

SNDT Women's University

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Syllabus M.Tech.

in

Computer Science and Technology



SNDT Women's University 1, Nathibai Thackersey Road, Churchgate

Mumbai 400 020

Revised – 2014 (Proposed for 2015-2016)

SNDT Women's University

SCHEME OF INSTRUCTION AND EVALUATION

Programme: M.Tech (Computer Science and Technology)

Scheme for Semester I

Sr. No	Subjects	No. of Periods per week (60 minutes each)			Credits	Duration of Theory papers (Hours)	Marks			
		Lecture	Practical	Tutorial			Theory (%)	Term-work(%)	Oral	Total (100%)
1	Research Methodology	3		2	4	3	50	50		100
2	Advanced Data structures and Algorithms	3	2		4	3	50	50		100
3	Distributed Computing	3	2	-	4	3	50	50		100
4	Image and Vision computing	3	2		4	3	50	50		100
5	Elective-I	3	2		4	3	50	50		100
6	Seminar		2		2			50	50	100
Total....		15	10	02	22	15	250	300	50	600

Scheme for Semester II

Sr. No	Subjects	No. of Periods per week (60 minutes each)			Credits	Duration of Theory papers (Hours)	Marks			
		Lecture	Practical	Tutorial			Theory	Term-work	Oral	Total
1	Communication Networking	3	2	-	4	3	50	50		100
2	Object Oriented Software Development	3	2	-	4	3	50	50		100
3	Computer Architectures	3	2	-	4	3	50	50		100
4	Elective II	3	2	-	4	3	50	50		100
5	Elective -III	3	2	-	4	3	50	50		100
6	R & D Project		2	-	2		-	50	50	100
Total....		15	12	-	22	-	250	300	50	600

Scheme for Semester III

Sr. No	Subjects	No. of Periods per week (60 minutes each)			Credits	Duration of Theory papers (Hours)	Marks			
		Lecture	Practical	Tutorial			Theory	Term-work	Oral	Total
1	Big Data	3	2	-	4	3	50	50		100
2	Cloud Computing	3	2	-	4	3	50	50		100
3	Elective-IV	3	2	-	4	3	50	50		100
4	Stage-I Project		8		8			100	100	200
5	Seminar/Project / Internship				2			50	50	100
Total....		9	8	-	22	9	150	300	150	600

Scheme for Semester IV

Sr. No	Subjects	No. of Periods per week (60 minutes each)			Credits	Duration of Theory papers (Hours)	Marks			
		Lec ture	Prac ti-cal	Tuto -rial			Theor y	Term- work	Oral	Total
1	Project–II Dissertation		2	-	10			150	150	300
2	Project-II Dissertation Viva		2	-	12			150	150	300
Total....			4		22	-		300	300	600

Elective List for M.Tech in Computer Science Technology

Sr. No.	Elective-I	Elective-II	Elective-III	Elective-IV
1	Geographic Information systematic	Advance data Networks	Network Security	Network Management
2	Distributed Algorithm	Compiler Construction	Semantics of Programming Languages	Complexity Theory
3	Knowledge Management	Computer Vision	Artificial Neural Network	Speech Processing
4	Object Oriented Techniques	Enterprise Resource Planning	Language Technologies On Web	Advance Internet Technologies

5	E-Commerce			
6	Service Oriented Architecture			

Detail Syllabus of M.Tech. In Computer Science Technology

Semester-I

Advanced Data structures and Algorithms

Sr. No.	Topics	No. of Hours	Weight-age in Percentage
1	Introduction to data structures. Introduction to complexity of algorithms.	2	5
2	Creation and manipulation of linear data structures viz. arrays, lists, stacks, queues and nonlinear data structures viz. trees, graphs, heaps	8	25
3	Comparison of different data structures. File organization methods, Internal and external sorting. Abstract data types.	8	20
4	Models of computation, algorithm analysis, time and space complexity, average and worst case analysis, lower bounds.	8	15
5	Algorithm design techniques: divide and conquer, greedy, dynamic	8	25

	programming, amortization, randomization.		
6	Problem classes P, NP, PSPACE; reducibility, NP-hard and NP-complete problems. Approximation algorithms for some NP-hard problems.	6	10

Books:

1. A. V. Aho, J.D. Ullman, Data Structures, Addison Wesley, 1984.
2. E. Horowitz, S. Sahni, Fundamentals of Data Structures, Galgotia Publishers 1983.
3. D. E. Knuth, The art of Computer Programming, Vol.1, Narosa Publishers, 19 85.
4. N. Wirth, Algorithms + Data Structures Programs, Prentice Hall, 1976.
5. T.H.Cormen, C.E.Leiserson, R.L.Rivest, C. Stein, Introduction to Algorithms, 2nd edition, Prentice-Hall India, 2001. 2.
6. J. Kleinberg and E. Tardos, Algorithm Design, Pearson International Edition, 2005.

Subject: Distributed Computing

Sr. No.	Topics	No. of Hours	Weight-age in Percentage
1	Introduction to Distributed systems-examples of distributed systems, challenges-architectural models- fundamental models -	4	10
2	Introduction to interprocess communications-external data representation and marshalling- client server communication-group communication – Case study: IPC in UNIX	6	15
3	DISTRIBUTED OBJECTS AND FILE SYSTEM Introduction - Communication between distributed objects - Remote procedure call - Events and notifications - Java RMI case Study - Introduction to DFS - File service architecture - Sun network file system - Introduction to Name Services- Name services and DNS - Directory and directory services	8	20
4	DISTRIBUTED OPERATING SYSTEM SUPPORT The operating system layer – Protection - Process and threads - Communication and invocation - Operating system architecture - Introduction to time and global states - Clocks, Events and Process states - Synchronizing physical clocks - Logical time and logical clocks - Global states - Distributed debugging – Distributed mutual exclusion.	8	20
5	TRANSACTION AND CONCURRENCY CONTROL – DISTRIBUTED TRANSACTIONS Transactions – Nested transaction – Locks - Optimistic concurrency control - Timestamp ordering - Comparison of methods for concurrency control - Introduction to distributed transactions - Flat and nested distributed transactions - Atomic commit protocols - Concurrency control in distributed transactions - Distributed deadlocks - Transaction recovery	8	20
6	SECURITY AND REPLICATION Overview of security techniques - Cryptographic algorithms – Digital signatures - Cryptography pragmatics – Replication - System model and group communications – Fault tolerant services – Highly available services – Transactions with replicated data	6	15

TEXT BOOK

1. George Coulouris, Jean Dollimore, Tim Kindberg “Distributed Systems Concepts and Design” Third Edition – 2002- Pearson Education Asia.

REFERENCES

1. A.S.Tanenbaum, M.Van Steen “ Distributed Systems” Pearson Education 2004
2. Mukesh Singhal, Ohio State University, Columbus “Advanced Concepts In Operating Systems” McGraw-Hill Series in Computer Science, 1994.
3. Elements of distributed computing - Vijay K. Garg

John wiley and sons publication

2) Distributed computing - principles, Algorithms and systems
Ajay D. Kshemkalyani, Mukesh Singhal

Image and Vision Computing

Semester: I

Lectures: 4 Hr

Branch: CST/ ENC

Credit: 04

Sr. No:	Topics and Details	No: of lectures assigned	Weighte ge in %
1	<p>Image enhancement:</p> <p>Image models, geometry, color, acquisition,</p> <p>Knowledge representation and inference,</p> <p>histogram equalization and specification, contrast modification,</p> <p>neighborhood filtering, image smoothing and image sharpening, Edge operators,</p> <p>Noise Models, denoising, deblurring, filtering of color images</p>	10	20

	<p>Filters in spatial and frequency domains,</p> <p>Multiplicative and additive noise removal techniques in satellite and medical images.</p> <p>Recent advances in image enhancement (case studies). Image registration</p>		
2	<p>Two dimensional orthogonal transforms:</p> <p>Fast Fourier Transform (FFT)</p> <p>Walsh Hadamard Transform (WHT)</p> <p>Haar Transform</p> <p>Karhunen-Loeve Transform (KLT)</p> <p>Discrete Cosine Transform (DCT)</p>	4	5

3	<p>Image segmentation and region growing :</p> <p>region-based methods, Hough transform,</p> <p>active contours (snakes) Color models,</p> <p>Edge and region segmentation of satellite images,</p> <p>Feature based image matching of images,</p> <p>feature evaluation, Data processing and image classification, accuracy assessment,</p> <p>Image texture analysis, Co-occurrence matrix</p> <p>Measures of textures, Statistical models for textures</p>	10	20
4	<p>Introduction to Computer vision applications.</p> <p>introduction to Shape,</p>	10	15

	<p>Imaging model and geometry,</p> <p>scene radiance and image irradiance,</p> <p>reflectance model of a surface,</p> <p>Lambertian and specular reflectance,</p>		
5	<p>Intermediate Vision:</p> <p>Boundary completion methods,</p> <p>Camera calibration Photometric stereo,</p> <p>Stereo Vision and correspondence problems.</p>	10	20
6	<p>High Level Vision:</p> <p>inference, and Goal Achievement in Computer Vision.</p> <p>Shape from Shading, Motion, Pyramid paradigms.</p>	10	20

Text Books:

Fundamentals of Digital Image Processing. by Anil K. Jain, Prentice-Hall, 1989.

Digital Image Processing. by W. K. Pratt. Wiley-Interscience, 1978.

Digital Image Processing, 3rd Ed., Gonzalez and Woods, Pearson Education Low Price Indian Edition.

Computer Vision: A Modern Approach, Forsyth and Ponce, Pearson Education Low Price Indian Edition.

Reference Books:

Introductory Techniques for 3D Computer Vision, Emanuele Trucco and Alessandro Verri, Prentice Hall.

Learning OpenCV: Computer Vision with the OpenCV Library, Gary Bradski, O'Reilly Media.

Multiple View Geometry, Hartley & Zisserman, Cambridge Press

Computer Vision by B. K. P. Horn Prentice Hall, 1982

Books:

1. A. Low, Introductory Computer Vision and Image Processing, McGraw-Hill, 1991.
2. D. Ballard and C. Brown, Computer Vision, Prentice Hall, 1982.
3. B. K. P. Horn, Robot Vision, MIT Press, 1985. E. Grimson, From Images to Surfaces, MIT Press, 1986.

Elective-I

End of Semester-I

Semester-II

Communication Networking

Sr. No.	Topics	No. of Hours	weightage in Percentage
1	Introduction to computer communication networks and layered architecture overview. Packet switching and fast packet switching.	5	10
2	Point to point protocols and links: ARQ retransmission strategies. Selective repeat ARQ. Framing and standard Data link Control protocol. HDLC, SDLC, LAPD.	9	25
3	Queuing models in communication networks. Multiaccess communication and multiple access protocols: ALOHA, slotted ALOHA, CSMA, CSMD/CD.	8	25
4	Performance modeling and analysis; Local Area Networks: Ethernet, Token Ring and FDDI. Design and Analysis.	6	15
5	Internetworking issues: Bridges, Routers and Switched networks. Routing and Flow Control Algorithms in Data networks.	6	15
6	Broadband Networks: ATM, Frame relay and Gigabit Ethernet. Traffic Management in ATM networks.	6	10

Books:

1. Gallager R. G. and Bertsekas D., Data Networks, Prentice Hall of India, 1992.
2. Hayes J. F., Modelling and Analysis of Computer Communication Networks, Plenum Publishing Corporation, New York, 1984.

3. Stallings W., Data and Computer Communications, Prentice Hall of India, 1997. Rom R. and Sidi M., Multiple Access Protocols, Springer Verlag, 1990.
4. DePrycker M., ATM solutions for Broadband ISDN, Prentice Hall of USA, 1995.

Object Oriented Software Development

Sr. No.	Topics	No. of Hours	Weight-age in Percentage
1	Introduction Why object orientation, History and development of Object Oriented Programming language, concepts of object oriented programming language. Object oriented analysis, Software development models .	6	15
2	Feasibility study, risk analysis, cost estimation of Object oriented software, quality assurance, testing	14	30
3	Relationships among objects, aggregation, links, relationships among classes- association, aggregation, using, instantiation, meta-class, grouping constructs	10	20
4	Fundamentals of Object Oriented design in UML Static and dynamic models, why modeling, UML diagrams: Class diagram, interaction diagram: collaboration diagram, sequence diagram, statechart diagram, activity diagram, implementation diagram,	10	15
5	UML extensibility- model constraints and comments, Note, Stereotype.	5	10
6	Domain driven design	5	10

Text Books:

1. Ali Bahrami, - "Object –Oriented System Development" - Mc Graw Hill. **Rambaugh, James Michael, Blaha - "Object Oriented Modelling and Design with UML" - Prentice Hall India/ Pearson Education**

Computer Architectures

Sr. No.	Topics	No. of Hours	weightage in Percentage
1	Advanced architectural features suitable to high level computational needs such as symbolic manipulation	6	15
2	graphic processing and logic inferencing (logic programming). Advanced architectures like parallel/concurrent architectures:	10	30
3	SIMD, MIMD, array processors, pipelined architectures. Distributed architectures.	8	20
4	Computer networks. Data flow architectures. Case studies of some contemporary advanced architectures.	8	20
5	Performance evaluation of systems and comparison of different architectures.	8	15

Books:

1. K.Hwang and F.Briggs, Parallel Processing and Architecture, McGraw Hill, 1984.
2. D.P.Siewiorek, C.G.Bell and A.Newell, Computer Structures; Principles and Examples, McGraw Hill, 1985.
3. D. Patterson and J. Hennessy, Computer Architecture: A Quantitative Approach, Second Edition, Morgan Kaufmann Publishers, 1996.

Elective III

Elective IV

End of Semester-II

Semester-III

BIG DATA

Sr. No.	Topics	No of hours	weightage in Percentage
1	Introduction to Big Data Analytics Overview of SQL and intro to R Using R for Initial Analysis of the Data	4	7
2	Advanced Analytics and Statistical Modeling for Big Data – Theory and Methods Advanced Analytics and Statistical Modeling for Big Data – Technology and Tools	6	8
3	Concluding and Operationalizing an Analytics Project Big Data Analytics Lifecycle Lab Hadoop, Pig, and Hive	10	25
4	Statistical Techniques: Multiple Linear Regression, Logistic Regression, Variable Importance, Variable Selection, Detecting Overfitting, Model Selection using Test Data Set Advanced Statistical Techniques: Elastic-Net Regularized General Linear Models, Advanced Model Selection using K-Fold Cross-Validation	5	15
5	Machine Learning: CART, Boosting Trees, Random Forests, Multivariate Adaptive Regression Splines, Using K-Fold Cross-Validation for Model Tuning	5	20

	and Model Selection, Using tree methods to improve linear and logistic regression models		
6	Machine Learning: Neural Networks, General Additive Models, Projection Pursuit Regression, Support Vector Machines, Using K-Fold Cross-Validation for Model Tuning and Model Selection	5	15
7	Forecasting Techniques: Moving Average, Exponentially Weighted Moving Average, Holt-Winters, Lagged Independent Variables, Lagged Dependent Variables, Bass Diffusion Model Ensemble Techniques	5	15

Text Book:

Big Data : A Revolution That Will Transform How We Live, Work and Think

Author: Kenneth Cukier, Viktor Mayer-Schonberger

Reference Book:

Big Data Big Analytics : Emerging Business Intelligence and Analytic Trends for Today's Businesses 1st Edition

Author: Michele Chambers, Michael Minelli, Ambiga Dhiraj

Big Data for Dummies

Author: Alan Nugent, Fern Halper, Judith Hurwitz, Marcia Kaufman

Too Big to Ignore : The Business Case for Big Data

Author: Phil Simon

Sem-III
Cloud Computing

Sr. No.	Topics	No. of Hours	Weight-age in Percentage
1	Data Centre foot prints & Concepts Introduction To cloud: Virtualization concepts, Types of Virtualization & its benefits, Introduction to Various Virtualization OS, Vmware , KVM etc, HA/DR using Virtualization Moving VMs	10	20
2	Data Centre foot prints & Concepts Introduction To cloud Virtualization concepts, Types of Virtualization & its benefits, Introduction to Various Virtualization OS Vmware , KVM etc, HA/DR using Virtualization, Moving VMsv. SAN backend concepts, Cloud Fundamentals, Cloud Building Blocks, Understanding Public & Private cloud environments	10	20

	<p>Cloud as IaaS</p> <p>Private Cloud Environment, Basics of Private cloud infrastructure , QRM cloud demo, Public Cloud Environment, Understanding & exploring Amazon Web services, Managing and Creating Amazon EC2 instances,</p> <p>Managing and Creating Amazon EBS volumes, Tata Cloud details & demo, Managing Hybrid Cloud environment</p>	15	30
3	<p>Setting up your own Cloud</p> <p>How to build private cloud using open source tools, Understanding various cloud plugins, Setting up your own cloud environment, Autoprovisioning, Custom images</p> <p>Integrating tools like Nagios, Integration of Public and Private cloud</p>	5	20
4	<p>Future directions</p> <p>Cloud Domain and scope of work, Cloud as PaaS, SaaS</p> <p>Cloud Computing Programming Introduction, Trends and market of cloud</p>	10	30

Test Book:

Cloud Computing : A practical Approach: By Anthony T. Velte : Tata McGraw-Hill

Reference book:

1. Cloud Application Architecture: By George: O.reilly Press

Elective List for M.Tech. In Computer Science Technology

Elective -I

Advanced Wireless Networks

Sr. No.	Topics	No of hours	weightage in Percentage
1	Medium access control in wireless LANs, System and protocol architecture of 802.11, MAC management, 802.11a, 802.11b, Case studies of 802.11.	8	20
2	Hiperlan: Historical Hiperlan1, WATM, BRAN, Hiperlan2.	6	15
3	Bluetooth: User Scenarios, System architecture, Security	6	15
4	Performance analysis and quality of service: Jitter, Reliability, Delay,etc	4	10
5	Single and multi-hop adhoc networks: Routing issues, Case studies of Mobile IP, IPv6, DSR, AODV and other protocols.	8	20
6	Transport issues: TCP adaptations for wireless and mobility. Flat and hierarchical architectures, personal/session/user mobility and supporting architectures.	8	20

Books:

5. H. Schiller. Mobile communications. Addison Wesley, 2000.
6. M. S. Gast. 802.11 wireless networks. O`Reilly, 2002. Charles Perkins. Mobile IP. Addison Wesley, 1999.
7. V. K. Garg and J.E. Wilkes. Wireless and personal communication systems, Prentice Hall, 1996.
8. Relevant RFCs, standards and research papers.

Distributed Algorithm

Sr. No.	Topics	No of hours	weightage in Percentage
1	Design of algorithms for multi-processor systems, proof methods and analysis of their complexity.	6	15
2	Study of basic problems in multiprocessor systems; lower bounds for comparison and non comparison based problems and impossibility results for identical processes.	8	25
3	Mutual exclusion and resource allocation, agreement problems (Byzantine generals' problem, approximate agreement, etc.)	8	25
4	Lock synchronization and logical clocks, Lamport's algorithm, Cristian's algorithm	10	20
5	Broadcast and multicast, lock-free synchronization.	8	15

Object Oriented Techniques

Sr. No.	Topics	No of hours	weightage in Percentage
1	Introduction: The meaning of Object Orientation, object identity, Encapsulation, information hiding, polymorphism, generosity, importance of modeling, principles of modeling, object oriented modeling, Introduction to UML, conceptual model of the UML, Architecture.	4	10
2	Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams.Collaboration Diagrams: Terms, Concepts, depicting a message, polymorphism in collaboration Diagrams, iterated messages, use of self in messages. Sequence Diagrams: Terms, concepts,depicting asynchronous messages with/without priority, callback mechanism, broadcast messages.Basic Behavioral Modeling: Use cases, Use case Diagrams, Activity Diagrams, State Machine , Process and thread, Event and signals, Time diagram, interaction diagram, Package diagram.Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams.	6	20
3	Object Oriented Analysis, Object oriented design, Object design, Combining three models,Designing algorithms, design optimization, Implementation of control, Adjustment of inheritance, Object representation, Physical packaging, Documenting design considerations.Structured analysis and structured design (SA/SD), Jackson Structured Development (JSD).Mapping object oriented concepts using non-object oriented language, Translating classes into data structures, Passing arguments to methods, Implementing inheritance, associations encapsulation. Object oriented programming style: reusability, extensibility, robustness, programming in the large. Procedural v/s OOP, Object oriented language features.	10	25

	Abstraction and Encapsulation.		
4	Introduction to Java, History, Features, Object Oriented concept of Java, Classes and Objects, Inheritance, Packages, Interface, abstract method and classes, Polymorphism, Inner classes, String Handling, I/O, Networking, Event Handling. Multi threading, Collection, Java APIs, Java Beans: Application Builder tools, The bean developer kit(BDK), JAR files, Introspection, Developing a simple bean, using Bound properties, The Java Beans API, Session Beans, Entity Beans, Introduction to Enterprise Java beans (EJB).	10	25
5	Java Swing: Introduction to AWT, AWT v/s Swing, Creating a Swing Applet and Application. Utility of Java as internet programming language, JDBC, The connectivity model, JDBC/ODBC Bridge, Introduction to servlets.	10	20

References:

1. James Rumbaugh et. al, "Object Oriented Modeling and Design", PHI
2. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Pearson Education
3. Naughton, Schildt, "The Complete Reference JAVA2", TMH
4. Mark Priestley "Practical Object-Oriented Design with UML", TMH
5. Booch, Maksimchuk, Engle, Young, Conallen and Houston, "Object Oriented Analysis and Design with Applications", Pearson Education
6. Pandey, Tiwari, "Object Oriented Programming with JAVA", Acme Learning

Elective-I

Knowledge Management

Sr. No.	Topics	No of Hours	weightage in Percentage
1	Principles, Case Studies, Overview of Knowledge Management, The Nature of Knowledge, Knowledge Management Solutions Organizational Impacts of Knowledge Management , Factors Influencing Knowledge Management , Knowledge Management Assessment of an Organization	6	10
2	Technologies to Manage Knowledge: Artificial Intelligence, Digital Libraries, Repositories, etc.	5	8
3	Preserving and Applying Human Expertise: Knowledge-Based Systems , Using Past History Explicitly as Knowledge: Case-Based Systems , Knowledge Elicitation: Converting Tacit Knowledge to Explicit	6	20
4	Discovering New Knowledge: Data Mining , Text KM & Text Mining , Knowledge Discovery: Systems that Create Knowledge	6	20
5	Knowledge Capture Systems: Systems that Preserve and Formalize	6	20

	Knowledge; Concept Maps, Process Modeling, RSS, Wikis, Delphi Method, etc.		
6	Knowledge Sharing Systems: Systems that Organize and Distribute Knowledge; Ontology Development Systems, Categorization and Classification Tools, XML-Based Tools, etc.	6	20
7	Knowledge Application Systems: Systems that Utilize Knowledge , What to Expect: The Future of Knowledge Management	5	7

Text Book: Irma Becerra-Fernandez, Avelino Gonzalez, Rajiv Sabherwal (2004). *Knowledge Management Challenges, Solutions, and Technologies* (edition with accompanying CD). Prentice Hall. ISBN: 0-13-109931-0.

Reference books:

- ⤴ Elias M. Awad, Hassan M. Ghaziri (2004). *Knowledge Management*. Prentice Hall. ISBN: 0-13-034820-1.
- ⤴ Ian Watson (2002). *Applying Knowledge Management: Techniques for Building Corporate Memories*. Morgan Kaufmann. ISBN: 1558607609.
- ⤴ Madanmohan Rao (2004). *Knowledge Management Tools and Techniques: Practitioners and Experts Evaluate KM Solutions*. Butterworth-Heinemann. ISBN: 0750678186.
- ⤴ Amrit Tiwana (2002). *The Knowledge Management Toolkit: Orchestrating IT, Strategy, and Knowledge Platforms* (2nd Edition). Prentice Hall. ISBN: 013009224X.
- ⤴ Stuart Barnes (ed) (2002). *Knowledge Management Systems Theory and Practice*. Thomson Learning.
- ⤴ Stuart Russell, Peter Norvig (2003). *Artificial Intelligence: A Modern Approach* (2nd Edition). ISBN: 0-13-790395-2.
- ⤴ Ian H. Witten, Alistair Moffat, Timothy C. Bell (1994). *Managing Gigabytes*. Van Nostrand Reinhold. ISBN: 0-442-01863-0.
- ⤴ Christopher D. Manning, Hinrich Schuetze (1999). *Foundations of Statistical Natural Language Processing*. MIT Press. ISBN: 0262133601.
- ⤴ Robert Dale, Hermann Moisl, Harold Somers (eds) (2000). *Handbook of Natural Language Processing*. Marcel Dekker. ISBN: 0824790006.
- ⤴ Dan Sullivan (2001). *Document Warehousing and Text Mining*. Wiley. ISBN: 0-471-39959-0.

- ▲ David M. Levy (2001). *Scrolling Forward: Making Sense of Documents in the Digital Age*. Arcade Publishing. ISBN: 1559705531.
- ▲ Chris Collison, Geoff Parcell (2001). *Learning to Fly: Practical Lessons from one of the World's Leading Knowledge Companies*. Capstone. ISBN: 1-84112-124-X.
- ▲ Peter F. Drucker, David Garvin, Leonard Dorothy, Straus Susan, John Seely Brown (1998). *Harvard Business Review on Knowledge Management*. Harvard Business School Press. ISBN: 0875848818.
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Elective-I

Service Oriented Architecture

Sr. No.	Topics	No of Hours	weightage in Percentage
1	Introducing SOA: Fundamental SOA, Characteristics of contemporary SOA, Misperception about SOA, Tangible benefits of SOA.	10	10
2	The Evolution of SOA: An SOA timeline, Continuing evolution of SOA, Roots of SOA.	10	20
3	Web Services and Primitive SOA: Web services framework, Services (Web services: Definition, Architecture and standards), Service descriptions with WSDL, Messaging with SOAP, UDDI.	10	20
4	Web Services and Contemporary SOA (I: Activity Management and Composition:) Message exchange patterns, Coordination, Atomic transactions, Business activities, Orchestration, Choreography.	10	20

5	Web Services and Contemporary SOA (II: Advanced Messaging, Metadata, and Security): Addressing, Reliable messaging, Correlation, Policies, Metadata exchange, Security, Notification and eventing	10	30
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Text Book:

1) Thomas Erl, “Service Oriented Architecture: Concepts, Technology, and Design”,
Pearson education.

References:

2) Mark D Hansen, “SOA using Java Web Services”, Prentice Hall Publication.

3) Michael Rosen & et el., “Applied SOA”, Wiley Publication.

4) Roshen, “SOA based Enterprise Integration”, TMH Publication.

5) Muninder Singh & Michael Huhns, “Service Oriented Computing”, Wiley Publication.

6) B.V.Kumar, Prakash Narayan & Tony Ng, “Implementing SOA Using Java EE”, Pearson Education.

7) Ron Schmelzer et al., “XML and Web Services”, Pearson Education.

8) William A. Brown, Robert G. Laird, Clive Gee & Tilak Mitra, “SOA Governance”, Pearson Education.

Advanced Database Technology

Sr. No.	Topics	No of Hours	weightage in Percentage
1	RELATIONAL MODEL ISSUES : ER Model - Normalization – Query Processing – Query Optimization - Transaction Processing - Concurrency Control – Recovery - Database Tuning.	6	10
2	DISTRIBUTED DATABASES: Parallel Databases – Inter and Intra Query Parallelism – Distributed Database Features – Distributed Database Architecture – Fragmentation – Distributed Query Processing – Distributed Transactions Processing – Concurrency Control – Recovery – Commit Protocols.	10	15
3	OBJECT ORIENTED DATABASES: Introduction to Object Oriented Data Bases - Approaches - Modeling and Design - Persistence – Query Languages - Transaction - Concurrency – Multi Version Locks – Recovery – POSTGRES – JASMINE –GEMSTONE - ODMG Model.	10	15

4	EMERGING SYSTEMS: Enhanced Data Models - Client/Server Model - Data Warehousing and Data Mining - Web Databases – Mobile Databases- XML and Web Databases.	10	20
5	CURRENT ISSUES : Rules - Knowledge Bases - Active and Deductive Databases – Multimedia Databases– Multimedia Data Structures – Multimedia Query languages - Spatial Databases.	10	20
6	Database on cloud, data migration issues in cloud. Data security in cloud	4	20

Elective-II

Geographic Information Systems

Sr. No	Topics	No of Hours	weightage in Percentage
1	Introducing GIS and spatial data: Definition - maps and spatial information - computer assisted mapping and map analysis - components of GIS - people and GIS - maps and spatial data - thematic characteristics of spatial data - other sources of spatial data: census, survey data, air photos, satellite images, field data.	4	10
2	Spatial and attributes data modeling and Management: Data quality and data standards: Concepts - Definition - Components and assessment of data quality: Spatial entities - generalization - Raster and Vector spatial data structures - comparison of Vector and Raster Methods - Acquisition of spatial data for terrain modeling - Raster and Vector approach to digital terrain modeling - modeling network - layered approach and object - oriented approach - modeling third and fourth dimension - problem of data management - database management system - relational database model - linking spatial and attribute data - GIS database	8	15

	application and development.		
3	Data Input and Editing: Integrated GIS database - Encoding methods of data input: keyboard, manual digitizing scanning and automatic digitizing methods, electronic data transfer - data editing: methods of developing and correcting errors in attributes and spatial data: reproduction, transformation and generalization - edge matching and rubber sheeting - integrated database.	8	15
4	Data Analyzing Operation in GIS: Terminologies - Measurements of lengths, perimeter and area in GIS - queries - reclassification - buffering and neighborhood functions - integrated data - Raster and Vector overlay method: point-in-polygon, line-in-polygon and polygon-on-polygon - problems of Raster and Vector overlays - spatial interpolation - GIS for surface analysis - network analysis: shortest path problem, traveling problem, location allocation of resources - route tracing.	10	30
5	GIS Modeling for decision support: Models of spatial processes: natural and scale analogue models - conceptual models - mathematical model - models of physical and environmental processes - modeling human process - gravity model - problems related to using GIS to model spatial processes. Maps as output - alternative cartographic outputs - non-cartographic outputs - spatial multimedia - delivery mechanism - GIS and spatial decision supports - maps as decision tools.	10	30

REFERENCES

1. Haywood.L, Comelius.S and S. Carver (1988) An Introduction to Geographical Information Systems, Addison Wiley Longmont, New York.
2. Burgh P.A (1986) Principles of geographical Information System for Land Resources Assessment, Clarendon Press, Oxford.
3. Burrough P A 2000 P A McDonnell [2000] Principles of Geographical Information systems, London: Oxford University Press.
4. Lo.C.P., Yeung. K.W. Albert (2002) Concepts And Techniques of Geographic Information Systems, Prentice-Hall of India Pvt ltd, New Delhi

Compiler Construction

Semester: II
Branch: M.Tech. CST

Lect: 4 Hr
Credit: 04

Sr. No.	Topic and Details	No of Lectures Assigned	Marks Assigned
1	Compiler structure: analysis-synthesis model of compilation, various phases of a compiler, tool based approach to compiler construction.	2	5
2	Lexical analysis: interface with input, parser and symbol table, token, lexeme and patterns, difficulties in lexical analysis, error reporting, and implementation. Regular definition, Transition diagrams, LEX.	6	15

3	Syntax analysis: context free grammars, ambiguity, associativity, precedence, top down parsing, recursive descent parsing, transformation on the grammars, predictive parsing, Bottom up parsing, operator precedence grammars, LR parsers (SLR, LALR, LR), YACC.	6	20
4	Syntax directed definitions: inherited and synthesized attributes, dependency graph, evaluation order, bottom up and top down evaluation of attributes, L- and S-attributed definitions.	5	10
5	Type checking: type system, type expressions, structural and name equivalence of types, type conversion, overloaded functions and operators, polymorphic functions.	3	7
6	Run time system: storage organization, activation tree, activation record, parameter passing, symbol table, dynamic storage allocation.	2	8
7	Intermediate code generation: intermediate representations, translation of declarations, assignments Intermediate Code generation for control flow, boolean expressions and procedure calls, implementation issues.	6	15
8	Code generation and instruction selection: issues, basic blocks and flow graphs, register allocation, code generation, DAG representation of programs, code generation from dags, peep hole optimization, code generator generators, specifications of machine.	4	10
9	Code optimization: source of optimizations, optimization of basic blocks, loops, global data flow analysis, solution to iterative data flow equations. Code improving transformations, dealing with aliases, data flow analysis of structured flow graphs	6	15

References

[1] Aho, Ullman, Sethi “ Compilers : Principles, Techniques and Tools”, Prentice Hall, 2nd Edition

[2] D. M. Dhamdhare, “ Compiler Construction”, Macmillan Publishers India, 2nd Edition

[3] R. K. Maurya, "System Programming and Compiler Construction", Wiley-dreamtech

[4] Torben, Mogensen, " Basics of Compiler Design", University of Copenhagen,2010

Algorithmic Graph Theory

Sr. No.	Topics	No of Hours	weightage in Percentage
1	Introduction of some of the new results in algorithmic graph theory and perfect graphs.	5	10
2	Integration of the solutions of the algorithmic problems on special graph classes to a variety of application areas.	10	25
3	Survey of new research directions that could be the investigation subjects for graduate students.	10	25
4	Graph Theoretic Foundations ,The Design of Efficient Algorithms, Graph Search Perfect Graph	15	40

Text Books:

1. Martin Charles Golumbic, "*Algorithmic Graph Theory and Perfect Graphs*", 2nd edition, 2004 Elsevier Inc. USA.

Reference:

1. Robert Sedgewick, “Algorithms in C: Part 5 Graph Algorithms”, 3rd edition, 2002, Addison Wesley.
2. Sara Baase etc., Chapters 7-9, “Computer Algorithms,” 3rd edition 2000, Addison Wesley.
3. Wayne Copes etc., “*Graph Theory*”, 1987, Jason Publications, Inc.

Adaptive Signal Processing

Sr. No.	Topics	No of Hours	weightage in Percentage
1	EIGEN ANALYSIS: Eigen Value Problem, Properties of eigen values and eigen vectors, Eigen Filters, eigen Value computations.	4	10
2	INTRODUCTION TO ADAPTIVE SYSTEMS: Definitions, Characteristics, Applications, Example of an Adaptive System. The Adaptive Linear Combiner - Description, Weight Vectors, Desired Response Performance function, Gradient & Mean Square Error.	6	10
3	DEVELOPMENT OF ADAPTIVE FILTER THEORY & SEARCHING THE PERFORMANCE SURFACE: Introduction to Filtering, Smoothing and Prediction, Linear Optimum Filtering, Problem statement, Principle of Orthogonality - Minimum Mean Square Error, Wiener- Hopf equations, Error Performance - Minimum Mean Square Error. SEARCHING THE PERFORMANCE SURFACE – Methods & Ideas of Gradient Search methods, Gradient Searching Algorithm & its Solution, Stability & Rate of convergence - Learning Curves.	5	20
4	STEEPEST DESCENT ALGORITHMS: Gradient Search by Newton’s Method, Method of Steepest Descent, Comparison of Learning Curves.	5	10
5	LMS ALGORITHM & APPLICATIONS: Overview - LMS Adaptation algorithms, Stability & Performance analysis of LMS Algorithms - LMS Gradient & Stochastic algorithms, Convergence of LMS algorithm. Applications: Noise cancellation, Cancellation of Echoes in long distance telephone circuits, Adaptive Beam forming.	5	10

6	RLS ALGORITHM: Matrix Inversion lemma, Exponentially weighted recursive least square algorithm, update recursion for the sum of weighted error squares, convergence analysis of RLS Algorithm, Application of RLS algorithm on Adaptive Equalization	5	10
7	KALMAN FILTERING: Introduction, Recursive Mean Square Estimation Random variables, Statement of Kalman filtering problem, Filtering, Initial conditions, Variants of Kalman filtering, Extend Kalman filtering.	5	15
8	NON LINEAR ADAPTIVE FILTERING: Theoretical and Practical considerations of Blind Deconvolution, Buss Gang Algorithm for blind Equalization of real base band Channels	5	15

TEXTBOOKS:

1. Adaptive Signal Processing - Bernard Widrow, Samuel D.Stearns, 2005, PE.
2. Adaptive Filter Theory - Simon Haykin-, 4 ed., 2002,PE Asia.

REFERENCES:

1. Optimum signal processing: An introduction - Sophocles.J.Orfamadis, 2 ed., 1988, McGraw-Hill, Newyork
2. Adaptive signal processing-Theory and Applications, S.Thomas Alexander, 1986, Springer –Verlag.

Electronics Commerce

Sr. No.	Topics	No of Hours	weightage in Percentage
1	Introduction to E-Commerce: The Internet and commercial Transactions, Infrastructure for Electronic Commerce; Internet, Internets and extra nets, web clients and servers.	4	15
2	Web based tools for E-Commerce: Web server hardware and software, web portals E-Commerce Soft ware, web hosting services and packages.	8	10
3	Security Technologies: Security threats to E-Commerce, Encryption, Digital signatures, certifying authorities, public key cryptography, security protocols; secure socket layer, (SSL), secured electronic Transaction (SET), PKI	10	30
4	Electronic Payment Systems: Secure online Transaction models, e-cash, smart cards, credit and charge cards, e-wallet.	8	15

5	Electronic Data Interchange (EDI): EDI basics, EDI on the Internet, supply chain management, software for purchasing, logistics and support activities. Cyber Law for E-Commerce, Legal, ethical and Tax issues. Case Studies	10	30
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Text Books

1. “ Electronic Commerce ” by Pete Loshin and P.A.Murphy, Jaico Publishing House, 1999.
- 2.“Electronic Commerce” by Gary Schneider and James T. Perry, Thomson learning, 2001.

Reference Books

- 1.“Frontiers of E-Commerce ” by Kalakota, Addison Wesley long man Publishers, 1999.
- 2.“Designing systems for Internet Commerce” by Treese Addison Wesley long man; 1999.
- 3.“E-Commerce: The cutting edge of Business” by Kamlesh Bajaj & Debjani Nag, Tata Mcgraw Hill, 2000.
- 4.“Creating a winning E-Business” by Napier, Judd, Rivers and Wagner, Thomson learning, Vikas Publishing House, 2001.
- 5.“E-Commerce for Managers: E-business strategy in developing countries”, by Alwyn Didar Singh, Vikas Publishing House, 2002.
- 6.“E-Commerce Application using Oracle 8i and Java”, Thakkar Prentice Hall of India 2001.
7. “E-Commerce strategies”, Trepper, Prentice Hall of India, 2001.

8.

Elective-III

Advanced Data Networks

Sr. No.	Topics	No of Hours	weightage in Percentage
1	Broadband Networks: ATM, Frame relay and Gigabit Ethernet.	10	25
2	Traffic Management in ATM networks, QOS in ATM, IP over ATM, Call Admission Control,	14	35
3	Multiprotocol Label Switch Technology, Real Time Communication and QOS in MPLS, MPLS Support of 3 Differentiated Services, Performance Analysis	16	40

Books:

1. J. M. Pitts and J.A. Schormans. Introduction to ATM: Design and Performance. Wiley, 2000
2. E. Grey. MPLS: Implementing The Technology. Addison Wesley, 2001 Relevant RFCs, internet drafts and research papers.
3. 3. Singhal, N. Shivaratri : Advanced concepts in operating systems, McGraw Hill, 1994. A. S. Tanenbaum : Modern operating systems, Prentice Hall, 1993.

Enterprise resource planning

Sr. No.	Topics	No of Hours	weightage in Percentage
1	Introduction : Concept of ERP, EERP, Evolution of ERP - MRP, MRP-II, Market Share, Vendors available etc.	4	10
2	Core Processes (Operations processes) in brief for Manufacturing, Materials, Sales & BD	8	20
3	Supporting processes :Finance & Accounts, Materials, HR processes	6	10
4	ERP - Technical architecture : Software modules and technical architecture	4	10
5	ERP - Implementation methodology : At least TIER- ERPs are covered, Extended ERP	8	20
6	Supply Chain (SCM), Customer relationship (CRM), BI, Data warehousing and Data mining, Careers in ERP	10	20
7	Advancement in ERP and EERP: Open Source ERP – Concept and need, Cloud based ERP. Market players.		10

Books:

1. Sandeep Desai, “ERP”

Elective-III

Network Security

Sr. No.	Topics	No of Hours	weightage in Percentage
1	Data security: Review of cryptography. Examples – RSA, DES, ECC, etc. Authentication, non-repudiation and message integrity. Digital signatures and certificates.	8	20
2	Protocols using cryptography (example – Kerberos). Attacks on protocols.	6	15
3	Network security: Firewalls, Proxy-Servers, Network intrusion detection.	10	25
4	Transport security: Mechanisms of TLS, SSL, IPSec.	8	20
5	Biometric authentication, Secure E-Commerce (ex. SET), Smart Cards, Security in Wireless Communication.	8	20

Books:

1. W. R. Cheswick and S. M. Bellovin. Firewalls and Internet Security. Addison Wesley, 1994.
2. W. Stallings. Cryptography and Network Security. Prentice Hall, 1999.
3. B. Schneier. Applied Cryptography. Wiley, 1999. A. J. Menezes, P.C. Van Oorschot, S. A. Vanstone.
4. Handbook of Applied Cryptography. CRC Press. 1996. Relevant RFCs, standards and research papers.

Semantics of Programming Lang

Sr. No.	Topics	No of Hours	weightage in Percentage
1	Program Design: Introduction- fundamental Design Concepts - Modules and Modularization Criteria - Design notation: Procedure Template, Pseudo Code - Structured Flow Chart – Decision Tables - Design techniques: Stepwise refinement, Levels of abstraction, Top down- Test Plans- Design Guidelines. Implementation Issues: Introduction – Structured Coding techniques: single entry and single exit constructs, Efficiency consideration, Validation of single entry and single exit, Coding Style.	8	20
2	Introduction: Characteristics of programming Languages, Factors influencing the evolution of programming language, Development in programming methodologies, desirable features and design issues. Programming Language processors: Structure and operations of translators, software simulated computer, syntax, semantics, structure, virtual computers, binding and binding time.	10	15
3	Data types: Properties of types and objects –elementary data types – structured data types. Abstraction: Abstract data types – encapsulation by subprograms – type definition – storage management.	6	20
4	Sequence Control: Implicit and explicit sequence control – sequencing with arithmetic and non-arithmetic expressions – sequence control between statements. Subprograms Control: Subprogram sequence control – attributes of data control – shared data in.	6	20
5	Object Oriented Programming: The class notion - Information hiding and data abstraction using classes, derived classes and inheritance, Polymorphism, Parameterized types. Logic Programming: Formal logical systems – PROLOG. Functional Programming: Features of functional languages – LISP – Applications of functional and logic programming languages.	10	25

TEXT BOOK

1. Richard Fairley,” Software Engineering Concepts”, Tata Macgraw Hill, 2006 (UNIT I)

2. Terrance W. Pratt, and Marvin V. Zelkowitz, “Programming Languages, Design and Implementation”, Prentice-Hall of India,
Fourth edition, 2002 (UNIT II to V)

REFERENCES

1. Ravi Sethi, “Programming Languages – Concepts and Constructs”, Addison-Wesley, Second edition, 1996.
2. Allen B. Tucker, Robert Noonan, Programming Languages: Principles and Paradigms, Tata McGraw-Hill, 2006.
3. E. Horowitz, “Fundamentals of **High Speed Network** Programming Languages”, Galgotia Publishers, 1984.
4. A.B. Tucker, Robert, Noonan, “Programming Languages”, McGraw-Hill, 2002.
5. Robert W. Sebesta, “Concepts of Programming Languages”, Addison Wesley, Sixth edition, 2003.

Artificial Neural Networks

Sr. No.	Topics	No of Hours	weightage in Percentage
1	Introduction, Fundamental concepts and Models of Artificial Neural systems, Simple neural nets for Pattern Classification	6	10
2	Single Layer Perceptron Classifiers, Multi Layer Feed Forward Networks,	8	20
3	Single Layer Feedback Networks, Associative Memories	8	15
4	Pattern Association, Neural Networks based on competition	10	40
5	Back Propagation neural net, Applications of Neural Algorithms and Systems	8	15

References:

1. Simon Hayking, 'Neural Networks: A Comprehensive Foundation', 2nd Ed., PHI.
2. Laurene Fausett, 'Fundamentals of Neural Networks: Architecture, Algorithms and Applications', Person Education, 2004.
3. Jacek M Zurada, 'Introduction to Artificial Neural Systems', Jaico Publishing House, 2003.

Lang. Technologies on Web

Sr. No.	Topics	No of Hours	weightage in Percentage
1	Internet Principles and Components: History of the Internet and World Wide Web – HTML - protocols – HTTP, SMTP, POP3, MIME, IMAP. Domain Name Server, Web Browsers and Web Servers, Dynamic HTML.,	6	15
2	Client Side and Server Side Programming: Introduction to JAVA Scripts and VB Scripts– Object Based Scripting for the web. Programming Java Script and VB Script - Structures – Functions – Arrays – Objects, Regular Expression in java script. Java Server Pages - Session and Application management - Session tracking and cookies – Access a database from JSP – Developing N-tier web application.	8	20
3	XML and ActiveX: Anatomy of xml document - XML markup-working with elements and attributes - creating valid documents-xml objects and DOM. ActiveX controls: OLE and ActiveX -ActiveX Documents, Server side Active-X Components, ActiveX DLL and ActiveX Exe.	8	20
4	Multimedia and Web Application: Multimedia in web design, Audio and video speech synthesis and recognition - Electronic Commerce – E-Business Model – E-Marketing – Online Payments and Security – N-tier Architecture. Search and Design: Working of search engines -optimization-Search interface.	8	20
5	Web Services: Introduction to Web Services, UDDI, SOAP, WSDL, Web Service Architecture, Developing and deploying web services. Ajax – Improving web page performance using Ajax, Programming in Ajax.	10	25

TEXT BOOKS

1. Deitel and Deitel, Goldberg, “Internet and World Wide Web – How to Program”, Pearson Education Asia, 2001.
(UNIT I)

2. Rajkamal, “Web Technology”, Tata McGraw-Hill, 2001. (UNITs II & IV)
3. John Paul Mueller, “Active X from the Ground Up”, Tata McGraw-Hill, 1997. (UNIT III)
4. Eric Newcomer, “Understanding Web Services: XML, WSDL, SOAP, and UDDI”, Addison-Wesley, 2002. (UNIT V)

REFERENCES

- 1 Phillip Hanna, “JSP 2.0 - The Complete Reference”, McGraw-Hill, 2003. Mathew Eernisse, “Build Your Own AJAX Web Applications”, Site Point, 2006.

Elective-IV

Network Management

Sr · N o	Topics	No. Of Ho urs	weightage in Percentage
1	Data communications and Network Management Overview : Analogy of Telephone Network Management, Communications protocols and Standards, Case Histories of Networking and Management, Challenges of Information Technology Managers, Network Management: Goals, Organization, and Functions, Network and System Management, Network Management System Platform, Current Status and future of Network Management.	4	5
2	SNMPV1 Network Management: Organization and Information and Information Models. Managed network: Case Histories and Examples, The History of SNMP Management, The SNMP Model, The Organization Model, System Overview, The Information Model.	4	10
3	SNMPv1 Network Management: Communication and Functional Models. The SNMP Communication Model, Functional model.	4	10
4	SNMP Management: SNMPv2 : Major Changes in SNMPv2, SNMPv2 System Architecture, SNMPv2 Structure of Management Information, The SNMPv2 Management Information Base, SNMPv2 Protocol, Compatibility With SNMPv1.	6	15
5	SNMP Management: RMON: What is Remote Monitoring? , RMON SMI and MIB, RMON1, RMON2, ATM Remote Monitoring, A Case Study of Internet Traffic Using RMON	4	15
6	Telecommunications Management Network: Why TMN? , Operations Systems, TMN Conceptual Model, TMN Standards, TMN Architecture, TMN Management Service Architecture, An Integrated View of TMN, implementation Issues.	6	15
7	Web-Based Management: NMS with Web Interface and Web-Based Management, Web Interface to SNMP Management, Embedded Web-Based Management, Desktop management Interface, Web-Based Enterprise Management, WBEM: Windows Management Instrumentation, Java management Extensions, Management of a Storage Area Network: , Future Directions.	6	20
8	Network Management Tools and Systems: Network Management Tools, Network Statistics Measurement Systems, History of Enterprise Management, Network Management systems, Commercial Network management Systems, System Management, Enterprise Management Solutions.	6	10

TEXT BOOK:

1. Network Management, Principles and Practice, Mani Subrahmanian, Pearson Education.

REFERENCES:

1. Network management, Morris, Pearson Education.
2. Principles of Network System Administration, Mark Burges, Wiley Dreamtech.
3. Distributed Network Management, Paul, John Wiley.

Complexity Theory

Sr. No	Topics	No. Of Hours	weightage in Percentage
1	Basic resources for computation (time, space, nondeterminism) and their associated complexity classes (P, NP, PSPACE and more)	4	5
2	Relationships among resources (P versus NP, time versus space, and more)	4	10
3	Reductions & completeness (NP completeness, PSPACE completeness, and more)	6	15
4	Counting problems, #P	4	10
5	Randomness as a computational resource; associated complexity classes	4	10
6	Nonuniform models of computation; circuit complexity; lower bounds	6	20
7	Communication complexity	4	10
8	Interactive proofs & $IP=PSPACE$	4	10
9	Probabilistically checkable proofs (PCP) and inapproximability	4	10

Books:

1. A. V. Aho , J. E. Hopcroft and J. D. Ullman, The Design and Analysis of Algorithms, Addison-Wesley, 1974.
2. T. H. Cormen , C. E. Leiserson and R. L. Rivest, Introduction to Algorithms, MIT Press, 1990 .
3. M. R. Garey and D. S. Johnson, Computers and Intractability: A Guide to the Theory of NP-Completeness, Freeman, 1979.
4. J. Van Leuween ed, Handbook of Theoretical Computer Science, Vol A., Elsevier, 1990 .

Speech Processing

Sr · No	Topics	No. Of Ho urs	weightage in Percentage
1	MECHANICS OF SPEECH: Speech production: Mechanism of speech production, Acoustic phonetics, Digital models for speech signals, Representations of speech waveform: Sampling speech signals, basics of quantization, delta modulation, and Differential PCM Auditory perception: psycho acoustics.	8	20
2	TIME DOMAIN METHODS FOR SPEECH PROCESSING: Time domain	8	15

	parameters of Speech signal – Methods for extracting the parameters Energy, Average Magnitude, Zero crossing Rate, Silence Discrimination using ZCR and energy, Short Time Auto Correlation Function, Pitch period estimation using Auto Correlation Function.		
3	FREQUENCY DOMAIN METHOD FOR SPEECH PROCESSING: Short Time Fourier analysis: Fourier transform and linear filtering interpretations, Sampling rates, Spectrographic displays, Pitch and formant extraction, Analysis by Synthesis, Analysis synthesis systems: Phase vocoder, Channel Vocoder, Homomorphic speech analysis: Cepstral analysis of Speech, Formant and Pitch Estimation, Homomorphic Vocoders.	8	25
4	LINEAR PREDICTIVE ANALYSIS OF SPEECH: Basic Principles of linear predictive analysis, Auto correlation method, Covariance method, Solution of LPC equations, Cholesky method, Durbin's Recursive algorithm, Application of LPC parameters, Pitch detection using LPC parameters, Formant analysis, VELP, CELP.	8	20
5	APPLICATION OF SPEECH & AUDIO SIGNAL PROCESSING: Algorithms: Dynamic time warping, K-means clustering and Vector quantization, Gaussian mixture modeling, hidden Markov modeling Automatic Speech Recognition: Feature Extraction for ASR, Deterministic sequence recognition, Statistical Sequence recognition, Language models, Speaker identification and verification, Voice response system, Speech synthesis: basics of articulatory, source-filter, and concatenative synthesis – VOIP	8	20

TEXT BOOK:

1. Thomas F, Quatieri, Discrete-Time Speech Signal Processing, Prentice Hall / Pearson Education, 2004.

REFERENCES:

1. Ben Gold and Nelson Morgan, Speech and Audio Signal Processing, John Wiley and Sons Inc., Singapore, 2004
2. L.R.Rabiner and R.W.Schaffer – Digital Processing of Speech signals – Prentice Hall -1979
3. L.R. Rabiner and B. H. Juang, Fundamentals of Speech Recognition, Prentice Hall, 1993.
4. J.R. Deller, J.H.L. Hansen and J.G. Proakis, Discrete Time Processing of Speech Signals, John Wiley, IEEE Press, 1999.

Advanced Internet Technology

Sr. No	Topics	No. Of Hours	weightage in Percentage
1	Advanced Internet Protocols: DNS, Working of DNS, DNS Header, Type of Records in DNS, forward and Reverse lookup, Configuration of Open Source (OS) DNS, working of DDNS - DHCP, DHCP header, Working of DHCP, Configuration of OS DHCP - FTP, Working of FTP, Configuration of OS Public FTP server and Private FTP server Understanding IPv6, CIDR, Hierarchical Routing, and Routing Protocol over internet. Multimedia over Internet, Voice over IP, Virtual Private network	10	20
2	Internet as a Distributed computing platform: Understanding Web Services technology, REST based web services (Resource Oriented Architecture) and Service oriented Architecture, Introduction to cloud computing, case study and working of Google App engine and Amazon Cloud, Working of Peer to Peer over internet with case study of Bittorent	12	30
3	Advanced Internet programming: HTML 5.0, Rich Internet Technology, AJAX, FLEX , Integrating PHP and AJAX, Consuming Web Service with AJAX, Resource Syndication (RSS), Working principle of search engines	10	25
4	Internet Security: Public Key Infrastructure, Client side Vulnerabilities, Server Side Vulnerabilities, Database Vulnerabilities, Secure Payment Mechanism, Security issues in cloud	8	25

TEXT BOOKS /REFERENCE BOOKS:

1. TCP/IP Protocol Suite : By Behrouz A. Forouzan : Tata McGraw-Hill
2. Cloud Computing : A practical Approach: By Anthony T. Velte : Tata McGraw-Hill
3. Using Google App Engine: By Charles : O.reilly Press
4. Cloud Application Architecture: By George: O.reilly Press
5. RESTful web services: By Leonard: O.Reilly Press
6. Rich Internet Application AJAX and Beyond: B y Dana moore : Wrox press