

UNIVERSITY OF MUMBAI

No. UG/260 of 2009

CIRCULAR :-

A reference is invited to the Ordinances, Regulations and syllabi relating to the Bachelor of Engineering degree course vide this office Circular No. UG/461 of 2003, dated 19th September, 2003 and the Principals of the affiliated colleges in Engineering are hereby informed that the recommendation made by the Faculty of Technology at its meeting held on 1st April, 2009 has been accepted by the Academic Council at its meeting held on 27th May, 2009 vide item No. 4.22 and that, in accordance therewith, the syllabus for the Third Year Computer Engineering (Sem. V and VI) of the B.E. degree course is revised as per Appendix and that the same has been brought into force with effect from the academic year 2009-2010.

MUMBAI - 400 032
7th July, 2009

PRN. K. VENKATARAMANI
REGISTRAR

The Principals of the affiliated colleges in Engineering .

A.C./4.22/27/05/2009

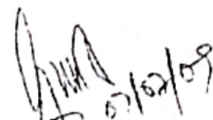
No.UG/260- A of 2009,

MUMBAI-400 032

7th July, 2009

Copy forwarded with compliments for information to :-

- 1) The Dean, Faculty of Technology,
- 2) The Chairman, Ad-hoc Board of Studies in Computer Engineering .
- 3) The Controller of Examinations,
- 4) The Co-Ordinator, University Computerization Centre,



(D. H. KATE)
DEPUTY REGISTRAR
U.G./P.G. Section.

Copy to :-

The Director, Board of College and University Development, the Deputy Registrar (Eligibility and Migration Section), the Director of Students Welfare, the Executive Secretary to the Vice-Chancellor, the Pro-Vice-Chancellor, the Registrar and the Assistant Registrar, Administrative sub-center, Ratnagiri, for information .

The Controller of Examinations (10 copies), the Registrar and Accounts Officer (2 copies), Record Section (5 copies), the Deputy Registrar (Enrolment, Eligibility and Migration Section) (3 copies), the Deputy Registrar (Accounts Section), Vidyanagari (2 copies), the Deputy Registrar, Publications Section (5 copies), the Deputy Registrar (Accounts Section) (10 copies), the Director, University Computer



UNIVERSITY OF MUMBAI



Revised Syllabus for the Third Year Computer Engineering (Semester V & VI)

(With effect from the academic year 2009-2010)

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				
				Paper		TW	Practical & Oral	Total
		Theory	Practical	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: Computer Network (Abbreviated as CN)		
Periods per Week (each 60 min)	Lecture	04	
	Practical	02	
	Tutorial	--	
Evaluation System		Hours	Marks
	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 Link 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; 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-N 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	08
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 (Indian 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), attendance (5 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: 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 : - 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	04
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	04

	• Other Operations Evaluation of Expression	
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, • Storage and access methods	06
7	Parallel and Distributed Databases and Client Server Architecture: • Introduction : for parallel databases • Parallel : 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. Atleast 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 interface having two data entry forms and two reports. (using any connectivity of DBMS)

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.

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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" 5th edition McGraw Hill.

Reference Books :

1. Raghu Ramkrishnan & Johannes Gehrke "Database Management System" Tata McGraw Hill. III edition.
2. Stefano Ceri, Hillseppe , pelagatti "Distributed Databases, Principles 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: 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	Contents	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.	08
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	16
6	Multiprocessor Systems: Study of Multiprocessor Configurations namely Tightly Coupled System (TCS) and Loosely Coupled System (LCS),	06

	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.	
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 = 10 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.

(c) Attendance:

~~Minimum 75% attendance is mandatory for the student to maintain the term.~~

~~Maximum weightage for the attendance = 05 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	--	
Evaluation System		Hours	Marks
	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 Structures 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	Contents	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. Myhill-Nerode Theorem.	03
4	DFA Minimization. Some decision properties of Regular languages -emptiness, finiteness, membership, equivalence of two DFAs 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, applications. Some closure properties of CFLs -Closure under union, concatenation, Kleene closure, substitution, Inverse homomorphism, reversal, intersection with regular set, etc. Some more decision properties of CFLs, Review of some undecidable CFL problems.	10
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	--		
Evaluation System		Hours	Marks	
	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, Servlet, 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 Modeling Concepts, Relation to Content	06

	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, Interaction 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 Script
 - Servlet

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~~

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

University of Mumbai

**CLASS: T.E.
Computer Engineering**

Semester - V

SUBJECT: Environmental Studies

Periods per week (each of 60 min.)	Lecture	2	
	Practical	-	
	Tutorial	1*	
Evaluation System		Hours	Marks
	Theory Examination	2	50
	Practical examination	-	-
	Oral Examination	-	-
	Term Work	-	25
	Total		75
* Class wise Tutorial			

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

Module	Contents	Hrs
1	The Multidisciplinary nature of environmental studies Definition, scope and importance Need for public awareness	1
2	Natural resources Renewable and non-renewable resources Natural resources & associated problem. 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 surface 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 resources, case studies. d. Food resources: World food problems overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e. Energy resources: Growing energy needs, renewable and non renewable energy 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 of resources for sustainable lifestyles.	4
3	- Ecosystems - Concepts of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem.	3

	• Ecological succession. • Food chains, food webs and ecological pyramids. • Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystem (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 • Bio-diversity at global, national, local levels • India as a mega diversity nation • Hot spots of bio-diversity • Threats to biodiversity: Habitat loss, poaching of wild life, man-wildlife conflicts • Endangered and endemic species of India • Conservation of biodiversity: In- situ and Ex-situ conservation of biodiversity	4
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	4
6	Social issues and environment • From unsustainable to sustainable development • Urban problems related to energy • Water conservation, rain water harvesting, watershed management • Re-settlement and rehabilitation of people: Its problems 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. • Wasteland reclamation • Consumerism and waste products • Environment protection act • Air(Prevention and control of pollution) act • Water (Prevention and control of pollution) act • Wildlife protection act	4

	• Forest conservation act • Issues involved in enforcement of environmental legislation • 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	4
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 Human Endeavor and Objectives, Interrelationship in Society, Mutual Fulfillment and Cyclicity in Nature.	6

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. Erach Bharucha, text book of environmental studies, Universities Press/Orient Blackswan
2. Jagdish Krishnaswami, R J Ranjit Daniels, 'Environmental Studies', Wiley India Private Ltd. New delhi
3. Anindita Basak, 'Environmental Studies', Pearson
4. Deeksha Dave, "Text book of , 'Environmental Studies", Cengage learning, Thomason India edition
5. Benny Joseph , 'Environmental Studies", Tata McGRAW HILL
6. D L Manjunath, , 'Environmental Studies", Pearson
7. R Rajgopalan, , 'Environmental Studies", Oxford
8. Alok Debi, 'Environmental science and Engineering", University press
9. A. Nagraj, Jeevan Vidya- A Primer.

University of Mumbai
Syllabus Structure(R-2007)
At
S.E. (Computer Engineering)

Semester-VI

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.	Advance Computer Network	4	2	3	100	25	50	175
2.	System Programming And Compiler Construction	4	2	3	100	25	25	150
3.	Object Oriented Software Engineering	4	2	3	100	25	50	175
4.	Advance Microprocessor	4	2	3	100	25	25	150
5.	Data Warehouse And xxxx Mining	4	2	3	100	25	25	150
6.	Seminar		2	3		25	25	50
		20	12		500	150	200	850

150 200

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

Objectives: This is advanced course in Computer Network. Main objectives of this course are to know details of TCP/IP along with all protocols, working of internet, applications on TCP/IP, managing TCP/IP and to prepare foundation for the future networks. Demonstration and practical should be the main approach of learning this course.

Pre-requisites: Computer Network

Module	Contents	Hours
1	Introduction: Protocols and standards, Standards Organizations, Internet Standards, Internet Administration: Overview of reference models: The OSI model, TCP/IP protocol Suite, Addressing, IP versions, Connectors, Transceivers and Media converters, Network interface cards and PC cards, Repeaters, Hubs, Bridges, Switches, Routers and Gateways etc. H/W selection.	06
2	Optical Networking: SONET/SDH standards, Dense Wavelength division multiplexing (DWDM), Performance and design Considerations.	06
3	ATM: The WAN Protocol: Faces of ATM, ATM Protocol operations (ATM cell and Transmission) ATM Networking basics, Theory of Operations, B-ISDN reference model, PHY layer, ATM Layer (Protocol model), ATM layer and cell, Traffic Descriptor and parameters, Traffic Congestion control defined, AAL Protocol model, Traffic contract and QoS, User Plane overview, Control Plane AAL, Management Plane, Sub-DS3 ATM, ATM public services.	08
4	Packet Switching Protocol : X.25, theory of Operation and Network Layer functions, X.75, Internetworking protocols, SMDS, Subscriber Interface and Access Protocol, Addressing and Traffic Control.	04
5	Common Protocols and interfaces in upper Layer: TCP/IP suite, Network Layer, Transport Layer, Applications Layer, Addressing and routing design, Socket programming	03
6	Routing in the Internet: Intra and interdomain routing; Unicast Routing Protocols: RIP, OSPF, BGP; Multicast Routing Protocols: MOSPF, DVMRP, Drawbacks of traditional routing methods, Idea of TE, TE and Different Traffic classes, IP over ATM, Multi protocol Label switching(MPLS), Storage Area Networks (SAN).	06
7	Network Management and Services: SNMP: Concept, Management components, SMI, MIB, SNMP format, Messages	03

8	Traffic Engineering and Capacity Planning: Traffic engineering basics: Requirement Definitions: Traffic sizing, characteristics, Protocols, Time Delay considerations. Connectivity, Reliability, Availability and Maintainability, Throughput calculations Quality of Service: Introduction, Application, Queue Analysis: M/M/1 as a packet processing Model. QoS Mechanisms Queue management Algorithms, Feedback, Resource reservation; Queued data and Packet switched traffic modeling. Application and QoS. Network Performance Modeling, Creating Traffic Matrix, Capacity Planning and Network vision. Design Tools	06
9	Multi-Media over Internet: RTP, RSVP, IP Multicasting. Voice Digitization standards, G.729 and G.723 and H.323 Enterprise Network Security: DMZ, NAT, SNAT, DNAT, Port Forwarding, Proxy, Transparent Proxy, Packet Filtering and Layer 7 Filtering. Backbone Network Design: Backbone Requirements, Network Capacities Topologies, Topologies Strategies, Tuning Networks	06

BOOKS

Text Books:

1. B. A. Forouzan, "TCP/IP Protocol Suite", Tata McGraw Hill edition, Third Edition.
2. N. Olifer, V. Olifer, "Computer Networks: Principles, Technologies and Protocols for Network design", Wiley India Edition, First edition.

References:

1. W. Richard Stevens, "TCP/IP Volume 1, 2, 3", Addison Wesley.
2. D.E. Comer, "TCP/IP Volume I and II", Pearson Education.
3. W.R. Stevens, "Unix Network Programming", Vol.1, Pearson Education.
4. J. Walrand, P. Varaiya, "High Performance Communication Networks", Morgan Kaufmann
5. A.S. Tanenbaum, "Computer Networks", Pearson Education, Fourth Edition.

TOPICS FOR EXPERIMENT

1. Installation of Proxy-Server
2. Installation of Mail-Server
3. Installation of Web-Server
4. Installation of DNS-Server
5. Packet grab and Analysis
6. Testing and measuring networks

TERM-WORK

Term work shall consist of at least 10 assignments/programming assignments and one written test.

Marks

- | | |
|--|----------|
| 1. Attendance (Theory and Practical) | 05 Marks |
| 2. Laboratory work (Experiments and Journal) | 15 Marks |
| 3. Test (at least one) | 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 : VI
	Subject : System Programming And Compiler Construction (Abbreviated as SPCC)		
Periods per Week(Each 60 Min)	Lecture	04	
	Practical	02	
	Tutorial	-----	
Evaluation System	Theory	Hours	Marks
		03	100
	Oral	--	25
	Term Work	--	25
	Total	03	150

Prerequisites: Programming Language (C/C++/ JAVA)

Objectives: This course is an introduction to design and implementation of various types of system software like assemblers, macros, loaders and linkers. The course also aims to give knowledge of the principal structure of a compiler and about the basic theories and methods used to implement the different parts of the compiler.

Module	Contents	Hours
1	System Software : Concept, introduction to various system programs such as assemblers, loaders , linkers ,macro processors, compilers, interpreters, operating systems, device drivers	03
2	Assemblers : Basic Assembler functions , Elements of Assembly language programming, Overview of the assembly process, Design of Single pass and multi pass assemblers. Examples: SPARC Assembler.	06
3	Macros & Macro processors: Macro definition and examples, Definitions and concept of parameterized macro, nested macros, conditional macro expansion, recursive macro. Design of simple macro processor	04
4	Loaders and Linkers – Basic loader functions, Linking and Relocation concept, Concept of linkage editors, dynamic linking loader	03
5	Compilers: Introduction to Compilers, Phases of a compiler, comparison of compilers and interpreters.	02
6	Lexical Analysis: Role of a Lexical analyzer, input buffering, specification and recognition of tokens, Finite Automata, Designing a lexical analyzer generator, Pattern matching based on NFA's.	03
7	Syntax Analysis: Role of Parser, Top-down parsing, Recursive descent and predictive parsers (LL), Bottom-Up parsing, Operator precedence parsing, LR, SLR and LALR parsers.	06
8	Syntax Directed Translation: Syntax directed definitions, construction of syntax tree, Top-down translation and Bottom-up evaluation of inherited attributes, analysis of syntax directed definitions	03
9	Run Time storage: Activation record, handling recursive calls, management of variable length blocks, garbage collection and compaction, storage allocation strategies.	04

10	Intermediate Code Generation: Intermediate languages: graphical representations, DAGs, Three address code, types of three address statement- syntax directed translation into three address code, implementation of three address statements	04
11	Code Generation : Semantic stacks, attributed translations, evaluation of expressions, control structures, and procedure calls.	04
12	Code Optimization : Machine dependent and machine independent code optimization, Sources of optimization.	04
13	Compiler-compilers : JAVA compiler environment, YACC compiler-compiler	02

Books

TEXT BOOKS

1. A.V. Aho, and J.D.Ullman: **Principles of compiler construction**, Pearson Education
2. A.V. Aho, R. Shethi and Ulman; **Compilers - Principles, Techniques and Tools** , Pearson Education
- 3 Leland Beck “ **System Software**” Addison Wesley
4. D. M. Dhamdhare; Systems programming & Operating systems. Tata McGraw Hill

REFERENCES

1. J.J Donovan: **Systems Programming**.
2. Dick Grune, Koen G.L, Henri Bal; **Modern Compiler Design**, Wiley Publications
3. Kenneth C. Loudon; **Compiler Construction, Principles and Practice**, Cengage Learning
4. John R. Levine; **Linkers and Loaders**, Morgan Kaufman

TERM WORK

1. Design and implementation of 2 pass assemblers for X86 machine.
2. Design and Implementation of Macro Processor
3. Design a Lexical Analyser for a language whose grammar is known.
4. Design and Implementation of simple Parser using Lex Yacc.
5. Implementation of code optimization techniques.
6. Generate target code for the code optimized , considering the target machine to be X86.
7. Study of Different Debugger Tools.

PRACTICAL & ORAL EXAMINATION

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

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

Pre-requisites: Computer Network

Module	Contents	Hours
1	1.1 Software life cycle models: Waterfall, RAD, Spiral, Open-source, Agile process 1.2 Understanding software process 1.2.1 Process metric 1.2.2 CMM levels	4
2	2.1 Planning & Estimation 2.1.1 Product metrics 2.1.2 Estimation- LOC, FP, COCOMO models. 2.2 Project Management 2.2.1 Planning 2.2.2 Scheduling 2.2.3 Tracking.	8
3	3.0 Workflow of Software life cycle 3.1 Requirement Workflow 3.1.1 Functional , Nonfunctional 3.1.2 Characteristics of Requirements 3.1.3 Requirement Elicitation Techniques 3.1.4 Requirement Documentation –Use case specification, Activity Diagram 3.2 Analysis workflow 3.2.1 Static Analysis 3.2.1.1 Identifying Object – Methods of identifying objects and types - Boundary, Control, Entity 3.2.1 Dynamic Analysis 3.2.1.1 Identifying Interaction – Sequence and Collaboration diagrams, State chart diagram	22

	3.3.Design Workflow 3.3.1 System Design Concept – Coupling and Cohesion 3.3.2 Architectural Styles 3.3.3 Identifying Subsystems and Interfaces 3.3.4 Design Patterns	
4	4.1 Implementation Workflow 4.1.1 Mapping models to Code 4.1.2 Mapping Object Model to Database Schema 4.2 Testing 4.2.1 FTR – Walkthrough and Inspection 4.2.2 Unit Testing, Integration, System and Regression Testing 4.2.3 User Acceptance Testing 4.3 Software Quality – Quality Standards , Quality Matrices Testing & SQA: FTR, unit testing, integration testing, product testing, and acceptance testing	8
5	5.1 Software Configuration Management 5.1.1 Managing and controlling Changes 5.1.2 Managing and controlling versions	3
6	6.1 Maintenance 6.1.1 Types of maintenance 6.1.2 Maintenance Log and defect reports. 6.1.3 Reverse and re-engineering	3

BOOKS

Text Books:

1. Bernd Bruegge, "Object oriented software engineering", Second Edition, Pearson Education.
2. Stephan R. Schach, "Object oriented software engineering", Tata McGraw Hill.
3. Roger Pressman, "Software Engineering", sixth edition, Tata McGraw Hill.

References:

- 1.Timothy C. Lethbridge, Robert Laganier " Object-Oriented Software Engineering – A practical software development using UML and Java", Tata McGraw-Hill, New Delhi

TOPICS FOR EXPERIMENT

1. At least two review assignments covering object oriented concepts.
2. Coding Assignment on Mapping models to Code
3. A full-fledged mini project in which a student will design an application using OOAD case tool covering all the workflows with UML, Documentation
4. Assignments on Design Patterns.
5. Working assignments using Project Management tools
6. Study of Configuration Management tool

TERM-WORK

Term Work

Term work shall consist of at least 10 assignments/programming assignments and one written test.

Marks

~~Attendance (Theory and Practical)~~

~~05 Marks~~

2. Laboratory work (Experiments and Journal)

15 Marks

3. Test (at least one)

10 Marks

The final certification and acceptance of TW ensures the satisfactory performance of laboratory Work and Minimum Passing in the term work.

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: VI
Subject: Advanced Microprocessors (Abbreviated as AMP)			
Periods per Week (each 60 min)	Lecture	04	
	Practical	02	
	Tutorial	--	
Evaluation System		Hours	Marks
	Theory	03	100
	Practical and Oral	--	25
	Oral	---	--
	Term Work	---	25
	Total	03	150

Pre-requisites: Computer Network

Module	Contents	Hours
1	Introduction to Pipelined Processors: Pipelining: An Overlapped Parallelism, Linear pipelining, Classification of Pipelined Processors, Principles of designing pipeline processor, Data Flow computers. Systolic architecture, Superscalar, Super pipeline and VLIW processors.	10
2	Intel 80386DX Processor: Detailed study of Block diagram, Signal interfaces, Bus cycles, Programming model, Operating modes, Address translation mechanism in protected mode, Memory management, Protection mechanism.	10
3	Intel P5 Micro architecture: Pentium Processor Block diagram, Superscalar operation, Integer pipeline stages, Floating point pipeline stages, Branch prediction logic, Cache unit.	06
4	Intel P6 Micro architectures: Introduction to Pentium-Pro Processor, Special Pentium-Pro features, Introduction to Pentium-2 Processor, Pentium-2 software changes, Pentium-3 processors.	06
5	Pentium-4 & IA-64 Architectures: Pentium-4 Net Burst Architecture, IA-64 Itanium Processor architecture	04
6	Sun SPARC Architecture: SPARC Processor, Data Formats, Registers, Memory model, Study of SuperSPARC and UltraSPARC architectures	06
7	Study of System Buses: Features, classifications, applications of the system buses like ISA, ATA, SCSI, PCI and USB. (Study of the buses is without signals and the timing diagrams).	06

BOOKS

- 1) Computer Architecture and Parallel Processing: By Hwang & Briggs (McGraw Hill International edition).
- 2) Pentium Processor System Architecture: By Tom Shanley & Don Anderson (Mindshare Publishing).
- 3) Intel Microprocessors: By Barry B. Brey (Pearson Education)
- 4) Advanced Microprocessor: By Roy & Bhurchandi (Tata McGraw Hill).
- 5) Advanced Microprocessors: By Daniel Tabak (McGraw Hill)
- 6) The SPARC Architecture Manual (Version 8).
- 7) Intel Manuals.

TERM-WORK

Term work: (25 Marks)

Term work shall contain minimum 08 experiments based on the above syllabus and the implementation of the experiments is using any Higher Level Language.

PRACTICAL & ORAL EXAMINATION

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

University of Mumbai

Class: T.E.	Branch: Computer Engineering	Semester: VI	
Subject: DATA WAREHOUSING AND MINING (Abbreviated as DWM)			
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: The data warehousing part of module aims to give students a good overview of the ideas and techniques which are behind recent development in the data warehousing and online analytical processing (OLAP) fields, in terms of data models, query language, conceptual design methodologies and storage techniques. Data mining part of the model aims to motivate, define and characterize data mining & S process; to motivate, define and characterize data mining applications.

Pre-requisites: DBMS

Module	Contents	Hours
Data Warehousing		
1	Overview and Concepts: Need for data warehousing, The building blocks of a Data warehouse.	04
2	Architecture and Infrastructure: Data Warehouse Architecture, Infrastructure and Metadata Management	04
3	Principles Of Dimension Modeling: Introduction to Dimensional Modeling, Advanced Concepts	04
4	Extract Transform Load Cycle: ETL overview, Extraction, Loading, Transformation techniques.	04
5	Information Access and Delivery: Matching information to classes of users, OLAP – the need, Design of the OLAP database, OLAP operations: slice, dice, rollup, drill-down etc. OLAP implementations.	04
6	Implementation And Maintenance: Physical design process, Aggregates and Indexing. Data Warehouse Deployment	04
Data Mining		
7	Introduction: Basics of data mining, related concepts, Data mining techniques. The KDD process	04

8	Concept Description: Class Characterization and comparison, Attribute relevance analysis, Attribute oriented Induction, Mining descriptive statistical measures in large databases.	04
9	Classification Algorithms: What is Classification? Supervised Learning, Classifier Accuracy. Decision Tree and Naïve Bayes Classifier.	04
10	Clustering: What is clustering? Types of data, Partitioning Methods (K-Means, K-Medoids) Hierarchical Methods(Agglomerative, Divisive)	04
11	Association rules: Motivation For Association Rule mining, Market Basket Analysis, Apriori Algorithm, FP tree Algorithm, Iceberg Queries. Advanced Association Rules (just concepts)	04
12	Web Mining: Web Content Mining, Web Structure Mining, Web Usage mining	04

BOOKS

Text Books:

- 1) Ralph Kimball, "The Data Warehouse Lifecycle toolkit", 2nd edition, Wiley India.
- 2) Han, Kamber, "Data Mining Concepts and Techniques", 2nd edition Elsevier
- 3) Reema Theraja "Data warehousing", Oxford University Press.
- 4) "Introduction to Data Mining", 1/e Pang-Ning Tan, Vipin Kumar, Michael Steinbach Pearson Education
- 5) M.H. Dunham, "Data Mining Introductory and Advanced Topics". Pearson Education.

Reference Books :

- 1) Paulraj Ponniah, "Data Warehousing Fundamentals", Wiley Student edition.
- 2) "Data mining For Business intelligence" Galit Shmueli, Nitin Patel, Peter Bruce; Wiley Student Edition.
- 3) "Data Warehousing, Data Mining & OLAP" Alex berson & Stephen J Smith, Tat McGraw Hill.
- 4) "Data Mining with SQL Server 2008" Jamie McLennan & others, Wiley Indian Edition.
- 5) "Mastering Data Mining", M Berry and G. Linoff, Wiley Student Edition.
- 6) R. Kimball, "The Data Warehouse Toolkit", John Wiley.

TERM-WORK

Term work should consist of at least of the following:

1. One case study given to a group of 3 to 4 students, who will start form dimensional modeling and go upto generating OLAP reports..
2. Programming the data mining algorithms (classification, clustering and Association mining) in Java on example data sets. (Can compare with tools like WEKA).
3. Study of some BI tool like SQL SERVER or ORACLE etc.

PRACTICAL & ORAL EXAMINATION

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

University of Mumbai

Branch: Computer Engineering

Semester: VI

Class: T.E.

Subject: Seminar
Periods per Week
(each 60 min)

Evaluation System

Lecture	--	
Practical	02	
Tutorial	--	
	Hours	Marks
Theory	--	--
Oral and Practical	--	25
Oral	---	--
*Term Work	---	25
Total	--	50

Objective:

Seminar should base on recent technical topics in the advanced development of .
Computer Engineering / Information Technology.

TERM-WORK

Term work should consist of the following:

1. One topic given to a group of 3 /4 students.
2. Hard copy of Seminar Report.

ORAL AND PRACTICAL

Oral presentation is compulsory in front of panel of examiners.

→ X ————— X →