UNIVERSITY OF MUMBAI

REVISED SCHEME

AND

SYLLABUS FOR THE

COMPUTER ENGINEERING

T.E. (SEM.V & VI)

(w.e.f. the academic year 2003-2004)

UNIVERSITY OF MUMBAI

B.E, COMPUTER ENGINEERING
SCHEME OF INSTRUCTIONS AND EVALUATION (R-2001)

S.E. SEMESTER III

Subjects	Scheme of Instruction			Scheme of Evaluation					
	Lect/ Week	Pract/ Week	Tuto/ Week	Paper Hours	Paper Marks	T/W	Pract	Oral	Total
1. Applied Mathematics III (CE)*	4	-	-	3	100	-	--	--	100
2. Electronics Devices and Circuits *	3	3	-	3	100	25	--	--	125
3. Electrical Network *	4	-	2	3	100	25	--	--	125
4. Data Structures	3	2	-	3	100	25	--	--	125
5. Digital Logic Design and Application *	4	2	-	3	100	25	--	--	125
6. Discrete Structures *	3	-	2	3	100	25	--	--	125
	20	7	5		600	125	--	--	725

S.E. SEMESTER IV

1. Applied Mathematics IV (CE)*	4	-	-	3	100	-	--	--	100
2. Principles of Communication* Engineering	3	2	-	3	100	25	--	25	150
3. Computer Organization and Architecture	4	2	-	3	100	25	--	25	150
4. Database Systems	4	2	-	3	100	25	--	25	150
5. Analysis of Algorithms	4	2	2	3	100	25	25	--	150
6. Industrial Economics and Management *	4	-	-	3	100	-	--	--	100
	23	8	2		600	100	25	75	800

* Common with IT

UNIVERSITY OF MUMBAI

B.E, COMPUTER ENGINEERING
SCHEME OF INSTRUCTIONS AND EVALUATION (R-2001)

T.E. SEMESTER V

	Scheme of Instruction			Scheme of Evaluation					
Subjects	Lect/ Week	Pract/ Week	Tuto/ Week	Paper Hours	Paper Marks	TA/V	Pract	Oral	Total
1. Applied Mathematics V (CE)*	4	-	-	3	100	-	--	--	100
2. Principles of Digital Communication	3	2	-	3	100	25	--	--	125
3. Computer Networks*	3	2	-	3	100	25	--	--	125
4. Microprocessors*	4	2	-	3	100	25	--	--	125
5. Theoretical Computer Science	3	-	2	3	100	25	--	--	125
6. Presentation and Communication Techniques $	2	-	2	--	--	25	--	25	50
7. Computer Programming Laboratory *	-	3	2	--	--	25	--	--	25
	19	9	6		500	150	--	25	675

T.E. SEMESTER VI

1. Systems Programming	3	2	-	3	100	25	--	25	150
2. Operating Systems with Unix	3	3	-	3	100	25	--	25	150
3. Web Technology	4	2	-	3	100	25	--	25	150
4. Object Oriented Analysis and Design*	3	3	-	3	100	25	25	--	150
5. Computer Graphics	3	3	-	3	100	25	25	--	150
6. Advanced Databases	3	2	-	3	100	25	--	25	150
	19	15	-		600	150	50	100	900

* Common with IT , $ Common with all branches

B.E. COMPUTER ENGINEERING
THIRD YEAR SEMESTER V

SUBJECT: APPLIED MATHEMATICS

Lectures: 4 Hrs per week Theory: 100 Marks

DETAILED SYLLABUS

1. **Random Variables:**
   Discrete and Continuous Random Variables. Probability Mass Function and Density Function Probability Distribution for Random Variables, Expected Value, Variance, Moment and Moments Generating Function. Relation between Raw Moments and Central Moments.

2. **Bernoull's Trails:**
   Binomial, Poisson, and Normal Distributions for Detailed Study. Central Limit Theorem and Problems Based on this Theorem.

3. **Sampling Theory:**
   Sampling Distribution. Test of Hypothesis. Level of Significance Critical Region. One Tailed and Two Tailed Tests. Interval Estimation of Population Parameters. Large and Small Samples Test of Significance for Large Samples: Test for Significance of the Difference between Sample Mean and Population Means; Test for Significance of the Difference between the Mean of Two Samples.
   Student's't' Distribution and its Properties.
   Test of Significance of Small Samples: Test for Significance of the Difference between Sample Means and Population Mean; Test for Significance of the Difference between the Mean of Two Samples; Paired t- tests. Chi-square Distribution and its Properties. Test of the Goodness of Fit and Independence of Attributes Contingency Table Yate's Correction.

4. **Fitting Of Curves Least Square Method:**
   Fitting the Straight Line and Parabolic Trend. Bivariate Frequency Distribution Correlation, Co variance Karl Pearson Coefficient and Spearman's Rank Co-relation Coefficient (non-repeated ranks and repeated ranks). Regression, coefficients and lines of regression.

5. **Mathematical Programming:**
   Linear Optimization Problem Formulation and Graphical Solution. Standard and Canonical Form. Basic Solution and feasible solution Primal Simplex Method.

6. **Artificial Variables:**
   Big M Method (method of penalty). Dual Simplex Method. Duality. Degeneracy. Alternative Optima. Unbounded Solution and Sensitivity Analysis.

7. **Nonlinear Programming:**
   Unconstrained Extremal Problems. Necessary and Sufficient Conditions for Extrema. Constrained Extremal Problems. Lagrange Multiplier and Kunh Tucker Method.

BOOKS

Text Books:

1. S.C. Gupta and U.K. Kapur, "Fundamentals of Mathematical Statistics", Sultan Chand and sons New Delhi.
2. T.V. Veerrajan, "Probability Statistics and Random Processes", TMH.
3. Probability and Statistics, Schaum series.

Reference:

1. M.D.Taha, "Operation Research".
2. N.D. Vora, "Quantitative Techniques in Management", TMH.
3. J.K. Sharma, "Operation Research Theory and Application", Mackmillan.
4. S.S. Rao, "Operation Theory And Applications",

B.E. COMPUTER ENGINEERING
THIRD YEAR SEMESTER V

SUBJECT: PRINCIPLES OF DIGITAL COMMUNICATION

Lectures: 3 Hrs per week
Practical: 2 Hrs per week

Theory: 100 Marks
Term work: 25 Marks

Objectives of the course: Digital communication systems are becoming increasingly attractive because of the ever growing demand for data communication and because digital transmission offers data processing options and flexibilities not available with analog communication.

Pre-requisites: Principles Of Communication Engineering

DETAILED SYLLABUS

1. **Random Variables and Processes:**
   Probability, Mutually Exclusive Events, Joint Probability of Related and Independent Events Random variables, Cumulative Distribution Function, Probability Density Function, Relation between Probability and Probability Density, Joint Cumulative Distribution and Probability Density. A Communication Example, Average value of Random Variable, Variance of Random Variables, The Gaussian Probability Density, The Error Function. Random Processes, Autocorrelation, Power Spectral Density of a sequence of random pulses, Power Spectral Density of digital data.

2. **Baseband Modulation and Demodulation:**
   Pulse Code Modulation, PCM Waveform Types, PCM Word Size, M-ary Pulse-Modulation Waveform, Correlative Coding; A Base Band Signal Receiver, Detection of binary signals in Gaussian Noise, Inter Symbol Interference, Equalization.

3. **Bandpass Modulation and Demodulation:**
   Binary Phase-Shift Keying, Differential Phase Shift Keying, Differentially Encoded PSK, QPSK, M-ary PSK, Quadrature Amplitude Shift Keying(QASK), Binary Frequency Shift Keying, M-ary, FSK, Minimum Shift keying (MSK). Error performance for Binary systems, Probability of Error for coherently detected BPSK, Probability of Error for coherently detected Differentially Encoded BPSK, Probability of Error for coherently detected Binary Orthogonal FSK, Probability of Error for non-coherently detected Binary Orthogonal FSK, Probability of Error for Binary Orthogonal DPSK. Symbol Error Performance for M-ary systems, Probability of Symbol Error for MPSK, Probability of Symbol Error for MFSK, Bit Error Probability Vs. Symbol Error Probability, Effects of Inter Symbol Interference.

4. **Communication Link Analysis:**
   The Channel: Concept of Free Space, Error Performance Degradation, Sources of Signal Loss and noise. Frequency representation of Noise, Spectral component of Noise, Superposition of Noise, Noise Bandwidth, Resister Noise, Multiple Resister Noise Source, Networks with Reactive Elements, Noise Temperature, Effective Input Noise Temperature, Antennas, Sky Noise Temperature.

5. **Information Theory:**
   Discrete Messages, The Concept of amount of Information, Average Information, Entropy, Information Rate, Coding to increase Average Information per bit, Shannon's Theorem, Capacity of Channel, Capacity of a Gaussian Channel, Bandwidth S/N Ratio tradeoff, Use of Orthogonal signals to attend Shannon's Limit, Efficiency of Orthogonal signal transmission.

6. **Channel Coding:**
   Wave form coding, Types of Error Control, Structured sequences, Linear Block Codes, Error Detection and Correcting capability, Cyclic Codes, Hamming Codes, Extended Goyal Code, BCH Codes, Convolution Encoding, Convolution Encoder Representation, Formulation of the Convolution Decoding Problem, Properties of Convolution Codes, Reed- Solomon Codes, Interleaving and Concatenation Codes, Coding and Interleaving applied to the Compact Disk and Digital Audio System, Turbo Codes.

7. Source Coding:

Sources, Amplitude quantizing, Differential Pulse Code Modulation, Adaptive Prediction, Block Coding, Transform Coding, Source Coding for Digital data, Huffman Codes, Run Length Codes, Examples of Source Coding, Audio Compression, Image Compression.

8. **Encryption And Decryption:**
Models, Goals and early chipper systems, The Secrecy of Chipper Text, Practical Security, Stream Encryption, Public Key Cryptosystems.

BOOKS

Text Books:

1. Taub and schilling, "Principles of Communication Systems", TMH, 1991, 2nd Edition.
2. Sklar, "Digital Communications", Pearson Education, 2001, 2nd Edition.

References:

1. Prokies, "Digital Communications", TMH.
2. Haykins, "Digital Communications", John Weily.
3. Lathi, "Modern Digital and Analog Communication Systems", Oxford Press.

TERM WORK

1. Term work should consist of at least 10 practical experiments covering all the topics of the syllabus.
2. A term work test must be conducted with a weightage of 10 marks.

B.E. COMPUTER ENGINEERING
THIRD YEAR SEMESTER V

SUBJECT: COMPUTER NETWORKS

Lectures: 3 Hrs per week
Practical: 2 Hrs per week

Theory: 100 Marks
Term work: 25 Marks

Objectives of the course: This is first course in computer networks. Students should able to identify networking layers properly. (For example where are the boundaries of system network programmers and network application developers). Subject can be studied in different ways like top down, bottom up, concept wise, programming wise. This subject reasonably creates base for further studies of high performance networks, network design and analysis, Network system and application programming.

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

DETAILED SYLLABUS

1. **Introduction:**
   Network Applications. Network Hardware. Network Software. Reference Models.

2. **The Physical Layer**
   Guided Transmission Media. Wireless Transmission. Communication Satellites. The Public Switched Telephone Network. The Mobile Telephone System. Cable Television.

3. **The Data Dink Layer:**
   Data Link Layer Design Issues. Elementary Data Link Protocols. Sliding Window Protocols Example of Data Link Protocols: HDLC: High-Level Data Link Control, The Data Link Layer In The Internet.

4. **The Medium Access Sub-layer:**
   The Channel Allocation Problem. Multiple Access Protocols. Ethernet. Wireless LANS. Broadband Wireless. Blue Tooth. Data Link Layer Switching.

5. **The Network Layer:**
   Network Layer Design Issues. Routing Algorithms. Congestion Control Algorithms. Quality Of Service. Internetworking. The Network Layer In The Internet: The IP Protocol, IP Addresses Internet Control Protocols, The Interior Gateway Routing Protocol: OSPF. The Exterior Gateway Routing Protocol: BGP, Internet Multicasting, Mobile IP, Ipv6.

6. **The Transport Layer:**
   The Transport Service. Elements Of Transport Protocols. A Simple Transport Protocol. The Internet Transport Protocols: UDP;
   TCP: Introduction To TCP, The TCP Service Model, The TCP Protocol The TCP Segment Header, TCP Connection Establishment, TCP Connection Release, Modeling TCP Connection Management, TCP Transmission Policy, TCP Congestion Control, TCP Timer Management, Wireless TCP And UDP, Transactional TCP.
   Performance Issues: Measuring Network Performance, System Design For Better PERFORMANCE, FAST TPDU Processing, Protocols For Gigabit Networks.

7. **The Application Layer:**
   DNS: The Domain name system; Electronic Mail; SNMP.

8. **ATM Network:**
   ATM Layer. ATM Application Layer. ATM Signaling. PNNI Routing.

9. **Case study with Window2000/Linux**

TOPICS FOR EXPERIMENT

1. PC-to-PC file transfer using serial ports.
2. Network OS installation and configuration.
3. Networking Hardware and software components.
4. Network Routing.
5. Network Socket programming.

6. Shortest path routing.
7. Modem commands study.
8. Use network simulators like NS2, DLL simulators.
9. Implement multithreaded client- server application.
10. Assignment: prepare short note on any one advanced topic (not from above syllabus)

BOOKS

Text Books:

1. A.S.Tanenbaum, "Computer Networks", Fourth Edition.
2. B.F.Ferouzan, "Data Communications and Networking", TMH.

References:

1. Peterson, and Davie," Computer Networks", Second Edition, Morgan Kaufmann.
2. Kurose, Ross, "Computer Networking", Pearson Education.
3. Leon-Garcia And Widjaja, "Communication Networks", TMH.
4. S.Keshay, "An Engg. Approach To Computer Networking", Addison Wesley.
5. W.Richard Stevens, "TCP/IP Volume1, 2,3 ", Addison Wesley.
6. D.E.Comer, "Computer Networks And Internets", Pearson Education.
7. Warland, and Varaiya, "High Performance Communication Networks", Morgan Kaufmann
8. B.F.Ferouzan, "TCP/IP Protocol Suit", TMH.

TERM WORK

1. Term work should be based on above listed practical.
2. A term work test must be conducted with a weightage of 10 marks

B.E. COMPUTER ENGINEERING
THIRD YEAR SEMESTER V

SUBJECT: MICROPROCESSORS

Lectures: 4 Hrs per week
Practical: 2 Hrs per week

Theory: 100 Marks
Term work: 25 Marks

Objectives of the course: This course deals with the systematic study of the Architecture and programming issues of 8086/88-microprocessor family. The aim of this course is to give the students basic knowledge of the above microprocessor needed to develop the systems using it

Pre-requisites: Digital Logic Design

DETAILED SYLLABUS

1. **Introduction to Microcomputer Systems:**
   Introduction to Microprocessors & its evolution, Overview of 8086 Family, Case study of PC System

2. **Architecture of 8086/88 Family:**
   Memory organization & Architecture of 8086 family, 8086 Hardware Design, System clock (8284) & reset signal, buffering & latching circuits, Minimum mode & Maximum mode Operation, Study of bus controller 8288 & its use in maximum mode Connection, System Timing diagrams for 8086.

3. **8086 Instruction Set & Programming:**
   Addressing modes, Instruction Set in detail, ALP, Mixed language programming, Stacks, Strings, Procedures, Macros, Timers, Counters & delay. Programming examples using DOS And BIOS Interrupts, Device Drivers Programming.

4. **8086 Interrupt System:**
   8086 Interrupt structure, types and applications: Study of Programmable Interrupt Controller 8259A & Interrupt Priority Management using 8259A,

5. **Memory System Design & I/O Interfacing:**
   Interfacing SRAM, ROM and DRAM to 8086, Address decoding & Timing Considerations. I/O interfacing in 8086: Serial communication interface includes Synchronous & Asynchronous Protocols, parallel communication Interface includes I/O Mapped I/O, Memory Mapped I/O, Handshaking Signals.

6. **I/O Controllers for 8086 and Data communication:**
   Study of 8255AH Programmable Peripheral Interface & its modes; Study of 8250 UART, DMA Concepts & transfer types: Study of DMA controller 8237, Study of Programmable Timer 8254 & its modes. Data communication includes EIA RS-232C Standard, IEEE 488 GPIB.

7. **8087 Numeric Co-processor:**
   8087 NDP Architecture, Data types & formats, Numeric Instruction Set, Stacks in 8087, Interface of Coprocessor (8087) to Host (8086), ALP for 8086-8087 systems; Study of IOP 8089, its interaction with 8086.

8. **Multiprocessor Systems:**
   8086/88 based Multiprocessor systems, Study of Multiprocessor configurations, Study of Bus Arbiter 8289, Bus arbitration & control using 8289.

BOOKS

Text Books:

1. Douglas Hall, "Microprocessors and Interfacing, Programming and Hardware", Second Edition. Tata McGraw-Hill.
2. John Uffenback, "8086/8088 Interfacing, Programming and Design", 1987,PHI.
3. Yu-Cheng Liu, Glenn A. Gibson, "The 8086/8088 Family Architecture, Programming and Design", Second Edition, PHI.
4. Peter Able, "IBM PC, Assembly Language Programming ", Fifth Edition.

ferences:

1. A. K. Ray, K. M. Bhurchandi, "Advanced Microprocessors and Peripherals", Tata McGraw Hill, 2000.
2. B. B. Brey, "The Intel Microprocessors", Sixth Edition.
3. Peter Norton, "IBM PC, Assembly Language programming", BPB publication.
4. Manuals from Intel.

TERM WORK

Term work should consist of at least 12 practical experiments covering all the topics.
A term work test must be conducted with a weightage of 10 marks.

B.E. COMPUTER ENGINEERING
THIRD YEAR SEMESTER V

SUBJECT: THEORETICAL

Objectives of the course: This course aims to build concepts regarding the fundamental prin
grammars, automata theory and Turing machine.

DETAILED SYLLABUS

1. **Regular Sets And Automata Theory:**
   Regular Sets, Regular Grammars and Languages; Regular Expressions, Grammars and Languages, Pumping Lemma, Closure properties, Decision problems, Myhill-Nerode theorem Finite automata and Finite State Machines, NFA, DFA, FSM, Moore and Mealy Machines, Converting NFA to DFA, Minimization of Automata and FSM, Kleene's Theorem.

2. **Context Free Grammars And Push Down Automata:**
   Context Free Grammars and Languages, Parse Trees, CNF and GNF, Pumping Lemma, Closure properties; Push Down Automata, Concept of Stack, PDA for CFG.

3. **Turing Machine:**
   Construction of Turing Machine for problem solving, TM as Acceptors and Generators, Variations and Equivalence of TM, TM Languages, Post Machine, Universal Turing Machine, Church's Hypothesis.

4. **Undecidability:**
   Undecidability and Halting problem, Rice's Theorem, Post Correspondence Problem; Unsolvable problems using TM, Unsolvable problems using CFG, Greibach Theorem; Enumerable and Recursively Enumerable Languages.

BOOKS

Text Books:

1. J.C. Martin, "Introduction To Languages and the Theory of Computation", Third Edition, TMH
2. Peter Linz, "Introduction Formal Languages and Automata", Narosa.
3. Michael Sipser, "Introduction to the Theory of Computation", Thompson Learning, 1997.

References:

1. J.E.Hopcroft, J.D.Ullman, "Introduction To Automata Theory, Languages And Computation", Second Edition, Pearson Education.

TERM WORK

1. Term work should consist of at least 10 experiments/assignments covering all the topics. Term work test must be conducted with a weightage of 10 marks.

B.E. COMPUTER ENGINEERING
THIRD YEAR SEMESTER V

SUBJECT: PRESENTATION AND COMMUNICATION TECHNIQUES

Lectures: 2 Hrs per week
Tutorials: 2 Hrs per week

Term work: 25 Marks
Oral Exam.: 25 Marks

DETAILED SYLLABUS

1. COMMUNICATION IN A BUSINESS ORGANISATION

Internal (Upward, Downward, Horizontal, Grapevine, Problems, Solutions) External Communication, Strategies for conducting successful business meetings, documentation (notice, agenda, minutes) of meetings, Introduction to modern communication techniques (for e.g. e-mail, internet, video conferencing etc), Legal & ethical issues in communication (intellectual property rights, patents)

6 – 7 Lectures

2. ADVANCED TECHNICAL WRITING

REPORT – WRITING AND PRESENTATION: Definition and importance of reports Qualities of Reports, language and style in reports, type of reports, formats (letter, memo, project – reports), methods of compiling data. A computer-aided presentation of a project report based on technical, survey-based, reference based or campus related topic. Topics to be assigned to a group of 8-10 students. The written report should not exceed 20 printed pages.

9 – 10 Lectures

3. TECHNICAL PAPER-WRITING

4. WRITING PROPOSALS

5. INTERPERSONAL SKILLS

Introduction to emotional intelligence, Motivation, Negotiation and conflict-resolution Assertiveness, Leadership, Term-building, Decision-making, Time-management

9-10 lectures

6. INTERVIEW TECHNIQUES

Preparing for job interviews, verbal and non-verbal communication during interviews Observation sessions and role-play techniques may be used to demonstrate interview strategies.

1 – 2 lectures

7. GROUP DISCUSSION

Dynamics of Group Behavior, Techniques for effective participation.

1 – 2 lectures

BOOKS

Text Books:

1. Fred Luthans, 'Organizational Behavior' McGraw Hill International Edition
2. Lesiker and Petit 'Report writing For Business' McGraw Hill International Edition
3. Huckin and Olsen 'Technical Writing and Professional Communication' - McGraw Hill International Edition
4. Wallace and Masters 'Personal Development for Life and Work' (workbook) Thomson Learning
5. Herta Murphy 'Effective Business Communication' Hearta Murphy Herburtwhildebraudt McGraw Hill

References:

1. Lewicki, Saunders, Minton 'Essential of Negotiation' McGraw Hill International Edition
2. Hartman Lemay 'Presentation Success' Thomson learning.
3. Kitty O Locker & Kaczmark - 'Business Communication Building Critical Skills' McGraw Hill
4. Vikas Gupta: Comdex Computer Course Kit, IDG Books Pvt. Ltd.

5 Heller & Handle : The Essential Manager's Manual – Dorleen Kindercey
6 The Sunday Times 'Creating Success Series'
   1. Develop your Assertiveness
   2. Make every Minute Count
   3. Successful Presentation Skills
   4. How to motivate people
   5. Team building

TERM WORK

1 2 assignments on Communication topics

2 3 assignments on Report writing

3 3 assignments on Interpersonal Skills

4 1 class test

Oral:

Practical sessions on Group-discussion / Interview Skills / Project Presentation / Power point Presentation.

5 BREAK UP OF TERM WORK MARKS (External Exam)

Assignment	15 marks
Test	10 marks
Total	25 marks

6 BREAK UP OF ORAL EXAMINATION (Internal Exam)

Project Report Presentation	20 marks
Group Discussion	5 marks
Total	25 marks

B.E. COMPUTER ENGINEERING
THIRD YEAR SEMESTER V

SUBJECT: COMPUTER PROGRAMMING LABORATORY

Practical: 3 Hrs per week Tutorials: 2 Hrs per week	Term work: 25 Marks

Objectives of the course: This course aims at giving students rigger for programming independent of any particular language and develop a strong problem solving skill.

Pre-requisites: One programming course, Course in Data Structures.

DETAILED SYLLABUS

1. **Programming Assignments:**
   Students will implement programs adhering to good programming practices. Problems selected should be able to use the selected programming style and language appropriately. Suggested programming style is object-oriented programming and languages may be C++, java, VC++. The assignments should be approximately 10 in number and to be completed in about 5 weeks

2. **Problem solving assignment:**
   This will be a mini group project to be completed within the Institute in a span of about 10 weeks. Student group should select any one stream area like database programming, network programming, multimedia programming, system programming etc. and use the appropriate skill set to design and implement the mini project.

References:

A.D.Smith and P.D. Smith , "Graded Problems in Computer science ",Addison-Wesley.

TERM WORK

1. Term work should consist of at least 10 programs covering all the topics.
2. A mini project.

B.E. COMPUTER ENGINEERING
THIRD YEAR SEMESTER VI

SUBJECT: SYSTEMS PROGRAMMING

Lectures: 3 Hrs per week **Practical: 2 Hrs per week**	**Theory: 100 Marks** **Term work: 25 Marks** **Oral Examination: 25 Marks**

Objectives of the course: This course is an introduction to the design and implementation of various types of system software. It is intended that the student should be able to design a working assembler, loader and macro-processor on completion of this course.

Pre-requisites: Course in computer organization, data structures and C/C++.

DETAILED SYLLABUS

1. **Language Processors:**
   Fundamentals of Language Processing and Language Specification. Classification of Programming Language Grammars. Static and Dynamic Binding. Language Processor Development Tools.

2. **System Software And Machine Architecture:**
   Introduction to Systems Programs. Introduction to Data Formats. Registers and Addressing Modes for Traditional CISC Machines and RISC Machines.

3. **Assemblers:**
   Basic Assembler Functions. Assembler Algorithm and Data Structures. Design of Single Pass Assembler. Design of Multi-pass Assemblers. Implementation Examples: MASM Assembler and SPARC Assembler.

4. **Macros And Macro Processors:**
   Macro Definition and Expansion. Conditional Macro Expansion. Macro Parameters. Recursive Macro Expansion. Nested Macro Calls. Design of Macro Preprocessors. Implementation Examples: MASM Macro Processor; ANSI C Macro Language.

5. **Loaders And Linkers:**
   Basic Loader Functions. Design of an Absolute Loader. Relocation and Linking Concepts. Linkage Editors. Dynamic Linking. Bootstrap Loaders. Design of a Linker. Implementation Examples: A Linker for MS-DOS.

6. **Scanning And Parsing:**
   Introduction to Regular Expressions and Finite State Automata. Optimization of DFA Based Pattern Matchers. Top-down and Bottom-up Parsing Techniques. Recursive Descent Parsing. LL (1) Parsing. LALR Parsing and Operator Precedence Parsing. LEX and YACC. Syntax Directed Translation.

7. **Compilers And Interpreters:**
   Aspects of Compilation. Memory Allocation: Run time storage organization, Static, Dynamic, Heap Storage and Garbage Compaction. Phases of Compilation: Lexical Analysis; Syntax Analysis; Intermediate Code Generation; Machine Independent and Machine Independent Code Optimization. Compilation of Expressions and Control Structures. Interpreters. Java Compiler and Environment. YACC Compiler-Compiler.

8. **Software Tools:**
   Software Tools for Program Development. Editors. Debug Monitors. Programming Environments. User Interfaces.

BOOKS

Text Books:

1. [illegible]amdhere "Systems Programming And Operating Systems", Tata McGraw Hill, 2nd [illegible] Edition, 2002.
2. Leland L. Beck, "Systems Software", Addison Wesley.
3. A.V. Aho, Ravi Sethi & J.D. Ullman, "Compilers Principles and Techniques", Pearson Education

ferences:

J.J Donovan, "Systems Programming", TMH.

TERM WORK

Term work should involve:

a. Course projects on Assembler implementation; design of compiler for simple language constructs.
b. Implementation of simple parsers.
c. Implementation of a simple loader.

A term work test of 10 marks must be conducted.

B.E. COMPUTER ENGINEERING
THIRD YEAR SEMESTER VI

SUBJECT: OPERATING SYSTEMS WITH UNIX

ectures: 3 Hrs per week
ractical: 3 Hrs per week

Theory: 100 Marks
Term work: 25 Marks
Oral Exam.: 25 Marks

DETAILED SYLLABUS

1. **Operating System Overview.**
   Operating System Objectives and Functions. The history and evolution of Operating Systems. Characteristics of Modern Operating Systems; Windows 2000 Overview; Traditional UNIX Systems; Modern UNIX Systems.
   Basic concepts. Processes; files; system calls; shel;, layered structure vs monolithic structure of O.S.

2. **Processes:**
   Process Model; Process states; Process Description; Process Control; PCB; creation of processes; context switching; exit of processes; UNIX SVR4 Process Management. Threads, SMP. Processes and Threads; Symmetric Multiprocessing; Windows 2000 Thread and SMP Management; Linux Process and Thread Management.

3. **Process Scheduling:**
   Objectives; premptive vs non-premptive scheduling; Multiprocessor Scheduling; Real-Time Scheduling; Linux Scheduling; UNIX SVR4 Scheduling; Windows 2000 Scheduling; comparative assesment of different scheduling algorithms.
   Concurrency. Mutual Exclusion and Synchronization; Principles of Concurrency; Mutual Exclusion; Software Approaches; Mutual Exclusion; Hardware Support; Semaphores; Monitors; Message Passing; Readers/Writers Problem.
   Concurrency. Deadlock and Starvation; Principles of Deadlock; Deadlock Prevention; Deadlock Avoidance; Deadlock Detection; An Integrated Deadlock Strategy; Dining Philosophers Problem; UNIX Concurrency Mechanisms; Windows 2000 Concurrency Mechanisms.

4. **Memory**
   Memory Management Requirements. Memory Partitioning; Virtual memory; Paging; Segmentation; Design and implementation issues in paging and segmentation; page replacement algorithms; page fault handling; working set model; UNIX and. Linux Memory Management; Windows 2000 Memory Management.

5. **I/O Management and Disk Scheduling.**
   I/O Devices. Organization of the I/O Function; Operating System Design Issues; I/O Buffering; Disk Scheduling; RAID; Disk Cache; UNIX SVR4 I/O; Windows 2000 I/O;

6. **File Management.**
   Overview; File Organization; File Directories; File Sharing; Record Blocking; Secondary Storage Management; UNIX File Management; Windows 2000 File System.

7. **Case Studies:**
   Unix. Internal representation of files; system calls for the file system; implementation of processes; process scheduling; memory management policies.
   Windows NT; Layered structure; interpretability

BOOKS

Text Books:

1. William Stallings, "Operating Systems".
2. Silbershatz, A., Peterson, J., Galvin, P., "Operating System Concepts", Addison Wesley.
3. Maurice J. Bach, "The Design of the Unix Operating system".

References:

1. Tannenbaum, "Modern Operating Systems", Second Edition.
2. Milan Milenkovic, "Operating System", Mc Graw Hill

3. Tannenbaum, A., "Operating Systems: Design and Implentation", Prentice Hall

TERM WORK

1. Term work shall consist of at least 9 programs based on the above topics.
2. It should also include Small routines, involving implantation of small utilities in shell programming for Unix system administration.
3. Programs that would give good exposure to Unix system calls for process control, memory management and file management.
4. Test must be conducted with a weightage of 10 marks.

B.E. COMPUTER ENGINEERING
THIRD YEAR SEMESTER VI

SUBJECT: WEB TECHNOLOGY

Loctures: 4 Hrs per week
Practical: 2 Hrs per week

Theory: 100 Marks
Term work: 25 Marks
Oral Examination: 25 Marks

Objectives of the course: The objective of the course is to provide an understanding of technology used for building WEB. This course gives knowledge right from building of Web to making business on Web. It also gives a comprehensive coverage of HTML, JavaScript, CGI/Perl Java Servlets, ASP for Building Secure E-commerce applications.

DETAILED SYLLABUS

1. **Introduction:**
   Introduction to WEB Technology, TCP/IP, Protocols, Telnet, Electronic Mail (Email) File Transfer Protocol (FTP), Word Wide Web, Domain Name System (DNS), Uniform Resource Locator (URL),

2. **HTML:**
   Introduction to Hypertext Markup Language, Tags, Anchors, Backgrounds, Images, Web page structure, Hyper linking, Lists, Character Formatting, Color Control, Images, Tables, Frames Multimedia, Cascading style sheet, Application with layers.

3. **Dynamic Web Pages:**
   HTML/DHTML: Introduction to DHTML, Forms, Client-side Forms, JavaScript, Incorporating JavaScript in HTML, JavaScript expressions, Control flow and functions, String and Arrays, JavaScript objects. JavaScript Forms, Cookies, history, location. XML, CGI Scripting with Perl

4. **Active Server Pages & Servlets:**
   ASP Objects: Application, Request, Response, Server, Session, Forms, Query Strings, Cookies, Connectivity with databases, Using ActiveX Objects, JSP, Java Servlets.

5. **Applications:**
   Electronics Commerce: An Introduction, Types, Solution, e-shop, Online Payment , Internet Banking

BOOKS

Text Books:

1. Kriss Jamsa, Konrad King,"HTML & Web Design", TMH
2. Achyut Godbole ,"Web Technologies", TMH

References:

1. Box ,"Essential XML" , Pearson Education.
2. David Whiteley,"E-Commerce", TMH .
3. Douglas E Comer,"Internetworking with TCP/IP", Volume I, Pearson education
4. Steven Holzner, "HTML Black Book", Dreamtech.
5. Vivek Sharma, Rajiv Sharma,"Developing e-commerce Site", Pearson Education.
6. Microsoft Commerce Solutions ,Web technology, PHI
7. Jason Hunter & William Crawford,"Java Servlet Programming",O'REILY.
8. Tom Negrino and Dori Smith,"JavaScript for The World Wide Web", Third Edition, Pearson Education.

TERM WORK

1. At least 10 Programs based on above syllabus
2. Build an e-commerce site
3. Study of ISP, Installation of WEB Server
4. A test must be conducted with a weightage of 10 Marks.

B.E. COMPUTER ENGINEERING
THIRD YEAR SEMESTER VI

SUBJECT: OBJECT ORIENTED ANALYSIS & DESIGN

Lectures: 3 Hrs per week Practical: 3 Hrs per week	Theory: 100 Marks Term work: 25 Marks Practical Exam: 25 Marks

DETAILED SYLLABUS

1. **Introduction:**
   Overview Of OOL; Object Classes; Meta Types. Object Oriented Methodologies; The Unified Approach Modeling; Why Modeling? Static And Dynamic Models; Functional Models.

2. **Object Modeling:**
   Object. Links. Association. Inheritance. Grouping Constructs; Problems On Object Modeling. Advantages Of Object Modeling.

3. **Analysis:**
   Problem Analysis. Problem Domain Classes. Identify Classes And Objects Of Real World Problems. Using Use Case Analysis; Recording Analysis.

4. **Basic Object Modeling:**
   Multiplicity. Constraints. Aggregation. Component.

5. **Sequence Diagram:**
   Modeling Scenarios. Mapping Events To Object. Interfaces. Discovering Attributes. Modeling Simple Collaboration Modeling. Logical Database Schema. Activity Diagram. Modeling Workflow.

6. **Class Diagram:**
   Test Scenarios. Interfaces. Classes. Methods. Stress Testing. System Testing. Scalability Testing. Regression Testing. Behavioral Modeling. State Chart Diagram.

7. **Design:**
   Architectural Design. Refining The Model. Refactoring. Coupling And Cohesion . Who Should Own The Attribute? Who Should Own The Operations? Process And Threads

8. **Design Classes:**
   Classes Visibility; User Interface. Subsystem Interface.

9. **Deponent Diagram:**
   Modeling Source Codes. Physical Databases.

10. **Deployment Diagram:**
    Modeling In A C/S System. Distributed System And Embedded Systems.

TOPICS FOR EXPERIMENT

Use any UML/OOAD tool and do the following:

1. Use case diagram.
2. Sequence diagram.
3. Collaboration diagram.
4. Activity diagram.
5. Use case realization.
6. Class diagram.
7. Testing, Debugging, Porting.
8. Component diagram.
9. Change management using MAKE/SCCS utility.

BOOKS

Text Books:

1. Ali Bahrami, "Object Oriented System Development ", McGraw Hill.
2. Grady Booch, J. Rambaugh, Ivar Jacobson, "The UML Users guide", Pearson Education

J. Rambaugh, *et. al*,, "Object Oriented Modeling and Design".
Andrew Haigh, "Object Oriented Analysis and Design", Tata McGrawHill

References:

1. Simon Benett, Steve McRobb, Ray Farmer, "Object Oriented System Analysis and Design Using UML" McGrawHill.
2. Timothy C. Lethbridge, Robert Laganiere, "Object Oriented Software Engineering" McGrawHill
3. Stephen R. Schach, "Object Oriented and Classical Software Engineering", TMH.

TERM WORK

1. Term work should consist of at least 8 experiments covering all the topics.
2. A term work test must be conducted with a weightage of 10 marks.

B.E. COMPUTER ENGINEERING
THIRD YEAR SEMESTER VI

SUBJECT: COMPUTER GRAPHICS

Lectures: 3 Hrs per week Practical: 3 Hrs per week	**Theory: 100 Marks** **Term work: 25 Marks** **Practical Exam: 25 Marks**

Pre-requisites: Knowledge of C language is needed.

DETAILED SYLLABUS

1. **Introduction:**
   Application Areas. Input and Output Devices. Video Display Devices: Refresh CRT; Raster scan display; Color CRT monitor; Flat panel display; Co-ordinate representation.

2. **Basic Raster Graphics Algorithm for drawing 2-D primitives:**
   Output Characteristics: Aspect ratio; Alising and Anti-alising. Line Drawing Algorithms: DDA algorithm; Bresenham's algorithm. Circle Generation Algorithm: Midpoint circle algorithm. Ellipse Generation Algorithm: Mid-point ellipse algorithm. Area filling: Scan line polygon filling algorithm; Inside-outside test; Boundary fill algorithm; Flood-fill algorithm.

3. **2-D Geometric Transformation:**
   Window and Viewport: Window and Viewport relationship; World co-ordinates; Normalised device co-ordinates and Homogenous co-ordinates. Basic Transformations: Translation; Rotation and Scaling. Other Transformation: Reflection and Shear. Composite Transformation.

4. **2-D Viewing and Clipping:**
   Window to Viewport Co-ordinate Transformation. Clipping: Point clipping; Line: Cohen-Sutherland algorithm, Liang Barsky clipping, Mid-point Subdivision; Polygon: Sutherland Hodgman algorithm.

5. **3-D Concepts:**
   3-D Display Methods: Parallel and Perspective projections; Depth Cueing. 3-D Transformation: Basic Transformations: translation, rotation and scaling; Other Transformation: reflection and shear; Composite Transformation. 3-D Viewing and Clipping

6. **Hidden Surface Elimination Methods:**
   Backface Detection, Depth or Z-buffer Method, Scan Line Method, Area Subdivision Method

7. **Curves:**
   Spline Representation, Bezier Curves, B-spline.

8. **Light Shading:**
   Illumination Model. Shading: Constant Intensity shading; Gouraud shading; Phong shading. Halftoning. Ray Tracing.

BOOKS

Text Books:

1. Donald Hearn and M. Pauline Baker, "Computer Graphics with C version ",Second Edition Pearson Education.
2. Newman and Sproll, "Principles of Interactive Computer Graphics", Second Edition, McGraw Hill.

References:

1. Rogers and Adams, "Mathematical Elements for Computer Graphics ", TMH.
2. [illegible] Rugtek, "Schaum's Outlines Computer Graphics", Second Edition, TMH.
3. [illegible] "Computer Graphics", McGraw Hill.
5. Rog[illegible]rocedural Elements for Computer Graphics", TMH.

TERM WORK

1. Term work should consist of at least 10 practical experiments covering all the topics of the

syllabus.

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

B.E. COMPUTER ENGINEERING
THIRD YEAR SEMESTER VI

SUBJECT: ADVANCED DATABASES

Lectures: 3 Hrs per week	Theory: 100 Marks
Practical: 2 Hrs per week	Term work: 25 Marks
	Oral Exam.: 25 Marks

Objectives of the course: To study the further database techniques beyond which covered in the second year, and thus to acquaint the students with some relatively advanced issues. At the end of the course students should be able to: gain an awareness of the basic issues in objected oriented data models, learn about the Web-DBMS integration technology and XML for Internet database applications, familiarize with the data-warehousing and data-mining techniques and other advanced topics, apply the knowledge acquired to solve simple problems

Pre-requisites: A basic course in "Database Systems" and knowledge of OOAD.

DETAILED SYLLABUS

1. **The Extended Entity Relationship Model And Object Model:**
   The ER model revisited, Motivation for complex data types, User Defined Abstract Data Types And Structured Types, Subclasses, Super classes, Inheritance, Specialization and Generalization, Constraints and Characteristics of Specialization and Generalization. Relationship Types of Degree Higher Than Two.

2. **Object-Oriented Databases:**
   Overview of Object-Oriented Concepts. Object Identity, Object Structure, and Type Constructors, Encapsulation of Operations, Methods, and Persistence, Type Hierarchies and Inheritance, Type extents and Queries, Complex Objects: Database Schema Design for OODBMS; OQL, Persistent Programming Languages; OODBMS Architecture And Storage Issues; Transactions and Concurrency control
   Example of ODBMSs, - O2

3. **Object Relational and Extended Relational Databases:**
   Database Design For An ORDBMS - Nested Relations and Collections; Storage And Access methods, Query processing and Optimization; An Overview of SQL3, Implementation Issues for Extended Type ;Systems. Comparison Of RDBMS, OODBMS, ORDBMS

4. **Parallel and Distributed Databases and Client-Server Architecture:**
   Architectures For Parallel Databases, Parallel Query Evaluation; Parallelizing Individual Operations, Sorting, Joins; Distributed Database 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

5. **Databases On The Web And Semi structured Data**
   Web Interfaces To The Web, Overview Of XML; Structure Of XML Data, Document Schema, Querying XML Data; Storage Of XML Data, XML Applications; The Semi structured Data Model, Implementation Issues, Indexes For Text Data

6. **Data Warehousing and Data Mining.**
   Introduction To Data Warehousing, Star Schemas; Multidimensional Data Model and OLAP, Introduction To Data Mining; Mining For Rules, Tree Methods, Clustering Approaches To Data Mining; Applications Of Data Warehousing and Data Mining

7 **Enhanced Data Models for Advanced Applications.**

Active Database Concepts. Temporal Database Concepts.; Spatial Databases, Concepts and architecture; Deductive Databases and Query processing; Mobile Databases, Geographic Information Systems.

BOOKS

Text Books:

1 Elmasri and Navathe, "fundamentals of database systems " , 4th Edition , Pearson Education
2 Raghu Ramakrishnan, Johannes Gehrke ," database management systems", Second Edition. McGraw-Hill

References:

1. Korth, Silberchatz, Sudarshan ,"Database System Concepts", 4th Edition, McGraw-Hill.
2. Peter Rob and Coronel,"Database systems, Design, Implementation and Management, Fifth Edition,Thomson Learning.
3. C J.Date, Longman, "Introduction To Database Systems", 7th Edition, Addison Wesley

TERM WORK

1 The term work should include 6 small projects that would cover the different data models dealt with in the subject.
2 Two Assignments on current topics should also be included.
3 A Term Work test must be conducted with a weightage of 10 Marks.