MAHAMAYA TECHNICAL UNIVERSITY

NOIDA

SYLLABUS

OF

M.TECH COMPUTER SCIENCE

Appendix-I: Study and Evaluation Scheme

UPTU M.Tech – CS/IT

SEMESTER-I

S.No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total
						Sessional			ESE	
		Theory	L	T	Lab	CT	TA	Total	Total	
1.	CS/IT 11	Foundations of Computer Science	3	1		20	30	50	100	150
2.	CS/IT 12	Computer Organization and Architecture	3	1		20	30	50	100	150
3.	CS/IT 13	OS and DBMS	3	1	2	20	30*	50	100	150
4.	CS/IT 14	Data Networks	3	1	2	20	30*	50	100	150
		Total	**12**	**4**	**4**			**200**	**400**	**600**

UPTU M.Tech – CS/IT

SEMESTER-II

S.No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total
						Sessional			ESE	
		Theory	L	T	Lab (*)	CT	TA	Total	Total	
1.	CS/IT 2xy	Elective-1	3	1		20	30*		100	150
2.	CS/IT 2xy	Elective-2	3	1		20	30*		100	150
3.	CS/IT 2xy	Elective-3	3	1		20	30*		100	150
4.	CS/IT 2xy	Elective-4	3	1		20	30*		100	150
		Total	**12**	**4**					**400**	**600**

*30 Marks are kept for tutorials: assignments quizzes and lab

**Refer the list of streams and their respective courses for the values of x and y

(*) The existence of 2 period of lab for elective will be decided as per the nature of the elective.

UPTU M.Tech – CS/IT

SEMESTER-III

S.No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total
						Sessional			ESE	
		Theory	L	T	Lab (*)	CT	TA	Total	Total	
1.	CS/IT 3xy *U	Elective-5	3	1		20	30*	50	100	150
2.	CS/IT 3xy **	Elective-6	3	1		20	30*	50	100	150
3.	CS/IT 31	Professional Aspect in Software Engineering	2			50		50		50
4.	CS/IT 32	Seminar						50		50
5.	CS/IT 33	Dissertation						100		100
		Total	**8**	**2**				**300**	**200**	**500**

*30 Marks are kept for tutorials: assignments quizzes and lab

**Refer the list of streams and their respective courses for the values of x and y

(*) The existence of 2 period of lab for elective dissertation will be decided as per the nature of the dissertation.

UPTU M.Tech – CS/IT

SEMESTER-IV

S.No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total
						Sessional			ESE	
		Theory	L	T	Lab (*)	CT	TA	Total	Total	
1.	CS/IT 41	Dissertation						100	200	300
		Total						**100**	**200**	**300**

(*) The existence and duration of lab will be decided as per the nature of the dissertation

Stream	Subject	Value of xy for subject code	Prerequisite Elective Subject
(CS) Distributed System	Distributed Computing	11	
	Mobile Computing	12	
	Analysis & Design of Real Time System	13	
	Dedicated System Design	14	
	VLSI Design	15	
(IT) Software Engineering	Engineering and Testing Structured Systems	21	
	Object-Oriented Programming	22	
	Engineering Object Oriented System	23	OOP
	Multimedia System	24	
	Internet Programming and Web Service Engineering	25	
(IT) Information System	Conceptual modeling	31	
	Requirements Engineering	32	ETSS/CM
	Method Engineering	33	ETSS/CM
	Process Engineering	34	ETSS
	Simulation and Modeling	35	
(IT) Data Management	Distributed DBMS	41	
	Data Warehousing	42	
	Multimedia Database	13	
IT	AT	51	
	Data Mining	52	AI
	Knowledge Based System	53	AI
	Natural Language Processing	54	AI
Theoretical CS	Parallel Algorithms	61	
	Randomized Algorithms	62	
	Approximation Algorithms	63	
	Complexity Theory	64	
	Computational Geometry	65	
Security	Cryptography	71	
	Network and System Security	72	Cryptography
	Digital forensic	73	Cryptography

NOTE: The students are required to courses from at least three streams.

CS students have to select at least one course each from theoretical CS and from Distributed System.

IT students have to select at least one course each from Software Engineering information system and Data Management.

Appendix-II: Streams and their Courses

1. Distributed Stream
Distributed Computing

Basic Concepts **6 Hours**

Characterization, Resource Sharing, Internet Implementations, name Resolution, DNS

Computation: Full Synchronism and Full Synchronism, Computation on Anonymous Systems, Events, Orders, Global States, Complexity

Distributed Synchronization **8 Hours**

Processes and Threads, IEEE POSIX

Mutual Exclusion Classification, Algorithms Mutual Exclusion in Shared Memory; Clock Synchronization, NTP Distributed Deadlock: Detection Methods Prevention Methods, Avoidance Methods.

BSD Sockets **8 Hours**

TCP/IP Model BSD Sockets Overview, TCP Sockets and Client/Server, UDP Sockets and Client/Server, Out of Band Data, Raw Socket, PING & TRACE ROUTE Programs, Routing, Multicasting using UDP Sockets.

Distributed OS **10 Hours**

Communication between distributed objects RPC Model and Implementation Issue, Sun RPC, Events and Notifications Java RMI and its Applications.

CORBA Architecture Introduction and Applications

Distributed Databases **8 Hours**

Introductions, Structure, Java Models, Query Processing, Transactions, Nested Transactions, Atomic Commit Protocols, Transaction Recovery, Transaction with replicated data, Concurrency Control Method Distributed Deadlocks.

References:

1. Lanenbaun “Distributed System pearson
2. W Richard Stevens. UNIX Network Programming Vol 1 & 2 Pearson
3. Sinha, “Distributed Algorithm MIT Press
4. Barbosa, “Distributed Algorithm MIT Press
5. Ceri Palgatti “ Distributed Database McGraw-Hill.

Mobile Computing

Introduction **8 Hours**

Basic Concepts, Principles of Cellular Communication, Overview of IG, 2G, 2.5G, 3G and 4G technologies, GSM and CDMA Architecture, Mobility Management, Mobile Devices: PDA, Mobile OS: Palm, OS, Mobile Linux

Process Migration **8 Hours**

Kernel Support for Migration Mobility Enhancement in Modern UNIX Systems, Transparent Process Migration Design Alternatives, Removing Process Migration Bottlenecks, Task Migration Issues

User Space support for Migration: Check pointing. Process Migration

Data Issues **8 Hours**

Workload Balancing Strategies in migration, Process lifetime distributions for dynamic load balancing Disconnected Operations in Coda File System Weak Connectivity for Mobile File Access, Weakly Connected Replicated Storage System.

Mobile Data Networking **8 Hours**

Mobile IPv4 and Mobile Pv6. Mobile Internetworking Architecture. Internet Mobility issues Rout Optimization Performance of Wireless TCP GPRS Services. IP Over CDMA.

Mobile Agents **8 Hours**

Basic Concepts, OS support for Mobile Agents, Java Aglet API, AGENT TCL, Network Aware Mobile Programs, Mobile Objects and Agent OMG MASIF Framework. Mobile Agent Security Issues.

References:

1. Richard Wheeler, “Mobility Processes, Computers and Agents
2. Charles Perkins “Mobile II” Design Principles and Practices” Pearson
3. Tomasz Imielinski “ Mobile Computing”, Springer Veriag

Analysis and Design of Real-Time Systems

Basic Concepts **6 Hours**

IEEE Definition of Real-Time System. Characterization of Real-Time Systems. Process. IEEE POSIX ic Threads, Tasks and Priorities Pre-emptive and Non-Preemptive Task. Soft and Hard Real-Time System

Scheduling **10 Hours**

Scheduling Paradigms Priority Driven. Time Driven and Share Driven

Priority Driven Scheduling of Periodic. Aperiodic and Sporadic tasks.

Static Priority Scheduling: Rate Monotonic Scheduling Algorithm and its exact analysis using Response Time Test

Dynamic Priority Scheduling: Analysis of EDF and ULF Algorithms and their open issues.

Specification and Verification **10 Hours**

Modeling Real Time System, Requirement Specification, Assumptions. Design, Basic Duration, Specification of Scheduling Polices, Probabilistic Duration Calculus, Applications of Duration Calculus.

RTOS **8 Hours**

Introduction, Requirement Real-Time Guarantees in industrial applications, Soft and I hard RTOS , Commercial RTOS Examples.

IEEE POSIX ib: Priority Scheduling. Real-Time Signals Timer, Binary Semaphores, Counting Semaphores, MUTEX operations and usage. Message Passing. Message Queues operations and usage, Shared Memory Synchronous and Asynchronous I/O. Memory Locking.

Application: **6 Hours**

Real-Time Application Design, Real-Time Application Interface (RTAI) Real-Time Java. Real-Time Communications and Networking.

References :

1. JWSI “Real-Time Systems” Pearson
2. Joseph. “Real-Time Systems Specification Verification , Prentree – Hall
3. Krishna, Shin, “Real Time System” TMH
4. Wellings “Real-Time Systems and Programming Language.

Dedicated System Design

Review of Digital Computer & Digital Arithmetic **8 Hours**

Algorithm and Algorithmic Notation, Timing, Synchronization and Memory Fixed and Floating point Arithmetic operations, Arithmetic Primitives, Sequential and Distributed Arithmetic

Hardware Elements and Hardware Design using VHDL **8 Hours**

Gate , Flip-Flop, Registers, Synchronization Signals, Power consumption and related des gr. Rules, Pulse generation and Interfacing. Chip Technology: Semiconductor Memories Processors and Configural Logic, Chip Level and Board Level Design Considerations.

Hardware Design Languages, Simulation of Hardware Elements using VHDL. Timing Behavior and Simulation, Test Benches Synthetic Aspects.

Sequential Control Circuits and Processors **8 Hours**

Manly and Moore Automaton, Designing the Control Automaton, Implementing Control Flow and Synchronization

Designing for ALU efficiency, Memory Subsystems, Simple Programmable Processor Design, Interrupt Processing and Context Switching, Interfacing Techniques, Standard Processor Architectures.

System Level Design

Aspects of System Design, Scalable System Architecture, Regular Processors. Networks Architecture, Integrated Processor Networks, Static Application Mapping and Dynamic Resource Allocation, Resource Allocation on Crossbar networks and FPGA Chips, Communication Data and Control Information, II (pi)-nets Language for Heterogeneous Programmable Systems.

Digital Signal Processors

Data Element Algorithms, Integrated DSP Chip, Floating Point Processors DSPs on FPGA, Typical Applications.

References:

1. Mayer, I mdenberg " Dedicated Digital Processors", Wiley
2. R Gupta, "Co-Synthesis of Hardware and Software for Embedded Systems" Kuver
3. "Digital Signal Processing " IEEE Press.

VLSI Design & Testing

Manipulation of Boolean Expressions **10 Hours**

Two Level realizations with NAND or NOR gates Standard form of Booleans functions Minterm & Maxterm designation of functions, simplification of functions on Karnaugh Maps, Map minimization of product-of-sums expression. Incompletely specified functions logic Hazards. Elimination of Hazards

Algorithms for optimization of combinational logic impact of logic synthesis, cubical representation of Boolean functions determination of prime implicants selection of optimum set of prime implicates, multiple output circuit, programmed logic array, minimization of multiple output function. Tabular determination of prime implicates. Field programmable logic arrays.

VLSI Realizations of Combinational Logic **10 Hours**

Introduction, pass transistor network realization, Steering of 01 x & x to the output, tree networks, negative gate realization logic design with CMOS standard cells, pre charged clocking of CMOS PLA.

Multilevel logic using complex (MSI) port & cells:- The place for complex part & cells, decoders, ROM as a logic element, binary adder, design with multiplexers, more than two level realizations with basic primitives, International MSI parts & cells, multilevel logic manipulation & optimization.

Sequential Circuits **8 Hours**

Sequential activity, memory elements, general model for sequential circuits, clock mode sequential circuits synthesis of clock mode sequential circuits Analysis of a sequential circuit design procedure, synthesis of state diagrams equivalent state & circuits simplification by implication tables, state assignment & memory element input equations.

VLSI Utilization of Digital System **8 Hours**

Alternative Structural descriptions, levels of descriptions standard CMOS layout & delay model analysis & simulation, Event driven gate level simulations switch level simulation OLD & programmable gate arrays.

Test Generation for VLSI **10 Hours**

Fault detection & Diagnosis, Stuck at fault model test generation strategy, test generation by evaluation & search modeling CMOS. Stuck-open faults, faults simulation in sequential system, boundary scan, built-itself test Fault Toolkit Design, Hardware redundancy, information redundancy time redundancy software redundancy system level fault tolerance Self-checking

sequential circuit Design fault in state machines, self checking state machines design techniques Synthesis of redundant fault-free state machines.

References:

1. Parag K. Lala " Fault Tolerant & fault Tested Hardware B.S. Publicatin Hyderabad
2. Prag K Lata " Self checking & Fault tolerant Digital Design" Morgan Karfman Publishers

2. Software Engineering Stream

Engineering and Testing Structured System

10 hours

Scope of software Engineering, The Software Crisis the functional approach structuring a problem .Notion of analysis Design as synthesis

The Yourdon method. Need for Event Partitioning. Statement of purpose, Context Diagram. Terminators, data stores, Event typology. Converting from event to software system functions

14 hours

Data Flow diagrams, process , flow, data stores, Constraints across levels Data Dictionary, Process specification techniques, structured English, constraint based, Data flow design heuristics.

Construction Design: Coupling and Cohesion. 7 Levels of cohesion. Afferent and Efferent modules, Conversion to modular structure, Design Heuristics for Module Design,

12 hours

Maturity levels of testing, Unit, Module, Sub-system and System Testing Interaction, Top down and bottom up testing, Constructing Stubs and Drivers, Notion of a test case, test design approach to software design

While box testing: Testing Hypotheses, Statement testing. branch testing, branch and statement testing, path predicate paths, path interpretation, Cyclometer complexity, condition testing, loop testing.

5 hours

Black box testing: Cause-effect technique, developing test cases from cause-effect graphs of Applications software systems on underling IT infrastructure,

References:

1. Yourdon, “Modern Structured Analysis” Pearson
2. Beizer, “Software Testing”, Van Nostrand Reinhold CO.
3. Pressman, “Software engineering” , McGraw-I[II]
4. Sommerville, “Software Engineering” Pearson

Object-Oriented Programming

10 Hours

The OO manifesto for Programming Languages. Object as having space and behavior, Object classes: definition, class as a factory, as a specification, constructor, destructor. Copy constructor and their defaults, public and private protection.

15 Hours

Complex Objects and complex classes, their constructor and destructors and policies for these Privacy for complex objects. Inheritance simple, multiple, repeated Resolving inheritance conflicts. Rules for constructors, destructors Protection policies for inheritance.

10 Hours

Notion of Late Binding Polymorphism universal and inheritance based, Abstract classes and their use, Meta-classes and templates.

05Hours

Special language features like friend functions, type casting etc. Separation of specification from implementation object-orientation for reuse and maintenance.

All the above to be introduced through C++

References :

1. Bjarne Surounstrap, “The C++ Programming Language”, Pearson
2. Parinala N “ Object Orientation Through C++”, MacMillam
3. Lappman, Lajoie, and Moo “C++ Primer”, Addison Wesley
4. Robert before, “ Object Orientation in C++”, Galgotia

Engineering OO Systems

05Hours

OO manifesto for OO Analysis Object modeling and difference with data-oriented, process-oriented and behavior modeling

15 Hours

Object modeling classes complex object classes, Inheritance and overriding, sub systems and systems in OO modeling Stat of an object State transition diagrams

10 Hours

Dynamic Modeling. Modeling and event. Event typology event as trigger, representing dynamics Relationship with state transition diagrams Relationship with object model.

10 Hours

Functional Modeling Review at Structured techniques DFD and its notions

Using object oriented concepts in OOSE, OOA&D, OMT

Cross model constraints and linkage Conversion to OO implementation UML notation

References:

1. Runbaught et al. " Object Oriented Madeline and Design", Prentice Hall
2. Odell and Martin " Object Oriented Analysis and Design" Prentice Hall

Multimedia Systems

15 Hours

Components of multimedia, multimedia and hypermedia, Multimedia authoring Metaphor, Production, presentation, Automatic authoring. VRML.

10 Hours

Graphics and Image data representation, Colour in Image and Video Colour Science, Colour Models in Image and Video, Fundamentals of video types of video signals, analog and digital.

10 Hours

Basics of Digital Audio, digitization quantization. MIDI, multimedia data compression lossy compressions, Image compression standards, basic video compression techniques, MPEG video coding. MPEG audio compression.

05 Hours

Multimedia communication quality factors in multimedia transmission multimedia over IP, video delay in ATM. Multimedia across DST.

References:

1. Ze-naut and Diey “Fundamentals of multimedia “ Prentice Hall
2. Rao, K.R. et “ Multimedia Communication Systems Techniques, Standards and Networks” Pearson.
3. Y Ramesh “ Multimedia Systems Concepts Standards and Practice” Kluwer

Internet Programming and Web Service Engineering

10 Hours

Notion of mark up. HTML and XHTML. Style Sheets, Cascading style sheets. JavaScript, Dynamic HTML.

15 Hours

SGML XML, XML Schema ASP .Net Perl/CGI and Python

15 Hours

Notion of a web service, Service Oriented Architecture, SOAP, UDDI, WSDL, WSQM, Issues in providing QoS Filaments of Service oriented software engineering**.**

Reference:

1. Deitel. Deitel and Goldberg. “Internet & Word Wide Web How to Program”, Pearson
2. W3 Soap Standard
3. UDDI Standard
4. WSDL Standard

3. Information System Stream

Conceptual Modeling

12 Hours

Why conceptual modeling ANSI, SPARC framework, 100% principle. Conceptualization principle abstraction

12 Hours

Data-oriented Models class as an abstraction. ET: entity class, relationship class, weak nd regular structures, binary and n-ary relationship attributes primary key, relationship cardinality, attribute functionality, Limitations, SHM, SHM: hierarchical data abstraction, inheritance and aggregation, format definite ns, inheritance forms.

06 Hours

Translation of data oriented connectional model into relational schemata translating entity class, relationship class weak and regular classes aggregate hierarchy inheritance hierarchy.

10 Hours

Behaviour oriented Models why these models " interpretations of an Event, event at state change event operation, entity cycles handling time pre and post conditions of an event message remora mode

Entities on conceptual modeling

References :

1. Batini, Ceri, Navathe " Conceptual Database Design: An Entity-Relationship Approach" The Bemamamin
2. Louncopunders and Zeari, "Conceptual Modeling. Databases and Case: An Integrated Views at information system Development" John Wiley & Sons

Requirements Engineering

10 Hours

Why requirements engineering ? Difference between Conceptual Modeling and RE Context Diagram and RE organizational versus Technical requirements.

Preparing IEEE SRS document

07 Hours

Stakeholders and their identification Types of stakeholders. Designing and conducting interviews questionnaires brainstorming sessions.

07 Hours

RE in functional systems Types of goals satisfaction and satisfying. Goal modeling and decomposition AND/OR goal structures, Goal operationalzing , the * model limitations of goal based techniques.

07 Hours

Scenario modeling Defining scenario types of scenarios, scenario classification base on its properties writing scenarios in natural language scenarios versus use cses, Goal-scenario coupling. Handling RI problems like.

09 Hours

Decisional systems: Organization versus Technical decisional requirements. Difference between transactional and decisional systems the changed role of RE. Notions of goals, decisions and information Difference between them the GDI model, informational scenarios, their form and usage.

References:

1. Hull. Jackson, and Dick, " Requirements Engineering", Springer
2. Maculay " Requirement Engineering", Springer
3. Jackson M. "Requirements & specifications a lexicon of practice principles " ACM Press.

Method Engineering

07 Hours

Notion of method. Method models, meta-models, and generic models CAME, CASE, meta CASE and their differences Method as artifact process model.

08 Hours

Product oriented meta-models. The OPRR model. notion of object, property relationship and role, the GOPRR model Product –Process meta-models, The fragment model instantiating meta-model to yield methods.

08 Hours

Integrated meta-models The contextual approach, notion of context right coupling. The decisional approach, method block types of methods, MRL.

10 Hours

Simulation Method engineering SDLC for method engineering intentional approach to method engineering method engineering process open issues.

References:

1. “Method Engineering “ Chaptan and staff 1996
2. R et al “Method Engineering” Springer, 2007

Process Engineering

10 Hours

SDLC in S/W and IS engineering Relationship of SDLC to process models. Classical process models. Code and Fix Waterfall. Prototype. Spiral. V, Fountain Iterative and Incremental process models.

12 Hours

Process meta-models Zhy meta-models, limitations of classical models Activity based models, IBIS, Contextual model and Map model, Tracing Backtracking, Guidance passive active.

10 Hours

The personal process and team process. Maturity models the five levels of CMM, metric to be collected for upward movement in levels, Introduction to ITIL, Six Sigma, ISO9000. Differences between these, classes of problems handled by these.

8 Hours

Business process models, business objects, relationship, role co-ordination activity, Workflow models, Formulating business process models building situation specific business models intentions, architecture, organization.

References:

1. Pressman, “Software Engineering” Megraw-Hill
2. Sommerville, “Software Engineering” Perason
3. Pfleegar, “Software Engineering Theory and Practice” Perason

Simulation and Modeling

10 Hours

Basic Simulation Modeling: The Nature of simulation system, models and simulation, discrete-event simulation, simulation of a single-server queuing, alternative approaches to modeling and coding simulations, network simulation, parallel and distributed simulation, simulation across the internet and web based simulation, steps in a sound simulation study, other types of simulation continuous simulation, combined discrete-continuous simulation, Monte Carlo simulation, advantages, disadvantage and pitfalls of simulation.

07 Hours

Modeling Complex Systems: Introduction list processing in simulation, approaches to staring lists in a computer linked storage allocation.

Simulation examples using any simulation language Single-server Queuing simulation with time-shared computer model, job-shop model and event list manipulation.

07 Hours

Discrete System Modeling : Classification of simulation models the simulation process, system in investigation validation and translation, simulation of complex discrete event systems with application in industrial and service organization tactical planning and management aspect Random variable generation and analysis.

08 Hours.

Simulation Software Comparison of simulation packages with programming language classification simulation software general purpose simulation package object oriented simulation , building valid, credible and appropriately detained simulation model experimental design sensitivity analysis and optimization simulation of manufacturing systems.

09 Hours

Embedded System Modeling: Embedded systems and system level design, models of computation, specification languages, hardware/hardware/software code design, system portioning, application specific processors and memory, low power design.
Real time system modeling, Fixed Priority scheduling Dynamic Priority Scheduling.

Data Communication network modeling IP network simulation (e.g.) OSPI, RIP) routing simulation.

References:

1. Law Kelton " Simulation Modeling" McGraw Hill
2. Gemlrey Gordon "System Simulation" PH

4. Data Management Stream

Distributed DBMS

6 Hours

Review of computer network and centralized DBMS , Why distributed . basic principles of DDBMS, distribution. Heterogeneity. Autonomy,

6 Hour

DDB architecture: client-Server: peer –to-peer, federated, multidatabase,

15 hours

DDB design and implementation fragmentation, replication and allocation techniques

6 Hours

Distributes query processing and optimization

7 Hours

Distributed transaction management concurrency control and reliability, DDB Interoperability

References:

1 Cen and relagatil, Distributed data base system Addison

2 O/Zu, Valduriez,Distributed Data Base system penrson

Data Warehousing

14 Hours

The organizational perspective, the technical perspective Dimensional Modeling: facts, dimensions slowly and rapidly changing dimensions, Date Warehouse operations. Converting ER to data cube

8 Hours

Aggregation their need and definitions, historical information Query facility, OLAP functions and tool, Data mining interfaces,

8Hours

Relational representation ROLAP, Multidimensional, MOLAP Advantages ,disadvantages trade offset with ROLAP, Meta data and CWM, DW Process and architecture: ETL process, tradeoffs between automated ETL and tailor made ETL

10Hours

SDLC, OF a Warehouse project; business process driven information systems product driven and goal drive approaches;

Design approaches data driven design, user design Information package , Diagram driven design.

Physical design: clustering, partitioning etc. Trade-offs in physical design.

Reference:

1. Ponnab Data Warehousing and data mining Wiley.
2. Inmon, Building the Data Warehouse, Wiley.
3. Kimball and Ross, “The Data Warehouse Toolkit” Wiley
4. Murray “Data Warehousing in the Real World” Wiley
5. Imhoff C” Mastering Data Warehouse Design” Wiley

Multi-media Databases

8Hours

Relational versus multimedia database, handing object data, multidimensional structures insertion, deletion, search in 2 referees, point quadtrees, and R-trees

Image databases: Raw and compressed images, Discrete Fourier transform and Discrete Cosine transform

Segmentation, similarity based and spatial layout retrieval, image representation in relations and R – trees

6 Hours

Document databases; precision and recall, latent semantic indexing, operating on TV trees inverted indices and sequential files:

8 Hours

Video databases: organization of video content, querying content of video libraries, video segmentation, video standards

4 Hours

Audio databases; general model, metadata, signal based audio content, discrete transformations for audio content indexing techniques

6 Hours

Physical storage and renewal retrieving form disk CD-ROM Tapes recording and placement methods, retrieval techniques.

Open issues security compression for special data bases e.g in medicine

References:

1: Subrahumaam VS. “Princip eg of Multimedia systems” Morgan kauhmain

2: Apers “Multimedia Databases in Perspective” Springer

3: Duneckles “Multimedia Databases in An object Relational Approach” Hebbian

5.AI STREAM

Artificial Intelligence

8 Hours

Knowledge: Introduction definition and Importance. Knowledge base system representation of knowledge organization. Of knowledge, knowledge manipulation, knowledge acquisition introduction to PROLOG.

8Hours

Formalized symbolic Logics, Syntax and semantics for FOPL Inference rules The resolution principle, No deductive inference methods, Bayesian probabilistic informer, Dumpster-Shafer theory, Heuristic Reasoning Methods.

8Hours

Search and Control strategies; introduction, concepts unformed or blind search, searching and – or graphs. Matching techniques, structures used in retrieval techniques integrating knowledge in memory, memory organization system

8Hours

Fuzzy Logic: Basic concepts, Fuzzy sets Membership Types of membership Function Basic operations in Fuzzy sets Intersection $ Union- Complementary Subset hood, properties of Fuzzy sets.

8Hours

AI System Introducing rule based system architecture, Non Production system architecture, dealing with uncertainty, knowledge organization and validation.

References:

1. Dan W Patterson ,’’Introduction to Artificial Intelligence and Expert system ‘’,PHI
2. Peter Jackson, “Introduction to Expert system”, Pearson
3. A Gonzalbz and D Dankel, “The Engineering knowledge Base system”, PHI
4. Stuart Russelt and peter nerving,”Artificial Intelligence: A Midem approac “ I”, PHI
5. John Yen $ Reza I angart,Fuzzy : Intelligence Control and information”, Pearson

Learning systems

8 Hours

Introduction; definition, Human Brain, Model of Neuran Feed back Network Architectures, knowledge Representation, AI & Neural Networks,

Learning Processes: Introduction, Error –correction Memory –Based Learning, Hebbian Learning Competitive Learning, Boltzmann Learning, Learning with teacher, Learning without a Teacher Memory Adaptation.

8 Hours

Single Layer perceptions concepts adaptive filtering, Unconstrained optimization, Steepest Descent Method, Newton s Method , Perception Convergence Theorem

Multilayer Perceptions: Preliminaries, Back- propagation algorithm, activation function Rate of learning.

8Hours

Neurodynamics Introduction Associative Memory, Linear Associater, Dynamical Systems, Stability of Equilibrium states Attractors Hopfield models, Brain- state –in a-box model.

8Hours

Genetic Algorithms: Basics of genetic algorithms, binary GA Implementation, real cod GA Design test GA Choice of encoding, selection probability mutation and cross over probability and evaluation function.

References:

1: Simon Haykin Neural Networks'', Pearson

2: Mohamad H. Hassiun. Fundamentals of Artificial Neural Networks'', PHI

3: James A. Anderson, An Introduction to Neural Networks'', PHI

4: Melanie Mitehal "Nn Introduction to Genetic Algorithm", PHI

Data Mining

8 Hours

Overview types of mining, Mining operations, introduction of statistical Data Mining, Heuristic Mining, Introduction of mining in data warehousing, Stages of DM process. Decision-Tree based classifiers: information gain, decision tree learning.

7 Hours

Data mining Techniques: Association-Rule mining methods, supervised neural network, perception back propagation, Bayesian methods, cross validation, Time Sequence discovery

7 Hours

Clustering similarity and distance measures, hierarchical algorithms, partitional algorithms, clustering large databases, clustering with categorical attributes K-means.

10 Hours

Introduction to information retrieval, Query optimization, unstructured and semi-structured text ,Text encoding, Tokenization steaming, Lemmatization, Index compression, Lexicon compression, Gap encoding, gamma codes index constructions, Dynamic Indexing, Positional indexes, n-gram indexes, real-world issues. Vector-Spaces Scoring, Nearest neighbor techniques.

10 Hours

Introduction to information retrieval, inverted indices and Boolean queries, Query optimization, Unconstrained and semi constrained text. Text encoding. Tokenization Stemming, Lemmatization. Tolerant retrieval: spelling correction and synonyms, permuterm indices-gram indices, Edit distance, index compression Lexicon characteristics web site measurement and website location and website link analysis

References:

1. *M. H. Dunham*, "*Data Mining*: Introductory and Advanced Topics",Pearson
2. *J.Han and M.Kamber."Data Mining concept Techniques",Morgan Kaufman*
3. *Mallach "Data Warehousing System",McGraw-Hill*

4. Rechard Roiger and Michal W Greatz “Data Mining:A Tutorial Based primer”.Pearson
5. *Tom Mitchell*, *Machine Learning*, McGraw Hill

Natural Language Processing

10 Hours

Context Free grammars, Lexical analysis. Introduction to parsing, context Sensitive grammars

10 Hours

Linguistics of English: Review of English Grammar, Morphology, syntax, semantics, structure of discourse. Words and the lexicon: word classes.

12 Hours

Semantic Grammars, TN, ATN, Case grammars, paninian Grammars, parser of NL statements, Determiners and quantifiers, noun-noun modification, pronoun resolution relative clauses.

08 Hours

Deep Structure, shallow structure, Differences between English and Hindi Application
(a) MT
(b) ASR
(c) IR
(d) Q & A

References:

1.Manning C.D..Selauze H.” Foundation of statical natural language processing”.MIT Press
2.Juratsby D.Martin J.H.”Speech and language processing”,PHI
3.Allen.J.”Natural language understanding.”Benjamin/Cummins Publishing
4.Wall Let W.”Programming PERL”.O Reilly

6.SECURITY SYSTEM
Cryptography

Number Theory **10 Hours**

Prime number, Euler's Totient function, Fermal's and Euler's Theorem Primarily Testing, Chinese Remainder Theorem Discrete Logarithms, Group, Rings, Fields. Modular Arithmetic Euclidean Algorithm, Finite Fields of the form GF(p).Polynomial Arithmetic, Fields of the form GF(2").Random Number Generation Testing

Public Key Encryption **10 Hours**

RSA System, Implementing RSA, Attacks on RSA, Rabin Crypto System, Factoring algorithms. The (p-1) method, Dixon's algorithm and Quadratic sieve.
Elliptic Curve Cryptography; Elliptic curves over GF(p). Elliptic curves over GF(2"). Elliptic curve cryptography factoring with ECC Key Management and Diffie Hellman Key Exchange.

Symetric Encryption **8 Hours**

Block Cipher and DES. The Strength of DES. Differential and Linear Cryptanalysis of DES, Advance Encryption Standard Stream Cipher and RC4.

Hash Function **8 Hours**

Hash Function, Security of hash function, MD5, Secure hash Algorithm. Whirlpool, HMAC, CMAC, The birth stock problem.

Digital Signature and requirement Authentication tools Digital Signature Standard, ECDSA.

Finite Automata and Cyphers **6 Hours**

Finite Automata and Cipher. Structure of ciphers. Section of the Ma,h and g functions, Cipher Design Automata

References:

1. William Stallings,"Cryptography and Network Security 4e "Pearson
2. Simon J Shepherd,"Cryptography Diffusing the Confusion",Research Press Studies
3. Dongfas R Stinson,"Cryptography Theory and Practice",CRC Press.

Network and System Security

8 Hours

Network Security

AH and ESP protocols, Security associations, Key management, Web security Considerations, secure socket layer and Transport layer security.

8 Hours

PKI Infrastructure

Concept of an infrastructure, application enables secure single sign-on, comprehensive security, defining PKI,LDAP and x500.

Core PKI Services: Authentication, Integrity and confidentiality, Mechanism required to create PKI enabled services X-500 certificate.

8 Hours

System Security: Intrusion Detection, password Management, Base Rate Fallacy.
Malicious Software: Virus and related threats, virus countermeasures, Distributed Denial of Services attacks.
Firewalls: Design Principles, Trusted Systems common Criterion for IT Security evaluation.

OS and Database Security **8 Hours**

Structure of an OS and application. application and OS Security ,Security in Unix and Linux Pluggable Authentication Modules, Access Control List, SE Linux

Database Security: Database security Evolution. Role based an object oriented encapsulation procedural extension to SQL security through Restrictive Clauses.

References:

1.William Stalling.”Cryptography and Network Security 4e”,PHI
2.C.Adams,Steve Liod,”Understanding PKI”,Addison Wesley.
3.Jay Ram Chandram,”Designing Security Architecture”,Wlley Computing Publishing.
4.C.Kanfinan,Radia Perlman and Mike,”Network Security Sell”,Pearson.

Digital Forensic

8 Hours

Transform Methods Fourier Transformation Fast Fourier Transformation Discrete Cosine Transformation Method Fourier Transformation, Wavelets Split Images to Perceptual Bands, Applications of Transformation Steganography.

8 Hours

Biometrics: Overview of Biometrics. Biometric Identification, Biometric Verification, Biometric Enrollment Biometric System Security.

Authentication and Biometrics: Secure Authentication Protocols, Access Control Security Services, Authentication Methods. Authentication Protocols, matching Biometric Simples, Verification by humans.

Common biometrics: Finger Print Recognition Face Recognition, Speaker Recognition, Iris Recognition, Hand Geometry, Signature Verification, Positive and Negative of Biometrics.

Matching: Two kinds of errors, Score distribution Estimating Errors from Data Error Rate of Match Engines, Definition of FAR and FRR.

8 Hours

Introduction to information hiding Technical Steganography Linguistic Steganography, Copy Right Enforcement Wisdom form Cryptography

Principles of Steganography: Framework for Secret Communication Security of Steganography System. Information Hiding in Noisy Data, Adaptive versus non-Adaptive Algorithms Active and Malicious Attackers, information hiding in Written Text.

Survey of Steganographic Techniques substitution and Bit Plane Tools, Transform Domain Techniques Spread Spectrum and Information hiding Statistical Steganography, Distortion Techniques, cover Generation Techniques.
Steganalysis Looking for Signature- Extracting hidden Information Disabling Hidden Information.

10 Hours

Watermarking and Copyright Protection: Basic Watermarking. Watermarking Applications, Requirements and Algorithmic Design Issues. Evaluation and Ben marking of watermarking system.

References:

1. Kat/endbisser. Petitenlas " Information hiding techniques for Steganography and Digital Watermarking , Artech House.

2. Peer Wayner " Disappearing Cryptography information hiding Steganography and watermarking"

7 Theoretical CS Stream

8Hours

Sequential model need of alternative model parallel computational models such as PRAM , LMCC , Hypercube Cube connected cycle, Butterfly perfect Shuffle Computers Tree model, pyramid model ,fully connected model PRAM-CREW, EREW model simulation of one models from another one

8Hours

Performance Measures of parallel Algorithms speed up and efficiency of PA, Cost-optimality AN example of illustrate Gost-optimal algorithms such as summation Min/Max on various models.

8Hours

Parallel Sorting Networks. Parallel Merging Algorithms on CREW/EREW/MCC/ Parallel Sorting Networks on CREW/EREW/MCC/linear array.

8 Hours

Parallel Searching Algorithms, Kth element, Kth element in X,Y on PRAM, Parallel Matrix Transportation and Multiplication Algorithm on PRAM, MCC, Vector-Matrix Multiplication Solution of Linear Equation , Root finding**.**

8 Hours

Graph Algorithms – Connected Graphs Search an traversal Combinatorial Algorithms-Permutation Combinations, Derangements.

Reference:

1. M.J. Quinn, "Designing Efficient Algorithms for Parallel Computer" by McGraw Hill.
2. S.G. Akl, " Design and Analysis of Parallel Algorithms
3. S.G. AKl "Parallel Sorting Algorithm" by Academic Press

4.

Randomized Algorithms

Introduction: Basic Probability Theory, Probability Spaces; Bayes Rule; Independence Expectation Moment Common Distribution Randomized Algorithm: General concepts and definitions, Quieksort, Min – cut Random partitions. Probabilistic recurrences, Randomized complexity classes: PP, BPP

Game Theoretic Techniques and Lower Bounds: Game theory concepts: applications' to lower bounds, Examples. Sorting and Game Tree evaluation.

Moments and Deviations: Random sampling bucketing. Tail bounds: Markov and chebyshev inequalities. High confidence selection pair wise independence. Application the stable marriage problem.

Tail inequalities: chernoff bounds: applications network routing and gate array wiring

Markov chains and random walks A 2 SAT Example, markov chains, Random walks on Graphs. Graph connectivity, expanders probability amplification by random walks on Expanders

Algebraic methods: Fingerprinting and Freivald's Technique. Verifying polynomial identities. randomized pattern matching.
Data Structures: Random treaps skip lists.
Randomized Graph Algorithm shortest
Parallel and Distributed Algorithms The PRAM Model. Sorting on a PRAM, Maximal Independent Sets Perfect Matching.
Number Theory and Algebra Elementary number theory, Quadratic residues ,Primarily testing, RSA cryptosystem

References:

Approximation Algorithms

7 Hours

Introduction overview of complexity theory: Class NP,NP-Completeness, reductions, Randomized complexity classes Basic of Probability Theory, Expectation and moments, basic distributions.

7 Hours

Vertex/Set cover, Greedy algorithm, Hardness of approximating Traveling Salesman Problem(TSP),Set cover layering algorithm shortest superstring.

Stemer tree Metric stemer tree Metric TSP; Minimum weight multiway cut minimum weight K.cut ,K-Center

8 Hours

Knapsack problem, pseudo polynomial time algorithms PTAS. Fully polynomial time approximation scheme FPTAS Strong NP hardness Bin Packing Asymptotic PTAS, Euclidean TSP. Proof of correctness

6 Hours

I,P Duality; I.P Duality Theorem ,Dual-fitting based analysis for the greedy set cover algorithm Rounding Algorithm set cover, randomized rounding

7 Hours

Half-integrality of vertex cover; Schema set cover

Scheduling on Unrelated Parallel Machines, Primal-Dual algorithms Facility Location and the Median Problem Steiner Network Design.

References:

1. William H. Cunningham , Lawrence Tang, Optimal 3-Terminal Cuts and Linear Programming

Complexity Theory

8 Hours

Models of Computation, resources (Time and space), algorithms computability complexity

8 Hours

Complexity classes P/NP, PSPACE, reductions hardness completeness hierarchy relationships between complexity classes

8 Hours

Randomized computation and complexity; Logical characterizations, incompleteness; Approximatebility

8 Hours

Circuit Complicity; Lower bounds parallel computation and complexity counting problems; Interactive proofs;

8 Hours

Probabilistically checkable proofs; Communication Complexity; Quantum Computation

References:

1. Gerhard J. Woeginger “Combinatorial approximation algorithms: a comparative review”.
2. Herbert S. Wilf - AK Peters “Algorithms and Complexity**”.**
3. Sanjeev Arora, Boaz Barak - Cambridge University Press Complexity Theory: A Modern Approach

Computational Geometry

8 Hours

Convex hulls: construction in 2d and 3d, lower bounds: Triangulations: polygon triangulations, representations, point-set triangulations, planar graphs;

8 Hours

Voronoi diagrams: construction and applications variants: Delaney triangulations: divide and conquer, flip and incremental algorithms, Quality of Voronoi diagrams, minmax angle properties

8 Hours

Geometric searching point-location, fractional cascading linear programming with prune and search, finger trees, coneatenable queues segment trees, interval trees; Visibility algorithms for weak and strong visibility, visibility with reflections, art-gallery problems.

8 Hours

Arrangements of lines: arrangements of hyper planes, zone theorems, many-faces complexity and algorithms: Combinatorial geometry: Ham-sandwich cuts.

8 Hours

Sweep techniques: plane sweep for segment intersections, Fortune's sweep for Voronoi diagrams, topological sweep for line arrangements; Randomization in computational geometry; algorithms, techniques for counting: Robust geometric computing; Applications of computational geometry

References:

1. Paul S. Heckbert, Graphics gems IV, Academic Press Professional
2. Roberto Tamassia, Strategic directions in computational geometry, ACM Computing Surveys

Compulsory Course for Sem-III

Professional Aspects in Software Engineering (1/2 Unit)

Intellectual Property rights **5 Hours**

Confidential information Copyright infringement of copyright act permitted in Relation to copyright works licensing and Assignment of copyright Moral Right Design. The port of passing off. Domain names patents.

Software Licenses **5 Hours**

Copyright Contract, Patent Free Software and open Source Software. MIT License, BSD License, GNU General Public License. Q Public License Proprietary License, Sun Community License.

Software Contracts: **5 Hours**

Basics of software Contracts, Extent of liability, Contract for the supply of custom-built software at a fixed price other type of software service contract for defective software.

Data Protection Regulations **5 Hours**

Data Protection and Privacy, The impact of the Internet Factor Influencing the Regulation of Data Processing Convergence of Data protection Practice Defamation and the Protection of Reputation .

References:

1. Andrew M. M. Laurent “Open Security” Realty Publication.