R.K.D.F. UNIVERSITY, BHOPAL

M.Tech. **(Computer Science & Engineering)**

FIRST YEAR

Semester – I

Course Content & Grade

Branch	Subject Title	Subject Code
CSE	Mathematical Foundations of Computer Science	MTCS-101

UNIT-I

Discrete Structures -- Sets, Relations and Functions; Proof Techniques, Algebraic Structures, Morphisms, Posets, Lattices and Boolean Algebras. Logic -- Propositional calculus and Predicate Calculus , Satisfiabiliy and validity, Notions of soundness and completeness Languages.

UNIT-II

Automata Theory -- Chomsky Hierarchy of Grammars and the corresponding acceptors, Turing Machines, Recursive and Recursively Enumerable Languages; Operations on Languages, closures with respect to the operations.

UNIT-III

Computability -- Church-Turing Thesis, Decision Problems, Decidability and Undecidability, Halting Problem of Turing Machines; Problem reduction (Turing and mapping reduction).

UNIT-IV

Computational Complexity -- Time Complexity -- Measuring Complexity, The class P, The class NP, NP-Completeness, Reduction, co-NP, Polynomial Hierarchy. Space Complexity -- Savichs Theorem, The class PSPACE

UNIT-V

Operations of fuzzy sets, fuzzy arithmetic & relations, fuzzy relation equations, fuzzy logics. MATLAB introduction, programming in MATLAB scripts, functions and their application.

Text Books and References:

1. J.P. Trembley and R. Manohar-- Discrete Mathematical Structures with Applications to Computer Science, McGraw Hill Book Co.
2. Michael Sipser -- Introduction to The Theory of Computation, Thomson Course Technology
3. John E. Hopcroft and J.D.Ullman -- Inrtroduction to Automata Theory, Languages and Computation, Narosa Pub. House, N. Delhi.
4. H.R. Lewis and C.H.Papadimitrou -- Elements of the Theory of Computation, Prentice Hall, International, Inc.
5. Fuzzy Logic in Engineering by T. J. Ross
6. Fuzzy Sets Theory & its Applications by H. J. Zimmersoms

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FIRST YEAR

Semester – I

Course Content & Grade

Branch	Subject Title	Subject Code
CSE	Pattern Recognition	MTCS-102

UNIT-I

Pattern recognition overview: Pattern recognition, Classification and Description—Patterns and feature Extraction with Examples—Training and Learning in PR systems—Pattern recognition Approaches—Other Approaches to PR.

UNIT-II

Statistical pattern recognition: Introduction to statistical Pattern Recognition—supervised Learning using Parametric and Non Parametric Approaches.

UNIT-III

Linear discriminant functions and unsupervised learning and clustering: Introduction—Discrete and binary Classification problems—Techniques to directly Obtain linear Classifiers -- Formulation of Unsupervised Learning Problems—Clustering for unsupervised learning and classification.

UNIT-IV

Neural pattern recognition : Introduction to Neural networks—Feedforward Networks and training by Back Propagation—Content Addressable Memory Approaches and Unsupervised Learning in Neural PR.

UNIT-V

Syntactic pattern recognition: Overview of Syntactic Pattern Recognition—Syntactic recognition via parsing and other grammars–Graphical Approaches to syntactic pattern recognition—Learning via grammatical inference.

Text Books and References:

1. Robert Schalkoff, “pattern Recognition: statistical , structural and neural approaches, John wiley & sons , Inc,1992.
2. Earl Gose, Richard johnsonbaugh, Steve Jost, Pattern Recognition and Image Analysis, Prentice Hall of India,.Pvt Ltd, new Delhi.
3. R.O.Duda, P.E.Hart & D.G Stork, Pattern Classification 2nd Edition, J.Wiley Inc 2001.

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FIRST YEAR

Semester – I

Course Content & Grade

Branch	Subject Title	Subject Code
CSE	High Performance Computer Architecture	MTCS-103

UNIT-I

Introduction: review of basic computer architecture, quantitative techniques in computer design, measuring and reporting performance.

UNIT-II

CISC and RISC processors. Pipelining: Basic concepts, instruction and arithmetic pipeline, data hazards, control hazards, and structural hazards, techniques for handling hazards. Exception handling.

UNIT-III

Pipeline optimization techniques. Compiler techniques for improving performance. Hierarchical memory technology: Inclusion, Coherence and locality properties; Cache memory organizations, Techniques for reducing cache misses; Virtual memory organization, mapping and management techniques, memory replacement policies.

UNIT-IV

Instruction-level parallelism: basic concepts, techniques for increasing ILP, superscalar, super-pipelined and VLIW processor architectures. Array and vector processors. Multiprocessor architecture: taxonomy of parallel architectures.

UNIT-V

Centralized shared-memory architecture: synchronization, memory consistency, interconnection networks. Distributed shared-memory architecture. Cluster computers. Non von Neumann architectures: data flow computers, reduction computer architectures, systolic architectures.

Text Books and References:

1. John L. Hennessy and David A. Patterson, Computer Architecture: A Quantitative Approach, Morgan Kaufmann.
2. John Paul Shen and Mikko H. Lipasti, Modern Processor Design: Fundamentals of Superscalar Processors, Tata McGraw-Hill
3. M. J. Flynn, Computer Architecture: Pipelined and Parallel Processor Design, Narosa Publishing House
4. Kai Hwang, Advanced Computer Architecture: Parallelism, Scalability, Programmability, cGraw-Hill.

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FIRST YEAR

Semester – I

Course Content & Grade

Branch	Subject Title	Subject Code
CSE	Advance Algorithm Design & Analysis	MTCS-104

UNIT-I

Introduction and basic concepts complexity measures, worst and average case complexity functions, problem complexity. Algorithm design principles : divide and conquer and recursive algorithms, greedy method, dynamic programming.

UNIT-II

Sorting And Selection Problems : -Finding maximum, minimum and minimum K largest elements in order and sorting by selection, lower bounds.

UNIT-III

Searching and set manipulation – Path lengths in binary trees, optimality of binary search in worst-case and average-case.

UNIT-IV

Union-Find Problems – Tree representation of set weighted union and path compression – analysis and application.

UNIT-V

Algebraic Problems – Winograd's and Strassen's matrix multiplication algorithms and applications to related problems.

Text Books and References:

1. Horowitz, Sahni, Rajasekaran, "Computer Algorithms", Galgotia,
2. Aho, Hopcroft, Ullman, "Data Structures and Algorithms", Pearson Education P
3. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Pearson P
4. Gilberg, Data structures Using C++, Cengage
5. Tanenbaum A.S., Langram Y, Augestien M.J., "Data Structures using C & C++",Prentice Hall of India, 2002

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FIRST YEAR

Semester – I

Course Content & Grade

Branch	Subject Title	Subject Code
CSE	Distributed Systems	MTCS-105

UNIT-I

Overview of distributed file system: Introduction to distributed file system-Design issues of DFS-Trends in distributed file system-Peer to Peer networks-characteristics of peer to peer networks.

UNIT-II

Designing file system in distributed networks: Designing Distributed file system(DFS)-DFS Scenarios-Features of DFS-Feature requirement of DFS-Design process of DFS.

UNIT-III

Concepts related to file sharing in manet : Issues in sharing files in MANET-Data replication-Issues in data replication-Pessimistic replication-primary copy tokens ,voting-Optimistic replication- replica state ,version ,time stamping—advantages of optimistic replication-Replication models-Master slave model ,Client server model ,peer to peer model.

UNIT-IV

Performance issues of file sharing in manet: System model-mobility patterns-assumptions-File accessing-file replica management-replica replacement policies-Maintaining replacement consistency-Performance issues-performance metrics-Factors affecting performance.

UNIT-V

Related work: A special purpose peer to peer file sharing system for MANET-A distributed service discovery model for MANET-Peer to Peer file sharing over MANET-,Efficient peer to peer information sharing over mobile ad hoc networks-Cluster based replication for large scale MANET-Trusted application centric ad hoc networks.

Text Books and References:

1. Andrew S Tanenbaum, "Distributed Operating Systems ", Pearson Education India, 2001
2. Mukesh Singhal , Niranjan G Shivratri, "Advanced Concepts in Operating Systems", McGraw Hill International, 1994.
3. Pradeep K Sinha, "Distributed Operating Systems Concepts and Design ", PHI, 2002
4. A Distributed File System for Mobile Ad-hoc Networks Jo˜ao Pedro Faria Mendon¸ca Barreto (Licenciado) funded by Microsoft research
5. Hassan Artail1, Member, IEEE, Khaleel Mershad, and Hicham Hamze," DSDM: A Distributed Service Discovery Model for MANETS",IEEE Transcations on Parallel and Distributed Systems,March 2008.

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FIRST YEAR

Semester – II

Course Content & Grade

Branch	Subject Title	Subject Code
CSE	Advanced Computer Networking	MTCS-201

UNIT-I

Introduction to computer networks; telephone networks, networking principles; multiple access, multiplexing FDM, TDM, SM; local area networks Ethernet, token ring, FDDI.

UNIT-II

Switching circuit switching, packet switching, multicasting; scheduling performance bounds, best effort disciplines, naming and addressing, protocol stack, SONET/SDH; ATM networks AAL, virtual circuits, SSCOP.

UNIT-III

Internet addressing, routing, end point control; Internet protocols IP, TCP, UDP, ICMP, HTTP; traffic management models, classes, scheduling.

UNIT-IV

Control of networks QoS, static and dynamic routing, Markov chains, queuing models, Bellman Ford and Dijkstra's algorithms, window and rate congestion control, large deviations of a queue and network, open and closed loop flow control, control of ATM networks. Mobile IP, Voice over IP (VoIP), VPNs, Network Security.

UNIT-V

Congestion Control: Control vs. Avoidance, Overview of Algorithms, Congestion in the Internet. Management: Quality of Service (QoS), network vs. distributed systems management, Protocols, web based management. Special topics in design of computer networks.

Text Books and References:

1. J. Walrand and P. Varaya, High Performance Communication Networks, Harcourt Asia (Morgan Kaufmann), 2000.
2. S. Keshav, An Engineering Approach to Computer Networking, Pearson Education, 2004 L. Garcia and I. Widjaja, Communication Networks: Fundamental Concepts and Key Architectures, Tata McGraw Hill, 2000.
3. J. F. Kurose and K. W. Ross, Computer Networking:A Top Down Approach Featuring the Internet, Pearson Education, 2001.

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FIRST YEAR

Semester – II

Course Content & Grade

Branch	Subject Title	Subject Code
CSE	Real Time Systems	MTCS-202

UNIT-I

Introduction, Modeling Timing constraints, Scheduling Real-Time Tasks: Types of Schedulers.

UNIT-II

Table-driven, Cyclic, EDF, RMA, Handling Resource sharing among real-time tasks, Scheduling Real-Time Tasks in Multiprocessor and Distributed systems

UNIT-III

Commercial Real-time operating systems: General concepts, Unix and Windows as RTOS, Real-time middleware

UNIT-IV

Survey of commercial RTOS, Real-Time Communication , Real-time channel, Packet scheduling, Real-Time MAC protocols.

UNIT-V

Real-Time Databases, Architecture and software engineering issues, Case studies

Text Books and References:

1. Rajib Mall, "Real-Time Systems: Theory and Practice," Pearson, 2008.
2. Jane W. Liu, "Real-Time Systems" Pearson Education, 2001.
3. Krishna and Shin, "Real-TIme Systems," Tata McGraw Hill. 1999.

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FIRST YEAR

Semester – II

Course Content & Grade

Branch	Subject Title	Subject Code
CSE	Advance Soft Computing	MTCS-203

UNIT-I

Fundamental Concepts: - Introduction to Artificial Neural Networks (ANN). Learning Process: - error–correction learning, Hebbian learning, competitive learning, Boltzmann learning, the credit-assignment problem, supervised learning, and other learning techniques.

UNIT-II

Single neuron/ Perceptron networks: - training methodology, typical application to linearly separable problems. Multilayer Perceptron: - Back propagation algorithm, virtues and limitation of BP algorithm, modifications to back-propagation.

UNIT-III

Radial-basis function Networks – interpolation problem, Covers theorem, regularization networks, applications. Recurrent Networks.

UNIT-IV

Introduction to Fuzzy systems, Membership function, Fuzzy relational operation, fuzzy IF THEN rules, Sugeno and Mamdani type systems, Adaptive Neuro-Fuzzy sytems, training methods.

UNIT-V

Application of ANN and Fuzzy systems to non-stationary time series prediction; pattern classification; control; communication engineering; system identification and pattern classification.

Text Books and References:

1. S. Haykin, Neural Networks, A Comprehensive Foundation; Pearson Education, India (The book is also published by Prentice Hall of India), 2008 (ISBN- 81-203-2373-4).
2. M. T. Hagan, Howard B. Demuth, Mark H. Beale, Neural Network Design; (ISBN: 0-9717321-0 8); Thomson 2002
3. Jang, Sun and Mizutani, Neuro-Fuzzy and Soft-Computing – A computational approach to learning and machine intelligence; Prentice Hall of India; ISBN-81-203-2243-6

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FIRST YEAR

Semester – II

Course Content & Grade

Branch	Subject Title	Subject Code
CSE	**Distributed And Parallel Databases**	**MTCS-204**

UNIT-I

Introduction: Parallel database system, Distributed database system, Architectures for Parallel Databases, Parallel Query Evaluation, Data Partitioning,

UNIT-II

Parallelizing Sequential Operator Evaluation Code, Parallelizing Individual Operations, Bulk Loading and Scanning, Sorting, Joins.

UNIT-III

Distributed Databases, Introduction to DBMS, Architecture of DDBs, Storing data in DDBs, Fragmentation, Replication, Distributed catalog management, Distributed query processing,

UNIT-IV

Distributed concurrency control and recovery: Concurrency Control and Recovery in Distributed Databases, Lock management can be distributed across sites in many ways.

UNIT-V

Distributed Deadlock, Distributed Recovery.

Text Books and References:

1. Raghu Ramakrishnan, Johannes Gerhke, “Database Management Systems” McGraw Hill.
2. Decision support & database system –Efrem G. Mallach.
3. Datawarehousing fundamental – Paulraj Ponniah Wiley.
4. Introduction to data mining with case studies – G.K. Gupta.
5. Elmasri and Navathe, “Fundamentals of Database Systems”, Person Education.
6. Korth, Silberchatz, Sudarshan, “Database System Concepts” Mc Graw Hill.
7. Peter Rob and Coronel, “Database Systems, Design, Implementation and Management”, Thomson Learning.
8. Data Warehousing (OLAP) S. Nagabhushana New Age.

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FIRST YEAR

Semester – II

Course Content & Grade

Branch	Subject Title	Subject Code
CSE	Advance Network Security	MTCS-205

UNIT-I

Introduction to cryptography**:** Attacks, Services, and Mechanisms, Security Attacks, Security Services, A Model for Internet work Security.

UNIT-II

Conventional Encryption: Classical and Modern Techniques, Conventional Encryption: Algorithms Triple DES, International Data Encryption Algorithm, Blowfish, RC5, CAST, RC2, Characteristics of Advanced Symmetric Block Ciphers.

UNIT-III

Confidentiality Using Conventional Encryption**:** Placement of Encryption Function, Traffic Confidentiality, Key Distribution, Random Number Generation.; Public-Key CryptographyPrinciples of Public-Key Cryptosystems, The RSA Algorithm, Key Management, Diffie-Hellman Key Exchange, Elliptic Curve Cryptography.

UNIT-IV

Message Authentication and Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Security of Hash Functions and MACs.

UNIT-V

Hash and Mac Algorithms (MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA-l), RIPEMD, HMAC), Digital Signatures and Authentication Protocols and Web Security.

Text Books and References:

1. W. Stalling, Cryptography and Network Security: Principles and Practices, 4th Ed, 2005
2. B. A. Forouzan, Cryptography and Network Security, McGraw Hill, 2nd Ed, 2004.
3. J. Hershey, Cryptography Demystified, McGraw Hill, 2003
4. R E Smith, Internet Cryptography, Addison Wesley
5. J. Knudsen, Java Cryptography, O'Reilly, 1998.

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SECOND YEAR

Semester – III

Course Content & Grade

Branch	Subject Title	Subject Code
CSE	**Fault Tolerant Computing Systems**	**MTCS-301**

UNIT-I

Introduction: Computer and Computation Distribution, System models and Fault models. Test generation for combinational circuits, sequential circuits and Fault simulation.

UNIT-II

Fault Tolerance Concepts- Recovery in time, Fault detection techniques, Modeling Faulttolerant systems - Rollback modular redundancy and Exception Handling.

UNIT-III

Fault Tolerant in Real time Systems - Architecture of Fault - tolerant computers generalpurpose commercial systems - High availability systems - Critical computations

UNIT-IV

Fault Tolerant multiprocessor - Communication Architectures, Shared memory

UNIT-V

Interconnections, loop architectures, Tree Networks, Graph Network and in Binary cube interconnection. Fault Tolerant Software - **Design** of fault Tolerant software - Reliability Models, Construction of acceptance tests, validation of Fault tolerant software.

Text Books and References:

1. Israel & Krishnan, "Fault Tolerant Systems" Elsevier Publications, 2007.
2. D. K. Pradhan, "Fault Tolerant computing - Theory and Techniques "Prentice Hall.Inc.1986.
3. Levi & Agrawala, "Fault Tolerant Systems Design, McGraw hill, 1994.
4. MA. Breuer and A.D.Friedman, "Diagnosis and Reliable design of Digital Systems", Computer Sci. Press, 1976.

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SECOND YEAR

Semester – III

Course Content & Grade

Branch	Subject Title	Subject Code
CSE	Statistical Data Mining	MTCS-302

UNIT-I

Introduction to Data mining: Motivation for Data Mining, its importance, Role Data in Data Mining, Data Mining functionalities, patterns in data mining.

UNIT-II

Type of patterns, Classification of Data Mining Systems, Major issues in Data Mining; Data Warehousing and OLTP technology for Data Mining, Data Mining Languages, and System Architectures.

UNIT-III

Concept Description: Characterization and Comparison, Mining Association Rules in Large Databases, Classification and Prediction, Cluster Analysis, Mining Complex Data.

UNIT-IV

Applications and Trends in Data Mining Characteristics of data warehouse, Data Mart, Online Analytical Processing, OLAP tools, Data warehouse Architecture, Organizational Issuer.

UNIT-V

Tools for Data warehousing, Performance consideration, case studies. Special topics in data mining and data ware housing.

Text Books and References:

1. J. Han & M. Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann, 2nd Ed,2006.
2. M. J. A. Berry and G. Linoff, Mastering Data Mining: The Art and Science of Customer Relationship Management, Wiley Computer Publishing, 2000.
3. P. Adriaans & D. Zantinge, Data Mining, Addison Wesley, 1996.
4. R. Mattison, Data Warehousing: Strategies, Tools and Techniques, Mc Graw Hill, 1996.
5. P. Ponniah, Data Warehousing Fundamentals: A Comprehensive Guide for IT Professionals,Wiley, 2001.

THESIS PHASE-I (MTCS 303)
(Literature Survey/Problem Formulation)

THESIS PHASE-II (MTCS 401)