techniques
M.Tech. Semester –III (Computer Science & Engg.)

L	T	P		
3-	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs**

UNIT I
Engineering application of Optimization, Formulation of design problems as mathematical programming problems.

UNIT II
General Structure of Optimization Algorithms, Constraints, The Feasible Region.

UNIT III
Branches of Mathematical Programming: Optimization using calculus, Graphical Optimization, Linear Programming, Quadratic Programming, Integer Programming, Semi Definite Programming.

UNIT IV
Optimization Algorithms like Genetic Optimization, Particle Swarm Optimization, Ant Colony Optimization etc.

UNIT V
Real life Problems and their mathemat ical formulat ion as standard programming problems. Recent trends: Applications of ant colony optimization, genetics and linear and
quadratic programming in real world applications.

References

1. Dimitris Bertsimas; Robert Weismantel (2005). Optimization over integers. Dynamic Ideas. ISBN 978-0-9759146-2-5.
2. John K. Karlof (2006). Integer programming: theory and practice.CRC Press. ISBN 978-0-8493-1914-3.
3. H. Paul Williams (2009). Logic and Integer Programming. Springer. ISBN 978-0-387-92279-9.
4. Pulleyblank; Gerhard Reinelt; Giovanni Rinaldi; Laurence A. Wolsey, eds. (2009). 50 Years of Integer Programming 1958-2008: From the Early Years to the State-of-the- Art. Springer. ISBN 978-3-540-68274-5.
5. Der-San Chen; Robert G. Batson; Yu Dang (2010). Applied Integer Programming: Modeling and Solution. John Wiley and Sons. ISBN 978-0-470-37306-4.

ECS-633 Network Programming
M.Tech. Semester –III (Computer Science & Engg.)

L	T	P		
3-	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs**

Unit 1: Socket Programming: Creating sockets, Posix data type, Socket addresses, Assigning address to a socket, Java socket programming, Thread programming, Berkeley Sockets: Overview, socket address structures, byte manipulation & address conversion functions, elementary socket system calls – socket, connect, bind, listen, accept, fork, exec, close, TCP ports (ephemeral, reserved), Berkeley Sockets: I/O asynchronous & multiplexing models, select & poll functions, signal & fcntl functions, socket implementation (client & server programs), UNIX domain protocols
.

Unit 2: APIs & Winsock Programming: Windows socket API, window socket & blocking I/O model, blocking sockets, blocking functions, timeouts for blocking I/O, API overview, Different APIs & their programming technique, DLL & new API's, DLL issues, Java Beans.

Unit 3: Web Programming: Java network programming, packages, RMI, Overview of Javascript, WAP architecture & WAP services, Web databases, Component technology, CORBA concept, CORBA architecture, CGI programming.

Unit 4: Firewall & security techniques Cryptography, Digital Signature.

Unit 5: Client/Server Programming: Client side programming: Creating sockets, Implementing generic network client, Parsing data using string Tokenizer, Retrieving file from an HTTP server, Retrieving web documents by using the URL class. Server side programming: Steps for creating server, Accepting connection from browsers, creating an HTTP server, Adding multithreading to an HTTP server.

Books:

1. Steven.W.R: UNIX Network Programming, PHI (VOL I& II)
2. Window Socket Programming by Bobb Quinn and Dave Schutes
3. Davis.R: Windows Network Programming, Addison Wesley
4. NETWORK PROGRAMMING With Windows Socket By Baner .P., PH New Jersey

TOE-630 Business Analytics

M.Tech. Semester –III (Computer Science & Engg.)

L	T	P
3	-	-

Class Work	**:60 Marks**
Exam.	**:90 Marks**
Total	**:150 Marks**
Duration of Exam	**: 3 Hrs**

TOE-631 Industrial Safety
M.Tech. Semester –III (Computer Science & Engg.)

L	T	P		
3	-	-	Class Work	:60 Marks
			Exam.	:90 Marks
			Total	:150 Marks
			Duration of Exam	: 3 Hrs

TOE-632 Operations Research

M.Tech. Semester –III (Computer Science & Engg.)

L	T	P
3	-	-

Class Work	**:60 Marks**
Exam.	**:90 Marks**
Total	**:150 Marks**
Duration of Exam	**: 3 Hrs**

TOE-633 Cost Management of Engineering Projects
M.Tech. Semester –III (Computer Science & Engg.)

L	T	P		
3	-	-	Class Work	:60 Marks
			Exam.	:90 Marks
			Total	:150 Marks
			Duration of Exam	: 3 Hrs

TOE-634 Composite Materials
M.Tech. Semester –III (Computer Science & Engg.)

L	T	P		
3	-	-	Class Work	:60 Marks
			Exam.	:90 Marks
			Total	:150 Marks
			Duration of Exam	: 3 Hrs

TOE-635 Waste to Energy

M.Tech. Semester –III (Computer Science & Engg.)

L	T	P
3	-	-

Class Work	**:60 Marks**
Exam.	**:90 Marks**
Total	**:150 Marks**
Duration of Exam	**: 3 Hrs**

PCS-631 Dissertation-I
M.Tech. Semester –III (Computer Science & Engg.)

L	T	P		
-	-	20	**Class Work**	**:200 Marks**
			Exam.	**:300 Marks**
			Total	**:500 Marks**
			Duration of Exam	**: 3 Hrs**

The student will submit a synopsis at the beginning of the semester for approval to Dissertation evaluation committee in a specified format. The student will have to present the progress of the work through seminars and progress report. A report must be submitted to the committee for evaluation purpose at the end of the semester in a specified format.

Distribution of Credits for Dissertation shall be as follows.

1) Selection of Topic and Work-Plan, Mid-Semester presentation and Pre- Submission Presentation - 200 Marks
2) Final Viva- Voce Examination -300 Marks

PCS-641 Dissertation-II
M.Tech. Semester –IV (Computer Science & Engg.)

L	T	P		
-	-	28	**Class Work**	**:300 Marks**
			Exam.	**:400 Marks**
			Total	**:700 Marks**
			Duration of Exam	**: 3 Hrs**

Distribution of Credits for Dissertation shall be as follows.

1) Mid-Semester presentation andPre- Submission Presentation - 300 Marks
2) Final Viva- Voce Examination - 400 Marks

A student is required to submit **Three** copies of bound report of the dissertation after pre-submission presentation to office of Head duly signed by his/her supervisor.

PCS-642 Seminar
M.Tech. Semester –IV (Computer Science & Engg.)

L	T	P		
-	-	4	**Class Work**	**:100 Marks**
			Exam.	**:Zero Marks**
			Total	**:100 Marks**
			Duration of Exam	**: 3 Hrs**

Concerned Teachers/Experts in the selected area must be identified by a student for approval of the topic. A student is required to submit **Three** copies of bound report of the seminar **One** week before the presentation to office of Head/Concerned faculty (examiner) appointed by the Head.