

Syllabus

M. Tech in Computer Science & Engineering

PG-CSE1-01	High Performance Computer Architecture	4-0-0	4
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Introduction : review of basic computer architecture, quantitative techniques in computer design, measuring and reporting performance. CISC and RISC processors, Pipelining, Basic concepts, instruction and arithmetic pipeline, data hazards, Exception handling, 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, Instruction-level parallelism, basic concepts, techniques for increasing ILP, super scalar, super pipelined and VLIW processor architectures, Array and vector processors, 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, reduction computer architectures, systolic architectures.

PG-CSE1-02	Advances in Operating System Design	4-0-0	4
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Theory and implementation aspects of distribute operating system. Process synchronization in multiprocessing / multiprogramming system. Inter-process communication and co-ordination in large distributed systems. Distributed resource management. Fundamentals of real time operating systems. Case studies, Information management in distributed systems, security, integrity and concurrency problems. Fault tolerance issues. OS issue, related to the internet, intranets, pervasive computing, embedded systems, mobile systems and wireless networks. Case studies of contemporary operating systems.

PG-CSE1-03	Object Oriented Systems	4-0-0	4
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Review of programming practices and code-reuse; Object model and object-oriented concepts; Object-oriented programming languages and implementation; Object-oriented analyses and design using UML structural, behavior and architectural modeling \, Unified development process, Software reuse design patterns, components and framework; Distributed object computing, interoperability and middleware standards COM/DCOM and COBRA; Object-oriented database system data model, object definition and query language, object-relational system.

PG-CSE1-04/1	Artificial Intelligence and Expert System Design	4-0-0	4
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Overview of history and goals of AI: Tentative definitions. Turing's test, knowledge Vs. Symbolic Level, Relations with other disciplines from Philosophy, to Linguistic to Engineering, Review of AI successes and failures.

State Spaces, Production System and Search: State Space representation of problems, Problem solving search, Constraints, Definition and examples of Production Systems, Heuristic search techniques, Two person games.

Knowledge representation Issues: Procedural Knowledge Representation Vs. Declarations Knowledge + reasoning, Facts, General Assertions, Meta knowledge, The Frame Problem.

Using First-Order logic for Knowledge Representation: Propositional Logic, Semantics and Deduction, first Order Logic: Semantic and Deduction. Unification. Resolution-based theorem proving. Using theorem proving to answer questions about the truth of sentences or to identify individuals that satisfy complex constraints, Logic Programming.

Weak Slot-and-Filler Structures: Semantic Nets and Frames, Scripts for representing prototypical combination of events and actions.

Rule-Based Systems: Pattern-matching algorithms. The problem of Control in Rule based Systems. The Rete Algorithm.

Statistical Reasoning: Use of Certainty factors in Rule Based Systems. Associating probabilities to assertions in first-order logic, Bayesian Networks, Fuzzy logic.

Learning: Learning to classify concepts using features of their instances, Learning a concept (Introduction) from examples. Explanation-Based Learning. Version Spaces, Neural Nets with back propagation.

Introduction to Expert Systems: Definition why build an expert system, application areas of expert system and how are expert systems used. Characteristics of Expert Systems, Structure of expert system, characteristics and phases and people involved in building an expert systems, Inference Techniques, Types of reasoning deductive, inductive, abductive, analogical, common-sense and non-monotonic, types of inference forward and backward chaining, search techniques, depth-first search, breadth-first search and best-first search.

Rule-Based Expert Systems: Evolution, architecture of rule-based expert system, examples of rule-based systems, backward chaining and forward chaining rule based systems and task on designing backward and forward chaining rule based system. Approach to Inexact Reasoning, Probability theory, Bayesian theory: example, variation and Prospector: an expert system application that employed Bayesian approach , Certainty theory: overview uncertain evidence, uncertain rules, uncertain inferencing certainty factor and certainty factor example program.

Fuzzy Logic : Overview a fuzzy logic, forming fuzzy set representation, hedges, set operations, inference of fuzzy logic and building a fuzzy logic expert system. Frame-Based Expert Systems: Overview, anatomy of a class, subclass, instance properties, inheritance, facts, methods, encapsulation, rules interaction with objects and design methodology for frame-based system. Define problem, analyze domain, define classes, instances , rules and object communications, design interface, evaluate system and expand system.

PG-CSE1-04/2	Data Warehousing & Mining	4-0-0	4
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Data Mining & Data Warehousing : Introduction to data mining, data Warehousing , Introduction to KDD process, Classifications and algorithms, Data mining tasks, Machine Learning- Basic-Concept, Data Warehouse Architecture , Data modeling.

Data marts & olap : Data Mart Designing, data mart builder, Data Mart Discovery, On-line analytical processing , OLTP VS. DW Environment.

Relationship of data mining and data warehousing : Application of Data Mining, Application of Data Ware housing, A relation between Data Mining and Data Warehousing according to need of business.

Stastical analysis and cluster analysis : What is statistics ? Difference between statistics and data mining , Histograms, Statistic for predictions, clustering for clarity, Hierarchical and Non-Hierarchical clusters, Choosing classics.

Neural networks & mining complex: What are neural Networks? Where to use these Networks?
Benefits and features of Networks, Rule Induction, various mining complexities.

Next generation of informatics mining & knowledge discovery : Business Intelligence and Information Mining .Text mining, Knowledge Management, Benefits and Products of Text Mining, Customer Relationship Management in the e-Business World.

Books and References:

1. Data Mining.
By Pieter Adriaans
2. Data mining Technology for Marketing ,Sales and Customer Support.
By Michel Berry.
3. Data Warehousing & Data Mining for Telecommunication
By Rob Maltison
4. Distributed Data Warehousing using Web Technology
By R.A. Moeller.
5. Building Data Mining Application for CRM
By Alex Berson

PG-CSE1-05/1	Neural Network & Fuzzy System	4-0-0	4
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Introduction to Biological Neural Networks : Neuron physiology, Neuronal diversity, specification of the brain, the eye's Neural Network.
Artificial Neural Network Concepts: Neural attributes, Modeling learning in ANN, characteristics of ANN, ANN topologies, learning algorithm, the stability-plasticity dilemma.

Neural Network Paradigm: McCulloch-Pitts, Model, the perception, Winner-Take-All learning Algorithm, Back-propagation learning algorithm. Adaptive Resonance (ART) paradigm, Hopfield Model, Competitive learning Model \, Memory-type Paradigm, Linear Associative Memory, Real-Time Models, LVQ, SOM, Probabilistic Neural Network.

Introduction to Fuzzy sets: Fuzzy set theory Vs Probability Theory, classical set theory, properties of Fuzzy sets, Operation on Fuzzy sets. Fuzzy relations, Operations of Fuzzy relation, the extension principle.

Fuzzy Arithmetic, Approximate reasoning: Introduction, linguistic variables, Fuzzy proposition, Fuzzy if-then rules.

Representing a set Rules: Mamdani Versus Godel, properties of a set of Rules.

Fuzzy Knowledge base Control, Fuzzy Networks, Applications of Fuzzy logic & Neural Networks, Fuzzy Neural Networks.

PG-CSE1-05/2	Real Time Systems	3-0-0	3
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Introduction to real time system, embedded systems and reactive systems. Hard and Soft Real Time Systems, Handling real time, Specification and Modeling, Design methods, Real Time operating systems, Validation and Verification, Real time Process and Applications, Distributed Real Time Systems.

PG-CSE1-05/3	Mobile Computing	4-0-0	4
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Introduction: A short history of wireless communication, A market for mobile communication, A simplified reference model.

Wireless transmission : Frequencies for radio transmission, Single, Antennas, Signal propagation, Multiplexing , Modulation, Spread spectrum, Cellular systems.

Medium access control: Motivation for a specialized MCA, SDMA, FDMA, TDMA, CDMA, Comparison of S/T/F/CDMA.

Telecommunication system: GSM, DECT, TETRA, UMTS, and IMT-2000,

Satellite systems: History, Application, Basics, Routing , Localization.

Broadcast systems : Overview, Cyclical repetition of data, Digital audio broadcasting, Digital video broadcasting, Convergence of broadcasting, and mobile communication.

Wireless LAN : Intra red vs. radio transmission, infrastructure and ad-hoc network, IEEE 802,11, HIPERLAN, Blue tooth.

Mobile network layer : Mobile IP, Dynamic host configuration protocol, Mobile ad-hoc network.

Mobile transport layer : Traditional TCP, Classical TCP improvement, TCP over 2.5/3G wireless network, Performance enhancing proxies.

Support for mobility : File systems, World wide web, Wireless application protocol (version 1.x), I-mode, SyncML , WAP 2.0.

Books and References:

Mobile Communication, 2nd edition, Jochen Schiller.

Mobile Commerce & Wireless Computing Systems, Geoffrey Elliott, Nigel Phillips. @ 2004.

Wireless Communication and Network , William Stallings, @ 2002, Prentice Hall.

The Essential Guide to wireless Communication Application, 2/E, Andy Dorman, , @ 20002, Prentice Hall PTR.

Principles of wireless Network : A Unified Approach, Kaveh Pahlavan, Prashant Krishnamurthy, @ 2002, Prentice Hall PTR.

Ad Hoc Wireless Network : Architectures and Protocols, C. Siva Ram Murthy, B. S. Manoj, @ 2004, Prentice Hall PTR.

Fixed and mobile Telecommunication: Network System, and Services, Second Edition, Jan van Duuren, Peter Kastelein, Frits C. Schoute.

Real 802, 11 Security : Wi-Fi Protected Access and 802.11, Jon Edney William Arbaugh, 2003.

Mobile Commerce & Wireless Computing Systems, Geoffrey Elliot, Nigel Phillips, @ 2004, Addison-Wesley.

Mobile Ipv6, Hesham Soliman, @ 2004, Addison Wesley Professional.