University of Mumbai
Syllabus Structure(R- 2007)
At
T.E. (Computer Engineering)
Semester-V

Sr. No.	Subject	Scheme of Instructions Periods per Week Each Period of 60 Min.		Scheme of Evaluation				
		Theory	Practical	Paper		TW	Practical & Oral	Total
				Hours	Marks			
1	Computer Network	4	2	3	100	25	50	175
2.	Advance database Management System	4	2	3	100	25	50	175
3.	Microprocessor	4	2	3	100	25	25	150
4.	Theory of Computer Science	4	2	3	100	25	-	125
5.	Web Engineering	4	2	3	100	25	25	150
6.	Environment Studies	2	1(T)	2	50	25	-	75
		22	11		550	150	150	850

(T) : Class wise tutorial

University of Mumbai			
Class: T.E.	**Branch:** Computer Engineering	**Semester:** V	
Subject: Advanced Database Management System(Abbreviated as **ADBMS**)			
Periods per Week (each 60 min)	Lecture	04	
	Practical	02	
	Tutorial	--	
		Hours	Marks
Evaluation System	Theory	03	100
	Practical and Oral	--	50
	Oral	---	--
	Term Work	---	25
	Total	03	175

Module	Contents	Hours
1	**Extended ER** :	04
	• E- R model revisited • Specialization & Generalization • Extended E-R • Subclass super class • Constraints and characteristics of specialization & Generalization • Relationship types of degree Higher than two • Aggregation, Union and categories • EER – To Relation Models Mapping	
2	**Database Design Methodology:** •Role of information system in organization • Database design and Implementation Process	04
3	**Advanced SQL :** • SQL Data types & Schemas • Queries based on SQL 3 standards • outer join, multi join , left, right, a full outer join, equal join, natural join • Aggregate, functions, Null values etc. • EXIST and NOT EXIST, any / all, pattern matching Dynamic SQL	08
4	**Query Processing :** • Overview • Measures of Query cost • Selection operation • Sorting • Join Operations • Other Operations Evaluation of Expression	04
5	**Query Optimization :** • Translations of SQL Queries into relational algebra • Heuristic approach & cost base optimization	04
6	**Object Relational and Extended Relational Databases :** • Overview of SQL 3 • Implementation issues for extended types, nested relations and collections,	06

	• Storage and access methods	
7	**Parallel and Distributed Databases and Client Server Architecture:** Introduction : for parallel databases • P arallel : Query Evaluation, Parallelizing, individual operations; sorting, joins, etc., distributed databases, concepts, data fragmentation, Replication and allocation techniques for distributed database design. Query Processing in distributed databases, concurrency control and recovery in distributed databases, An overview of Client Server Architecture.	10
8	**XML and Internet Databases:** • Structured unstructured and semi structured data. • XML hierarchical Data Model • XML Document, DTD and XML Schema • XML Documents & databases • XML Query	08

TERM WORK :

1. At least 6 practical experiments based on above syllabus
2. A mini project is desirable to be completed by a group of three with following specifications.

Problem definition
EER Model
Mapping to relational Model
Implementation should include user inter face having two data entry for ms and two reports. (using any connectivity of DBMS)

NOTE: The above (mini project) would carry a weightage of 10 marks.

A term work test must be conducted with a weightage of 10 marks.

Attendance 05 marks.

Practical Exam: Students are expected to develop a database application as a part of practical examination.

Text Books :

1. Elmasri & Navathe "Fundamentals of Database Systems" IV edition.
PEARSON Education.
2. Korth, Silberschatz sudarshan "Database systems, concepts" 5 edition th
McGraw Hill.

Reference Books :

1. Raghu Ramkrishnan & Johannes Gehr ke "Database Management System" Tata McGraw Hill. III edition.
2. Stefano Ceri, Hillseppe , pelagatti "Distributed Databases, Pr inciples and Systems" Tata Mc Graw Hill editions.
3. Dr. P.S. Deshpande, SQL and PL/SQL for Oracle log, Black Books Dreamtech Press.
4. Mark L. Gillenson, Paulraj Ponniah "Fundamentals of Database Systems" WILEY

University of Mumbai			
Class: T.E.	**Branch:** Computer Engineering	**Semester:** V	
Subject: Computer Network (Abbreviated as **CN**)			
Periods per Week (each 60 min)	Lecture	04	
	Practical	02	
	Tutorial	--	
		Hours	Marks
Evaluation System	Theory	03	100
	Practical and Oral	--	50
	Oral	---	--
	Term Work	---	25
	Total	03	175

Objectives of the course : This is first course in Computer Networks. Need of Communication is the fundamental expectation along with the Layered approach of Computer Network. It is expected to know the details of layers along with the functionalities like: How each layer works? and how each layer communicates with other layers?

Pre-requisites: Course in Data Structures and computer organization, C/C++.

Module	Contents	Hours
1	**Introduction:** Network Applications; Network Hardware: Topologies, LAN, MAN, WAN, Wireless network, Home Network, Internetworks; Network Software: Protocol Hierarchies, Design Issues for the layers, Connection oriented and connectionless Services; Reference Models: Layers details of OSI, TCP/IP Models	04
2	**The Physical Layer** **Transmission Media:** Guided Transmission Media: Twisted pair, Coaxial, Fiber optics; Unguided media (Wireless Transmission): Radio Waves, Microwaves, Infrared. **Network Hardware Components:** Connectors, Transceivers and Media converters, Network interface cards and PC cards, Repeaters, Hubs, Bridges, Switches, Routers and Gateways etc. **Telephone network:** Major components, Local access transport areas, Signaling, Services provided by telephone networks; Dial-up Modems; Digital subscriber line: ADSL, HDSL, SDSL,VDSL; **Cable Television network**: Cable TV for data transfer, BW, sharing, CM and CMTS, Data transmission schemes: DOCSIS.	08
3	**The Data Dink Layer** **Error detection and correction:** Types of errors, redundancy, detection versus correction, forward error correction versus retransmission, coding; Block Coding: Error detection, Error correction, Hamming distance, minimum hamming distance; Linear block codes; Cyclic codes: CRC, hardware implementation, Polynomials, Cyclic code analysis, Advantages, Other cyclic codes; Checksum;	08

	Data Link Control: Framing: Fixed size and variable size framing; Flow and Error control, Protocols for Noisy Channels: simplex protocol, Stop and wait protocol; Protocols for Noisy Channels: Concept of Sliding Window Protocol, Stop and wait ARQ, Go-back-ARQ, Selective repeat ARQ; Example of Data Link Protocols: HDLC; The Data Link Layer in the Internet: PPP. Eg.: Ethernet, Token Bus and Token Ring, FDDI, Bridge Protocols, Switching in LAN environment	
4	**The Medium Access Sub- layer:** The channel Allocation Problem: Static and Dynamic Channel Allocation; Random Access: ALOHA, CSMA, CSMA/CD, CSMA/CA; Controlled Access: Reservation, Polling, Token passing; Channelization: FDMA, TDMA, CDMA; Ethernet: IEEE standards; Standard Ethernet: MAC Sublayer , Physical Layer ; Bridged Ethernet, Switched Internet, Full-Duplex Ethernet; Fast Ethernet: MAC Sublayer, Physical Layer; Gigabit Ethernet: MAC Sublayer, Physical Layer, Ten Gigabit Ethernet.	08
5	**The Network Layer:** Network Layer Design Issues: Store and Forward Packet switching, Service provided to the transport layer , Implementation of connectionless and connection oriented services, comparison of Virtual-Circuit and Datagram Subnets; Routing Algorithms: Shortest path routing, Flooding, Distance vector routing, Link state routing, Hierarchical routing, Broadcast routing, Multicast Routing; Congestion Control Algorithms: General Principles, Congestion prevention policies, Congestion control in virtual circuit & Datagram subnets; Quality Of Service: Requirements, Techniques for achieving good QoS; Internetworking; Introduction to IP Protocol and IP Addresses,	08
6	**The Transport Layer:** The Transport Service: Transport service primitives, Berkeley Sockets, Socket programming examples; Elements of Transport Protocols: Addressing, Connection Establishment, Connection Release, Flow control and buffering, Multiplexing; Introduction to the Internet Transport Protocols: UDP and TCP	04
7	**Network Hardware Components:** Connectors, Transceivers and Media converters, Network interface cards and PC cards, Repeaters, Hubs, Bridges, Switches, Routers and Gateways etc	04
8	**Wireless LANs/WANs:** Introduction to Architecture and Layers of IEEE 802.11, Bluetooth, SONET; Introduction to Satellite Networks.	04

TOPICS FOR EXPERIMENT

1. Programs on Error detection and correction: CRC, Hamming Code, Checksum, etc
2. Use network simulators like NS2 to implement:
   a. Monitoring traffic for the given topology
   b. Analysis of CSMA and Ethernet protocols

c. Network Routing: Shortest path routing, DVR, LSR.
d. Analysis of congestion control (TCP and UDP).

3. Network Socket programming:
   a. TCP/UDP Client-Server program.
   b. Stop and Wait using sockets.
   c. Sliding Window Program using sockets.

4. Assignment: Case study with Windows / Linux, Prepare short note on any one advanced topic.

BOOKS

Text Books:

1. A. S. Tanenbaum, "Computer Networks", Pearson Education, Fourth Edition.
2. B. A. Forouzan, "Data Communications and Networking", TMH, Fourth Edition.

References:

1. M. A. Gallo and W. M. Hancock, "Computer Communications and Networking Technologies", CENGAGE Learning (I ndian Edition), First Edition.
2. Peterson, and Davie," Computer Networks", Morgan Kaufmann, Second Edition.
3. Kurose, Ross, "Computer Networking", Pearson Education, Third Edition.
4. S. Keshay, "An Engineering Approach to Computer Networking", Addison Wesley.
5. W.R. Stevens, "Unix Network Programming", Vol.1, Pearson Education.

TERM WORK

Term work should be based on the Lab experiments (15 Marks) and at least one term test must be conducted with a weightage of (10 Marks).

PRACTICAL/ORAL EXAMINATION

A Practical/Oral examination is to be conducted based on the above syllabus.

University of Mumbai			
Class: T.E.	**Branch:** Computer Engineering	**Semester:** V	
Subject: Environment Studies(Abbreviated as **EVS**)			
Periods per Week (each 60 min)	Lecture	02	
	Practical	--	
	Tutorial	01*	
		Hours	Marks
Evaluation System	Theory	02	50
	Practical and Oral	--	
	Oral	---	--
	Term Work	---	25
	Total	02	75
*Class wise Tutorial			

Objectives: Objective of this course is to create environmental awareness, of variety of environmental concerns.

Module	Content s	Hours
1	The multidisciplinary nature of environmental studies: Definition, Scope and importance, need for public awareness.	01
2.	Natural Resources Renewable and non- renewable resources Natural resources and associated problems a.Forest resources: use and over-exploitation, deforestation, case studies, timber extraction, mining, dams and their effects on forests and tribal people. b.Water resources: use and over utilization of surfaces and ground water, floods drought, conflicts over water, dams-benefits and problems. c.Mineral resources: use and exploitation, environmental effects of extracting and using mineral sources, case studies. d.Food resources: World food problems overgrazing, effects of modern agriculture, fertilizers-pesticides problems, Water logging, salinity, case studies. e.Energy resources: Growing energy needs, Renewable and non-renewable sources, use of alternate energy sources, case studies f. Land resources: Land as a resource, Land degradation, man induced landslides, soil erosion and desertification Role of an individual in conservation of natural resources. Equitable use resources for sustainable lifestyles	04
3.	• Ecosystems • Concepts of ecosystems • Structure and function of an ecosystem • Producers, consumers and decomposers • Energy flow in ecosystems • Ecological succession • Food chains, food web and ecological pyramids • Introduction, types, characteristics features, structure and function of following ecosystems a. Forest ecosystems	03

	b. Grassland ecosystems c. Desert ecosystems d. Aquatic ecosystems(ponds, streams, lakes, rivers, oceans, estuaries)	
4.	Biodiversity and its conservation • Introduction- definition: genetic species and ecosystem diversity • Bio-geographical classification of India • Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values • Biodiversity at global, national, local level • India as a mega diversity nation • Hot spots of bio diversity • Threats to biodiversity: habitat loss, poaching of wild life, man-wild life conflicts • Endangered and endemic species of India • Conservation of bio-diversity: In-situ and Ex-situ conservation of biodiversity	04
5	Environmental Pollution Definition- Causes, effects and control measures of:- a. Air pollution b. Water pollution c .Soil pollution d. marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards • Solid waste management: Causes, effect and control measures of urban and industrial wastes • Role of an individual in prevention of pollution • Pollution case studies • Disaster management: floods, earthquake, cyclone and land slides.	04
6.	Social Issues and environment • From unsustainable to sustainable development. • Urban problems related to energy • Water conservation rain water, harvesting, water-shed management. • Resettlement and rehabilitation of people, its problem and concerns case studies. • Environmental ethics, issues and possible solution • Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. case studies. • Waste-land reclamation • Consumerism and waste products • Environmental protection act • Air(prevention and control of pollution) act • Water (prevention and control of pollution) act • Wide-life protection act. • Forest conservation act. • Issues involved in enforcement of environmental legislation.	04

	• Public awareness	
7.	Human population and the environment • Population growth variation among nations • Population explosion-family welfare program • Environment and human health • Human rights • Value education • HIV/AIDS • Women and child welfare • Role of information technology in environment and human health • Case studies	04
8.	**Understanding existence and co-existence:** Interrelation and cyclicity between material order, bio-order, animal-order and human-order. **Understanding the human conduct:** Relationship in family, justice in relationship, relationship of human with nature(environment), human behavior, human values, nature and morality **Understanding the human society:** Dimensions of humans Endeavor and objectives, inter-relationship in society, mutual fulfillment and cyclicity in nature.	06

Theory Examination:
1. Question paper will be comprising of total 7 questions, each of 10 marks.
2. Only 5 questions need to be solved.
3. Question number 1 will be compulsory and covering the all modules.
4. Remaining questions will be mixed in nature. (e.g.- suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3.)
5.In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Term work:
Term work shall consist of minimum five projects (PROJECTS SHALL BE DESIGNED ON THE SAME GUIDE- LINE OF GIVEN TEXT BOOK) and a written test.
The distribution of marks for term work shall be as follows,
Laboratory work (Tutorial/Project and Journal) : 15 marks.
Test (at least one) : 10 marks.
The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Recommended Books:
1.Jagdish Krishnawamy , R J Ranjit Daniels, " Environmental Studies", Wiley India Private Ltd. New Delhi
2.Anindita Basak, Environmental Studies, Pearson
3.Deeksha Dave , "Textbook of Environmental Studies", Cengage learning, THOMSON INDIA EDITION
4.Benny Joseph" Environmental Studies"Tata McGRAW HILL
5.D. L. Manjunath, Environmental Studies, Pearson
6.R.Rajgopalan, Environmental Studies, Oxford
7.Erach Bharucha, Textbook of Environmental Studies , Universities Press/Orient BlackSwan
8.Alok Debi, Environmental science and engineering, university press
9.A. Nagraj, Jeevan Vidya- A Primer.

University of Mumbai			
Class: T.E.	**Branch:** Computer Engineering	**Semester:** V	
Subject: Microprocessor (Abbreviated as **MP**)			
Periods per Week (each 60 min)	Lecture	04	
	Practical	02	
	Tutorial	--	
		Hours	Marks
Evaluation System	Theory	03	100
	Practical and Oral	--	25
	Oral	---	--
	Term Work	---	25
	Total	03	150

Module	Content s	Hours
1	**Introduction to Intel 8085 Microprocessor:** Basic functions of the microprocessor, System bus, Architecture, Pin Configuration and Programmer's model of Intel 8085 Microprocessor. Overview of the instruction groups of 8085 and the addressing modes. (No programming based on 8085).	06
2	**Intel 8086 Architecture:** Major features of 8086 processor, 8086/88 CPU Architecture and the pipelined operation, Programmer's Model and Segmented Memory.	04
3	**Instruction Set of 8086 and Programming:** Instruction Set of 8086 microprocessor in details, Addressing modes of 8086/88, Programming the 8086 in assembly language, Mixed mode programming with C-language and assembly.	06
4	**Designing the 8086 CPU module:** 8086 pin description in details, Generating the 8086 System Clock and Reset Signals, 8086 Minimum and Maximum Mode CPU Modules, Minimum and Maximum Mode Timing Diagrams, Interrupt Structure, Interrupt Processing and the Predefined interrupts in 8086 Processor.	06
5	**Peripheral Controllers for 8086 family and System Design:** Functional Block Diagram and description, Control Word Formats, Operating Modes and Applications of the Peripheral Controller namely 8255-PPI, 8253-PIT, 8259- PIC and 8237-DMAC. Interfacing of the above Peripheral Controllers. Keyword and Display Interface using 8255. Memory Interfacing: SRAM, ROM and DRAM (using a typical DRAM Controller such as Intel 8203). System Design based on the Memory and Peripherals	14
6	**Multiprocessor Systems:** Study of Multiprocessor Configurations namely Tightly Coupled System (TCS) and Loosely Coupled System (LCS), TCS with the case study of the Coprocessor, Various System Bus Arbitration Schemes in LCS, and Role of the Bus Arbiter (Intel 8289) in the LCS.	06
7	**I/O Buses and Standards:** The EIA RS-232C Serial Interface Standard and IEEE-488 GPIB Standard	02

Term work:

Term work shall contain minimum 10 experiments (from the list given below) and 03 assignments and at least one term test on the above syllabus. A mini-project based on the syllabus to be taken by group of students and is desirable but not mandatory.

(a) Term work and the journal:

- Assembly Language Programming based on TASM/MASM- 03 experiments.
- Assembly Language Programming using BIOS/DOS interrupts- 02 experiments.
- Mixed Language Programming- 02 experiments,
- Peripheral Interfacing and applications- 05 experiments.

The journal shall also contain at least 03 assignments on the syllabus/ beyond syllabus.
Maximum weightage for the certified journal = 15 Marks in the Term work.

(b) Term test:

Test can be a mid- term test of 50 marks (preferably preliminary examination of 100 marks at the end of the semester).

Maximum weightage for the test = 10 Marks in the Term work.

Practical examination:

Practical examination is based on the experiments carried out in the term work and may contain the other experiments based on the concepts. Necessary data sheets/control word formats will be available to the students at the time of the practical examination

Oral examination:

Oral examination is based on the entire syllabus and may not be restricted to the practical carried out in the practical examination.

List of reference books:

1) Microprocessor architecture and applications with 8085: By Ramesh Gaonkar (Penram International Publication).
2) 8086/8088 family: Design Programming and Interfacing: By John Uffenbeck (Pearson Education) .
3) 8086 Microprocessor Programming and Interfacing the PC: By Kenneth Ayala
4) Microcomputer Systems: 8086/8088 family Architecture, Programming and Design: By Liu & Gibson (PHI Publication).
5) Microprocessor and Interfacing: By Douglas Hall (TMH Publication).

University of Mumbai			
Class: T.E.	**Branch:** Computer Engineering	**Semester:** V	
Subject: Theory of Computer Science (Abbreviated as **TCS**)			
Periods per Week (each 60 min)	Lecture	04	
	Practical	02	
	Tutorial	--	
		Hours	Marks
Evaluation System	Theory	03	100
	Practical and Oral	--	--
	Oral	---	--
	Term Work	---	25
	Total	03	125

OBJECTIVES		
Objectives of the Course : This course aims to build concepts regarding the fundamental principles of Grammars, Automata Theory, Turing Machines, Push Down Automata, Undecidability and Intractable Problems		
PREREQUISITES		
Prerequisites: Discrete Str uctures and Graphs Theory (e.g. Graphs, Trees, Logic and Proof Techniques) and also familiar with common Data Structures, Recursion, and the role of major system components such as Compilers.		
Module	**Content s**	**Hours**
1	Introduction: alphabets, Strings and Languages, automata and Grammars. Finite. Automata (FA) -its behavior; DFA -Formal definition, simplified notations (state transition diagram, transition table), Language of a DFA. NFA -Formal definition, Language of an NFA. An Application: Text Search, FA with epsilon-transitions, Eliminating epsilon-transitions, Equivalence of DFAs and NFAs.	05
2	Regular expressions (RE) - Definition, FA and RE, RE to FA, FA to RE, algebraic laws for RE, applications of REs, Regular grammars and FA, FA for regular grammar, Regular grammar for FA	03
3	Proving languages to be non-regular - Pumping Lemma, and its applications. Some closure properties of Regular languages - Closure under Boolean operations, reversal, homomorphism, inverse homomorphism, etc. M hill-Nerode Theorem.	03
4	DFA Minimization Some decision properties of Regular languages -emptiness, finiteness, membership, equivalence of two DF As or REs, Finite automata with output.	03
5	Context-free Grammars (CFGs) -Formal definition, sentential forms, leftmost and rightmost derivations, the language of a CFG. Derivation tree or Parse tree- Definition, Relationship between parse trees and derivations. Parsing and ambiguity, Application of CFGs, Ambiguity in grammars and Languages. Simplification of CFGs - Removing useless symbols, epsilon-Productions, and unit productions, Normal forms - CNF and GNF. Proving that some languages are not context free -Pumping lemma for CFLs,	10

	applications. Some closure properties of CFLs -Closure under union, concatenation, Kleene closure, substitution, Inverse homomor phism, reversal, intersection with r egular set, etc. Some more decision properties of CFLs, Review of some undecidable CFL problems.	
6	Pushdown Automata (PDA) - Formal definition, behavior and graphical notation, Instantaneous descriptions (Ids) , The language of PDA (acceptance by final state and empty stack) . Equivalence of acceptance by final state and empty stack, Equivalence of PDAs and CFGs, CFG to PDA, PDA to CFG. DPDAs -Definition, DPDAs and Regular Languages, DPDAs, Multistack DPDAs & NPDAs and CFLs. Languages of DPDAs, NPDAs, and ambiguous grammars	06
7	Turing Machines TM -Formal definition and behavior, Transition diagrams, Language of a TM, TM as accepters deciders and generators. TM as a computer of integer functions, Design of TMs, Programming techniques for TMs -Storage in state, multiple tracks, subroutines, etc. Universal TMs, Variants of TMs -Multitape TMs, Nondeterministic TMs. TMs with semi- infinite tapes, Multistack machines, Simulating TM by computer, Simulating a Computer by a TM, Equivalence of the various variants with the basic model. Recursive and recursively enumerable languages, Properties of recursive and recursively enumerable languages, A language that is not recursively enumerable (the diagonalization language). The universal language, Undecidability of the universal language, The Halting problem, Rice's Theorem, Greibach Theorem, Post's Correspondence Problem (PCP) -Definition, Undecidability of PCP. Context sensitive language and linear bounded automata. Chomsky hierarchy.	10
8	Intractable Problems :The classes P and NP, An NP-complete problem, A Restricted Satisfiability problem, Additional NP-complete problems, Complements of languages in NP, Problems Solvable in polynomial space, A problem that is complete for PS, Language Classes based on randomization, The complexity of primality testing.	08

TEXT BOOKS

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, " Introduction to Automata Theory, Languages and Computation", Pearson Education.
2. J.C.Martin, "Introduction to languages and the Theory of Computation", TMH.
3. Michael Sipser, "Theory of Computation", Cengage Learning.

REFERENCES

1. O.G.Kakde, "Theory of Computation", LP.
2. Krishnamurthy E.V. , "Introductory Theory of Computer Science", East-West press.

TERM WORK

1. Term Work should consists of at least 04 experiments and 08 assignments (at least one implementation on each machine and at least one assignment on each module).
2. A Term Work should consists of Term Test must be conducted with a weightage of 10 marks.

University of Mumbai			
Class: T.E.	**Branch:** Computer Engineering	**Semester:** V	
Subject: Web Engineering (Abbreviated as **WE**)			
Periods per Week (each 60 min)	Lecture	04	
	Practical	02	
	Tutorial	--	
		Hours	Marks
Evaluation System	Theory	03	100
	Practical and Oral	--	25
	Oral	---	--
	Term Work	---	25
	Total	03	150

Objectives: To understand the concepts, principles, strategies, and methodologies of Web applications and development. to apply current Web technologies to understand current Web business models, to understand and apply Web development processes.

Module	Contents	Hours
1	**An Introduction to Web Engineering** Motivation, Categories of Web Applications, Characteristics of Web Applications, Product-related Characteristics, Usage-related Characteristics, Development-related Characteristic, Evolution of web engineering	03
2	**Requirements Engineering for Web Applications** Introduction, Fundamentals, Where Do Requirements Come From? Requirements Engineering Activities RE Specifics in Web Engineering, Principles for RE of Web Applications, Adapting RE Methods to Web Application Development, Requirement Types, Notations, Tools.	**05**
3	**Technologies for Web Applications** Client-side Technologies, ActiveX Controls, Document-specific Technologies, HTML-Hypertext Markup Language, DHTML, SMIL Synchronized Multimedia Integration Language, XML-eXtensible Markup Language, XSL-eXtensible Stylesheet Language, Java Script, Server-side Technologies, Servelet, URI Handlers, Web Service, Middleware Technologies	08
4	**Web Application Architectures** Introduction, Fundamentals, What is an Architecture? Developing Architectures Categorizing Architectures, Specifics of Web Application Architectures, Components of a Generic Web Application Architecture, Layered Architectures, 2-Layer Architectures, N- Layer Architectures Data-aspect Architectures, Database-centric Architectures, Architectures for Web Document Management, Architectures for Multimedia Data	06
5	**Modeling Web Applications** Introduction, Fundamental, Modeling Specifics in Web Engineering, Levels, Aspects, Phases Customization, Modeling Requirements, Hypertext Modeling, Hypertext Structure Modeling Concepts, Access	06

	Modeling Concepts, Relation to Content Modeling, Presentation Modeling, Relation to Hypertext Modeling, Customization Modeling, Relation to Content, Hypertext, and Presentation Modeling	
6	**Web Application Design** Introduction, Web Design from an Evolutionary Perspective, Information Design, Software Design: A Programming Activity, Merging Information Design and Software Design, Problems and Restrictions in Integrated Web Design, A Proposed Structural Approach, Presentation Design, Presentation of Nodes and Meshes, Device-independent Development, Approaches, Inter action Design, User Interaction User Interface Organization, Navigation Design, Designing a Link Representation, Designing Link Internals, Navigation and Orientation, Structured Dialog for Complex Activities, Interplay with Technology and Architecture, Functional Design.	08
7	**Testing Web Applications** Introduction, Fundamentals, Terminology, Quality Characteristics, Test Objectives, Test Levels, Role of the Tester, Test Specifics in Web Engineering, Test Approaches, Conventional Approaches, Agile Approaches, Test Scheme, Three Test Dimensions, Applying the Scheme to Web Applications, Test Methods and Techniques, Link Testing, Browser Testing, Usability Testing, Load, Stress, and Continuous Testing, Testing Security, Test-driven Development, Test Automation, Benefits and Drawbacks of Automated Test, Test Tools.	08
8	**Web Project Management** Understanding Scope, Refining Framework Activities, Building a WebE Team, Managing Risk, Developing a Schedule, Managing Quality, Managing Change, Tracking the Project.	04

BOOKS

TEXT BOOKS

1. Gerti Kappel, Birgit Proll, "Web Engineering", John Wiley and Sons Ltd, 2006
2. Roger S.Pressman, David Lowe, "Web Engineering", Tata McGraw Hill Publication, 2007
3. Guy W. Lecky-Thompson, "Web Programming", Cengage Learning, 2008

REFERENCES

1. Moller, "An Introduction to XML and Web Technologies" , Pearson Education New Delhi, 2009
2. Chris Bates, "Web Programming: Building Internet Applications", Third Edition, Wiley India Edition, 2007
3. John Paul Mueller, "Web Development with Microsoft Visual Studio 2005", Wiley Dreamtech, 2006.

TERM WORK

1. Atleast six practical experiments based on above syllabus
2. A mini project is desirable to be completed by a group of three that cover following tools.

- HTML
- DHTML
- XML
- Java Scr ipt
- Servelet

NOTE: The above (mini project) would carry a weightage of 15 marks.
A term work test must be conducted with a weightage of 10 marks.

3. Industrial visit: Prepare and submit the report of Industrial visit in a group. Each group contains not more than five students.