

**B.E. SEMESTER VII**

Scheme of Instructions					Scheme of Evaluation					
Subjects		Lect/ Week	Pract/ Week	Tuto/ Week	Paper		T/W	Pract	Oral	Total
		Week	Week	Week	Hours	Marks				
1	Advanced Microprocessors	4	2	-	3	100	25	-	25	150
2	Intelligent Systems	4	2	-	3	100	25	-	25	150
3	Digital Signal Processing	4	2	-	3	100	25	-	25	150
4	Software Engineering	4	2	-	3	100	25	-	25	150
5	Elective-I	4	2	-	3	100	25	-	25	150
6	Project-A	-	-	2	-	-	25	-	25	50
		20	10	2	-	500	150	-	150	800

Elective-I	
1	Image Processing
2	Pattern Recognition*
3	Mobile Computing*
4	Embedded Systems*
5	Computer Simulation and Modeling*
6	Advanced Computer Networks*

Elective-II	
1	Robotics*
2	Computer Vision*
3	Parallel Processing
4	Data Warehousing and Mining*
5	Neural Networks and Fuzzy Systems*
6	Software Testing*

**B.E. COMPUTER ENGINEERING**  
**FOURTH YEAR SEMISTER VII**

**SUBJECT: ADVANCED MICROPROCESSORS**

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

**Theory: 100 Marks**  
**Term Work: 25 Marks**  
**Oral: 25 Marks**

**Objective:** To study microprocessor basics and the fundamental principles of architecture related to advanced microprocessors.

**Pre-requisite:** Microprocessors

**DETAILED SYLLABUS**

- 1. Overview of new generation of modern microprocessors.**
- 2. Advanced Intel Microprocessors:** Protected Mode operation of x86 Intel Family; Study of Pentium: Super-Scalar architecture & Pipelining, Register Set & special Instructions, Memory Management, Cache Organizations, Bus operation, Branch Prediction Logic.
- 3. Study of Pentium Family of Processors:** Pentium I, Pentium II, Pentium III, Pentium IV, Pentium V: Architectural features, Comparative study.
- 4. Advanced RISC Microprocessors:** Overview of RISC Development and current systems, Alpha AXP Architecture, Alpha AXP Implementations & Applications.
- 5. Study of Sun SPARC Family:** SPARC Architecture, The Super SPARC, SPARC Implementations & Applications.
- 6. Standard for Bus Architecture and Ports:** EISA, VESA, PCI, SCSI, PCMCIA Cards & Slots, ATA, ATAPI, LPT, USB, AGP, RAID
- 7. System Architectures for Desktop and Server based systems:** Study of memory subsystems and I/O subsystems. Integration issues

**BOOKS**

**Text Books:**

1. Daniel Tabak, "*Advanced Microprocessors*", McGraw-Hill.
2. Barry Brey, "*The Intel Microprocessors, Architecture, Programming and Interfacing*"
3. Tom Shanley, "*Pentium Processor System Architecture*", Addison Wesley Press.

**References:**

1. Ray and Bhurchandi, "*Advanced Microprocessors and Peripherals*", TMH
2. James Antonakos, "*The Pentium Microprocessor*", Pearson Education.
3. Badri Ram, "*Advanced Microprocessors and Interfacing*", TMH Publication.
4. Intel Manuals.

<b>TERM WORK</b>
1. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.
<b>ORAL EXAMINATION</b>
An oral examination is to be conducted based on the above syllabus.

**B.E. COMPUTER ENGINEERING**  
**FOURTH YEAR SEMISTER VII**

**SUBJECT: INTELLIGENT SYSTEMS**

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

**Theory: 100 Marks**  
**Term Work: 25 Marks**  
**Oral: 25 Marks**

**Objectives:** To understand and apply principles, methodologies and techniques in design and implementation of intelligent system.

**Prerequisite:** Data Structures, Programming Languages, and Algorithms

**DETAILED SYLLABUS**

1. **Artificial Intelligence:** An overview, Intelligent Systems: Evolution of the concept.
2. **Intelligent Agents:** How agent should act, Structure of intelligent agents, Environments
3. **Problem Solving:** Solving problems by searching, Informed search methods, Game playing
4. **Knowledge and Reasoning:** A knowledge based agent, The wumpus world environment, Representation, Reasoning, Logic, Proportional logic, First order logic: Syntax and Semantics, Extensions and Notational variation, Using first order logic
5. **Building a Knowledge Base:** Properties of good and bad knowledge base, Knowledge engineering, General ontology
6. **Interfacing First Order Logic:** Interface rules involving quantifiers, An example proof, Forward and backward chaining, Completeness
7. **Acting Logically:** Planning, Practical planning: Practical planners, Hierarchical decomposition, Conditional planning
8. **Uncertain Knowledge and Reasoning:** Uncertainty, Representing knowledge in an uncertain domain, The semantics of belief networks, Inference in belief networks
9. **Learning:** Learning from observations: General model of learning agents, Inductive learning, learning decision trees, Learning in neural and belief networks: Introduction to neural networks, Perceptrons, Multilayer feed-forward network, Application of ANN, Reinforcement learning: Passive learning in a known environment, Generalization in reinforcement learning, Genetic algorithms
10. **Agents that Communicate:** Communication as action, Types of communicating agents, A formal grammar for a subset of English
11. **Expert system:** Introduction to expert system, Representing and using domain knowledge, Expert system shells, Explanation, Knowledge acquisition
12. **Applications:** Natural language processing, Perception, Robotics

**BOOKS**

**Text Books:**

1. Stuart Russell and Peter Norvig, “*Artificial Intelligence: A Modern Approach*”
2. George F.Luger, “*Artificial Intelligence: Structures and Strategies for Complex Problem Solving*”, Pearson Education

<b>References:</b>
<ol style="list-style-type: none"> <li>1. Nils J. Nilsson, <i>“Artificial Intelligence: A New Synthesis”</i>, Harcourt Asia</li> <li>2. Elaine Rich and Kevin Knight, <i>“Artificial Intelligence”</i>, TMH</li> <li>3. Patrick Winston, <i>“Artificial Intelligence”</i>, Pearson Education</li> <li>4. Ivan Brakto, <i>“Prolog Programming for Artificial Intelligence”</i>, Pearson Education</li> <li>5. Efraim Turban Jay E. Aronson, <i>“Decision Support Systems and Intelligent Systems”</i></li> <li>6. Ed. M. Sasikumar and Others, <i>“Artificial Intelligence : Theory and Practice”</i> Proceedings of the International Conference KBCS-2002, Vikas Publishing House</li> </ol>
<b>TERM WORK</b>
<ol style="list-style-type: none"> <li>2. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.</li> </ol>
<b>ORAL EXAMINATION</b>
An oral examination is to be conducted based on the above syllabus.

**B.E. COMPUTER ENGINEERING**  
**FOURTH YEAR SEMISTER VII**

**SUBJECT: DIGITAL SIGNAL PROCESSING**

**Lectures: 4 Hrs per week**

**Practical: 2 Hrs per week**

**Theory: 100 Marks**

**Term Work: 25 Marks**

**Oral: 25 Marks**

**Objective:** Digital Signal Processing continues to play an increasingly important role in the fields that range literally from A (astronomy) to Z (zeugmatography, or magnetic resonance imaging) and encompass applications such as Compact Disc player, Speech Recognition, echo cancellations in communication systems, image Enhancement, geophysical exploration, and noninvasive medical imaging. This course aims to build concepts regarding the fundamental principles and applications of Signals, System Transforms and Filters.

**Pre-requisites:** Nil

**DETAILED SYLLABUS**

1. **Discrete Time Signals & System:** Discrete-time signals, Discrete-time systems, Analysis of discrete-time LTI systems, Discrete-time systems described by differential equations, Implementation of discrete-time systems, Correlation of discrete-time systems
2. **Z-Transform:** Definition and Properties of Z-transform, Rational Z-transforms, Inverse Z-transform, one-sided Z-transform, Analysis of LTI systems in Z-domain
3. **Frequency Analysis of Signals and Systems:** Frequency analysis: Continuous time signals and Discrete-time signals, Properties of the Fourier transform for discrete-time signals, Frequency domain characteristics of LTI systems, LTI system as a frequency selective filter, Inverse systems and deconvolution
4. **Discrete Fourier Transform:** Frequency domain sampling, Properties of DFT, Linear filtering method based on DFT, Frequency analysis of signals using DFT, FFT algorithm, Applications of FFT, Goertzel algorithm, Quantisation effects in the computation of DFT
5. **Implementation of Discrete Time Systems:** Structure of FIR systems, Structure of IIR systems, quantization of filter coefficients, round-off effects in digital filters
6. **Design of Digital Filters:** Design of FIR filters, Design of IIR filters from analog filters, frequency transformations, Design of digital filters based on least-squares method digital filters from analogue filters, Properties of FIR digital filters, Design of FIR filters using windows, Comparison of IIR and FIR filters, and Linear phase filters.
7. **Introduction to DSP co-processors:** TMS 320C40/50, Analog Devices.
8. **Applications :** Image processing, Control, Speech, Audio, Telecommunication

**BOOKS**

**Text Books:**

1. J.G. Proakis, "Introduction to Digital Signal Processing", PHI
2. Oppenheim and Schaffer, "Discrete Time Signal Processing"

**References:**

1. S.K. Mitra, "Digital Signal Processing", TMH.

2. T.J. Cavicchi, "*Digital Signal Processing*", John Wiley.
3. L.C. Ludeman, "*Fundamentals Of Digital Signal Processing*", John Wiley.
4. E.C. Ifeachor, B.W. Jervis, "*Digital Signal Processing*", Pearson Education.
5. S Sallivahanan, "*Digital Signal Processing*", TMH.
6. Ashok Ambaradar, "*Analog and Digital Signal Processing*", Thompson Learning.

**TERM WORK**

3. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

**ORAL EXAMINATION**

An oral examination is to be conducted based on the above syllabus.

**B.E. COMPUTER ENGINEERING**  
**FOURTH YEAR SEMISTER VII**

**SUBJECT: SOFTWARE ENGINEERING**

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

**Theory: 100 Marks**  
**Term Work: 25 Marks**  
**Oral: 25 Marks**

**Objectives:** Apply various software Engineering principles and methodologies while dealing with the various phases of software development.

**Pre-requisite:** Programming concepts.

**DETAILED SYLLABUS**

- 1. Product:** Evolving role of software, Software Characteristics, Software Applications, Software myths.
- 2. Process:** Software Process, Process Models, Linear sequential model, Prototyping model, RAD model, Evolutionary software models, Component-based development, Formal methods model, Fourth generation techniques, Process technology, Product and process.
- 3. Project Management:** Management spectrum, People, Product, Process, Project, W<sup>5</sup>HH principle.
- 4. Software Process and Project Metrics:** Measures-Metrics-Indicators, Metrics in the process and project domains, Software measurement, Metrics for software quality, Integrating metrics within the software engineering process, Statistical quality control, Metrics for small organizations, Establishing a software metrics program.
- 5. Software Project Planning:** Objectives, Software scope, Resources, Software project estimation, Decomposition techniques, Empirical estimation models, Make/Buy decision, Automated estimation tools.
- 6. Risk Analysis and Management:** Reactive versus proactive risk strategies, Software risks, Risk identification, Risk projection, Risk refinement, Risk mitigation-monitoring-management, Safety risks and hazards, RMMM plan.
- 7. Project Scheduling and Tracking:** Basic concepts, Relationship between people and effort, Defining a task set for the software project, Selecting software Engineering tasks, Refinement of major tasks, Defining a task network, Scheduling, Earned value network, Error tracking, Project plan.
- 8. Software Quality Assurance:** Quality concepts, Quality Movement, Software quality assurance, Software reviews, Formal technical reviews, Formal approaches to SQA, Statistical software quality assurance, Software reliability, Mistake-proofing for software, ISO 9000 quality standards, SQA plan.
- 9. Software Configuration Management:** Introduction, SCM process, Identification of objects in the software configuration, Version control, Change control, Configuration audit, Status reporting, SCM standards.
- 10. System Engineering:** Computer-based systems, System engineering hierarchy, Business process engineering, product engineering, Requirements engineering, System modeling.
- 11. Analysis Concepts and Principles:** Requirement Analysis, Requirement elicitation for software, Analysis principles, Software prototyping, Specification.
- 12. Analysis Modeling:** Introduction, Elements of analysis model, Data modeling,

<p>Functional modeling and information flow, Behavioral modeling, Mechanics of structured analysis, Data dictionary, Other classical analysis methods.</p> <p><b>13. Design Concepts and Principles:</b> Software design and software engineering, Design process, Design principles, Design concepts, Effective modular design, Design heuristics for effective modularity, Design model, Design documentation.</p> <p><b>14. Architectural Design:</b> Software architecture, Data design, Architectural styles, Analyzing alternative architectural designs, Mapping requirements into a software architecture, Transform mapping, Transaction mapping, Refining architectural design.</p> <p><b>15. User Interface Design:</b> The golden rules, User interface design, Task analysis and modeling, Interface design activities, Implementation tools, Design evaluation.</p> <p><b>16. Component-Level Design:</b> Structured programming, Comparison of design notation.</p> <p><b>17. Software Testing Techniques:</b> Software testing fundamentals, Test case design, White-box testing, Basis path testing, Control structure testing, Black-box testing, Testing for specialized environments, architectures and applications.</p> <p><b>18. Software Testing Strategies:</b> Strategic approach to software testing, Strategic issues, Unit testing, Integration testing, Validation testing, System testing, Art of debugging.</p> <p><b>19. Technical Metrics for Software:</b> Software quality, framework for technical software metrics, Metrics for the analysis model, Metrics for the design model, Metrics for source code, Metrics for testing, Metrics for maintenance.</p>
<b>BOOKS</b>
<b>Text Books:</b>
<ol style="list-style-type: none"> <li>1. Roger Pressman, “<i>Software Engineering</i>”, McGraw Hill, Fifth Edition.</li> <li>2. James Peter, “<i>Software Engineering An Engineering Approach</i>”, John Wiley</li> <li>3. Ian Sommerville, “<i>Software Engineering</i>”, Pearson Education.</li> </ol>
<b>References:</b>
<ol style="list-style-type: none"> <li>1. W.S. Jawadekar, “<i>Software Engineering</i>”, TMH.</li> <li>2. Pankaj Jalote, “<i>An Integrated Approach To Software Engineering</i>“, Narosa.</li> <li>3. R. Mall, “<i>Fundamentals of Software Engineering</i>”, Prentice Hall of India</li> <li>4. A. Behferooz &amp; F. J. Hudson, “<i>Software Engineering Fundamentals</i>”, Oxford University Press</li> <li>5. S. L. Pfleeger, “<i>Software Engineering Theory and Practice</i>”, Pearson Education</li> </ol>
<b>TERM WORK</b>
<ol style="list-style-type: none"> <li>4. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.</li> </ol>
<b>ORAL EXAMINATION</b>
An oral examination is to be conducted based on the above syllabus.

**B.E. COMPUTER ENGINEERING**  
**FOURTH YEAR SEMISTER VII**

**SUBJECT: IMAGE PROCESSING**  
**(ELECTIVE-I)**

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

**Theory: 100 Marks**  
**Term Work: 25 Marks**  
**Oral: 25 Marks**

**Objective:** Digital Image Processing is a rapidly evolving field with growing applications in science and engineering. Image processing holds the possibility of developing the ultimate machine that could perform the visual functions of all living beings. There is an abundance of image processing applications that can serve mankind with the available and anticipated technology in the near future.

**Pre-requisites:** Digital Signal Processing, & Computer Graphics

**DETAILED SYLLABUS**

1. **Digital Image Processing Systems:** Introduction, Structure of human eye, Image formation in the human eye, Brightness adaptation and discrimination, Image sensing and acquisition, Storage, Processing, Communication, Display. Image sampling and quantization, Basic relationships between pixels
2. **Image Transforms (Implementation):** Introduction to Fourier transform, DFT and 2-D DFT, Properties of 2-D DFT, FFT, IFFT, Walsh transform, Hadamard transform, Discrete cosine transform, Slant transform, Optimum transform: Karhunen - Loeve (Hotelling) transform.
3. **Image Enhancement in the Spatial Domain:** Gray level transformations, Histogram processing, Arithmetic and logic operations, Spatial filtering: Introduction, Smoothing and sharpening filters
4. **Image Enhancement in the Frequency Domain:** Frequency domain filters: Smoothing and Sharpening filters, Homomorphic filtering
5. **Wavelets and Multiresolution Processing:** Image pyramids, Subband coding, Haar transform, Series expansion, Scaling functions, Wavelet functions, Discrete wavelet transforms in one dimensions, Fast wavelet transform, Wavelet transforms in two dimensions
6. **Image Data Compression:** Fundamentals, Redundancies: Coding, Interpixel, Psycho-visual, Fidelity criteria, Image compression models, Error free compression, Lossy compression, Image compression standards: Binary image and Continuous tone still image compression standards, Video compression standards.
7. **Morphological Image Processing:** Introduction, Dilation, Erosion, Opening, Closing, Hit-or-Miss transformation, Morphological algorithm operations on binary images, Morphological algorithm operations on gray-scale images
8. **Image Segmentation:** Detection of discontinuities, Edge linking and Boundary detection, Thresholding, Region based segmentation
9. **Image Representation and Description:** Representation schemes, Boundary descriptors, Regional descriptors

## **BOOKS**

### **Text Books:**

1. R.C.Gonsales R.E.Woods, “*Digital Image Processing*”, Second Edition, Pearson Education
2. Anil K.Jain, “*Fundamentals of Image Processing*”, PHI

### **References:**

1. William Pratt, “*Digital Image Processing*”, John Wiley
3. Milan Sonka, Vaclav Hlavac, Roger Boyle, “*Image Processing, Analysis, and Machine Vision*” Thomson Learning
2. N Ahmed & K.R. Rao, “*Orthogonal Transforms for Digital Signal Processing*” Springer
3. B. Chanda, D. Dutta Majumder, “*Digital Image Processing and Analysis*”, PHI.

## **TERM WORK**

5. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

## **ORAL EXAMINATION**

An oral examination is to be conducted based on the above syllabus.

**B.E. COMPUTER ENGINEERING**  
**FOURTH YEAR SEMISTER VII**

**SUBJECT: PATTERN RECOGNITION**  
**(ELECTIVE-I)**

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

**Theory: 100 Marks**  
**Term Work: 25 Marks**  
**Oral: 25 Marks**

**Objective:** This course teaches the fundamentals of techniques for classifying multi-dimensional data, to be utilized for problem-solving in a wide variety of applications, such as engineering system design, manufacturing, technical and medical diagnostics, image processing, economics, psychology.

**Pre-requisite:** Linear Algebra, Probability and Statistics

**DETAILED SYLLABUS**

1. **Introduction:** Machine perception, Pattern recognition systems, Design cycle, Learning and Adaptation
2. **Bayesian Decision Theory:** Bayesian decision theory: Continuous features, Minimum-error rate classification, classification, Classifiers, Discriminant functions and Decision surfaces, Normal density, Discriminant functions for normal density, Bayes Decision theory: discrete features
3. **Maximum-Likelihood and Bayesian Parameter Estimation:** Maximum likelihood estimation, Bayesian estimation, Bayesian parameter estimation: Gaussian case and General theory, Problems of dimensionality, Hidden Markov Model
4. **Nonparametric Techniques:** Density estimation, Parzen windows,  $k_n$ -Nearest-Neighbor estimation, Nearest-Neighbor rule, Matrices and Nearest-Neighbor classification
5. **Linear Discriminant Functions:** Linear discriminant functions and decision surfaces, Generalised linear discriminant functions, 2-Category linearly separable case, Minimising the Perceptron criterion function, Relaxation procedure, Non-separable behavior, Minimum squared error procedure, Ho-Kashyap procedures, Multicategory generalizations
6. **Nonmetric Methods:** Decision tree, CART, ID3, C4.5, Gramatical methods, Gramatical interfaces
7. **Algorithm Independent Machine Learning:** Lack of inherent superiority of any classifier, Bias and Variance, Resampling for estimating statistic, Resampling for classifier design, Estimating and comparing classifiers, Combining classifiers
8. **Unsupervised Learning and Clustering:** Mixture densities and Identifiability, Maximum-Likelihood estimations, Application to normal mixtures, Unsupervised Bayesian learning, Data description and clustering criterion function for clustering, Hierarchical clustering
9. **Applications of Pattern Recognition**

**BOOKS**

**Text Books:**

1. Duda, Hart, and Stock, "*Pattern Classification*", John Wiley and Sons.

2. Gose, Johnsonbaugh and Jost, "*Pattern Recognition and Image analysis*", PHI

**TERM WORK**

6. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

**ORAL EXAMINATION**

An oral examination is to be conducted based on the above syllabus.

**B.E. COMPUTER ENGINEERING  
FOURTH YEAR SEMESTER VII**

**SUBJECT: MOBILE COMPUTING  
(ELECTIVE-I)**

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

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

**Objective:** Recent developments in portable devices and high-bandwidth, ubiquitous wireless networks has made mobile computing a reality. Indeed, it is widely predicted that within the next few years' access to Internet services will be primarily from wireless devices, with desktop browsing the exception. Such predictions are based on the huge growth in the wireless phone market and the success of wireless data services. This course will help in understanding fundamental concepts, current developments in mobile communication systems and wireless computer networks.

**Pre-requisites:** Computer Networks.

**DETAILED SYLLABUS**

1. **Introduction:** Applications, A short history of wireless communication
2. **Wireless Transmission:** Frequency for radio transmission, Signals, Antennas, Signal propagation, Multiplexing, Modulation, Spread spectrum, Cellular systems.
3. **Medium Access Control:** Motivation for a specialized MAC: Hidden and Exposed terminals. Near and Far terminals; SDMA, FDMA, TDMA: Fixed TDM, Classical Aloha, Slotted Aloha, Carrier sense multiple access, Demand assigned multiple access, PRMA packet reservation multiple access, Reservation TDMA, Multiple access with collision avoidance, Polling, Inhibit sense multiple access; CDMA: Spread Aloha multiple access.
4. **Telecommunication Systems:** GSM: Mobile services, System architecture, Radio interface, Protocols, Localization And Calling, Handover, Security, New data services; DECT: System architecture, Protocol architecture; TETRA, UMTS and IMT-2000: UMTS Basic architecture, UTRA FDD mode, UTRA TDD mode
5. **Satellite Systems:** History, Applications, Basics: GEO, LEO, MEO; Routing, Localization, Handover, Examples
6. **Broadcast Systems:** Overview, Cyclic repetition of data, Digital audio broadcasting: Multimedia object transfer protocol; Digital video broadcasting
7. **Wireless LAN:** Infrared vs. Radio transmission, Infrastructure and Ad hoc Networks, IEEE 802.11: System architecture, Protocol architecture, Physical layer, Medium access control layer, MAC management, Future development; HIPERLAN: Protocol architecture, Physical layer, Channel access control. Sublayer, Medium access control Sublayer, Information bases And Networking; Bluetooth: User scenarios, Physical layer, MAC layer, Networking. Security, Link management.
8. **Wireless ATM:** Motivation for WATM, Wireless ATM working group, WATM services, Reference model: Example configurations, Generic reference model; Functions: Wireless mobile terminal side, Mobility supporting network side; Radio access layer: Requirements, BRAN; Handover: Handover reference model, Handover requirements, Types of handover, Handover scenarios, Backward handover, Forward handover; Location management: Requirements for location management, Procedures

<p>and Entities; Addressing, Mobile quality of service, Access point control protocol</p> <p>9. <b>Mobile Network Layer:</b> Mobile IP: Goals, assumptions and requirements, Entities and Terminology, IP packet delivery, Agent advertisement and discovery, Registration, Tunneling and Encapsulation , Optimizations, Reverse tunneling, Ipv6; Dynamic host configuration protocol, Ad hoc networks: Routing, Destination sequence distance vector, Dynamic source routing, Hierarchical algorithms, Alternative metrics</p> <p>10. <b>Mobile Transport Layer:</b> Traditional TCP: Congestion control, Slow start, Fast retransmit/fast recovery, Implications on mobility; Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission/time-out freezing, Selective retransmission, Transaction oriented TCP</p> <p>11. <b>Support for Mobility:</b> File systems: Consistency, Examples; World Wide Web: Hypertext transfer protocol, Hypertext markup language, Some approaches that might help wireless access, System architectures; Wireless application protocol: Architecture, Wireless datagram protocol, Wireless transport layer security, Wireless transaction protocol, Wireless session protocol, Wireless application environment, Wireless markup language, WML script, Wireless telephony application, Examples Stacks with Wap, Mobile databases, Mobile agents</p>
<b>BOOKS</b>
<b>Text Books:</b>
<p>1. Jochen Schiller, “<i>Mobile communications</i>”, Addison wisely , Pearson Education</p> <p>2. Wiiliam Stallings, “<i>Wireless Communications and Networks</i>”</p>
<b>References :</b>
<p>1. Rappaort, “<i>Wireless Communications Principals and Practices</i>”</p> <p>2. YI Bing Lin , “<i>Wireless and Mobile Network Architectures</i>”, John Wiley</p> <p>3. P. Nicopolitidis , “<i>Wireless Networks</i>”, John Wiley</p> <p>4. K Pahlavan, P. Krishnamurthy , “<i>Principles of Wireless Networks</i>”</p> <p>5. M. Richharia , “<i>Mobile Satellite Communication: Principles and Trends</i>”, Pearson Education</p>
<b>TERM WORK</b>
<p>7. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.</p>
<b>ORAL EXAMINATION</b>
<p>An oral examination is to be conducted based on the above syllabus.</p>

**B.E. COMPUTER ENGINEERING**  
**FOURTH YEAR SEMISTER VII**

**SUBJECT: EMBEDDED SYSTEMS**  
**(ELECTIVE-I)**

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

**Theory: 100 Marks**  
**Term Work: 25 Marks**  
**Oral: 25 Marks**

**Objective:** Embedded system tools and products are evolving rapidly. This course deals with various approaches to building embedded systems. It introduces unified view of hardware and software. The aim of this course is to make the students aware of the various applications of embedded systems.

**Pre-requisites:** Microprocessors and C Programming

**DETAILED SYLLABUS**

1. **An overview of embedded systems:** Introduction to embedded systems, Categories and requirements of embedded systems, Challenges and issues related to embedded software development, Hardware/Software co-design, Introduction to IC technology, Introduction to design technology
2. **Embedded Software development:** Concepts of concurrency, processes, threads, mutual exclusion and inter-process communication, Models and languages for embedded software, Synchronous approach to embedded system design, Scheduling paradigms, Scheduling algorithms, Introduction to RTOS, Basic design using RTOS
3. **Embedded C Language:** Real time methods, Mixing C and Assembly, Standard I/O functions, Preprocessor directives, Study of C compilers and IDE, Programming the target device
4. **Hardware for embedded systems:** Various interface standards, Various methods of interfacing, Parallel I/O interface, Blind counting synchronization and Gadget Busy waiting, Parallel port interfacing with switches, keypads and display units, Memory and high speed interfacing, Interfacing of data acquisition systems, Interfacing of controllers, Serial communication interface, Implementation of above concepts using C language
5. **Study of ATMEL RISC Processor:** Architecture, Memory, Reset and interrupt , functions, Parallel I/O ports, Timers/Counters, Serial communication, Analog interfaces, Implementation of above concepts using C language, Implementation of above concepts using C language
6. **Case studies and Applications of embedded systems:** Applications to: Communication, Networking, Database, Process Control, Case Studies of: Digital Camera, Network Router, RTLinux

**BOOKS**

**Text Books:**

1. Raj Kamal, "*Embedded Systems*", TMH
2. David E. Simon, "*An Embedded Software Primer* ", Pearson Education
3. Muhammad Ali Mazidi and Janice Gillispie Mazidi, "*The 8051Microcontroller and Embedded Systems*", Pearson Education

**References:**

1. Frank Vahid, Tony Givargis, "*Embedded System Design: A Unified Hardware/Software Introduction*", John Wiley
2. Craig Hollabaugh, "*Embedded Linux*", Pearson Education
3. Daniel Lewis, "*Fundamentals of Embedded Software*", Pearson Education.
4. Barnett, Cox, O’Cull, "*Embedded C Programming and the Atmel AVR* ", Thomson Learning
5. Myke Predko, "*Programming and Customizing the 8051 Microcontroller*", TMH

**TERM WORK**

8. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.
  - Four experiments on micro controller based systems.
  - Four experiments using cross C compiler and Linux.
  - Two experiments using developments tools like logic analyzer, emulator and simulator.
  - Two experiments on case study of advanced embedded systems

**ORAL EXAMINATION**

An oral examination is to be conducted based on the above syllabus.

**B.E. COMPUTER ENGINEERING**  
**FOURTH YEAR SEMISTER VII**

**SUBJECT: COMPUTER SIMULATION AND MODELING**  
**(ELECTIVE-I)**

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

**Theory: 100 Marks**  
**Term Work: 25 Marks**  
**Oral Exam: 25 Marks**

**Objective:** In the last five decades digital computer simulation has developed from infancy to a full-fledged discipline. The field of modeling and simulation is as diverse as of man. The application of simulation continues to expand, both in terms of extent to which simulation is used and the range of applications. This course gives a comprehensive and state of art treatment of all the important aspects of a simulation study, including modeling, simulation software, model verification and validation, input modeling.

**Pre-Requisite:** Probability and Statistics

**DETAILED SYLLABUS**

1. **Introduction to Simulation:** System and System environment, Components of system, Type of systems, Type of models, Steps in simulation study, Advantages and Disadvantages of simulation.
2. **Simulation Examples:** Simulation of Queueing systems, Other examples of simulation.
3. **General Principles:** Concepts of discrete event simulation, List processing,
4. **Simulation Software:** History of simulation software, Desirable software features, General-purpose simulation packages, Object oriented simulation, Trends in simulation software.
5. **Statistical Models in Simulation:** Useful statistical model, Discrete distribution, Continuous distribution, Poisson process, Empirical distribution.
6. **Queueing Models:** Characteristics of Queueing systems, Queueing notations, Long run measures of performance of Queueing systems, Steady state behavior of infinite population Markovian models, Steady state behavior finite population model, Network of Queues.
7. **Random Number Generation:** Properties of random numbers, Generation of pseudo random numbers, Techniques for generating random numbers, Tests for random numbers.
8. **Random Variate Generation:** Inverse transform technique, Convolution method, Acceptance rejection techniques
9. **Input Modeling:** Data Collection, Identifying the Distribution of data, Parameter estimation, Goodness of fit tests, Selection input model without data, Multivariate and Time series input models.
10. **Verification and Validation of Simulation Model:** Model building, Verification, and Validation, Verification of simulation models, Calibration and Validation of models.
11. **Output Analysis for a Single Model:** Types of simulations with respect to output analysis, Stochastic nature of output data, Measure of performance and their estimation, Output analysis of terminating simulators, Output analysis for steady state simulation
12. **Comparison and Evaluation of Alternative System Design:** Comparison of two

<p>system design, Comparison of several system design, Meta modeling, Optimization via simulation.</p> <p>13. <b>Case Studies:</b> Simulation of manufacturing systems, Simulation of computer systems, Simulation of super market, Simulation of pert network</p>
<b>BOOKS</b>
<b>Text Books:</b>
<ol style="list-style-type: none"> <li>1. Jerry Banks, John Carson, Barry Nelson, David Nicol, “<i>Discrete Event System Simulation</i>”</li> <li>2. Averill Law, W. David Kelton, “<i>Simulation Modeling and Analysis</i>”, McGRAW-HILL</li> </ol>
<b>References:</b>
<ol style="list-style-type: none"> <li>1. Geffery Gordon, “<i>System Simulation</i>”, PHI</li> <li>2. Bernard Zeigler, Herbert Praehofer, Tag Gon Kim, “<i>Theory of Modeling and Simulation</i>”, Academic Press</li> <li>3. Narsing Deo, “<i>System Simulation with Digital Computer</i>”, PHI</li> <li>4. Donald W. Body, “<i>System Analysis and Modeling</i>”, Academic Press Harcourt India</li> <li>5. W David Kelton, Randall Sadowski, Deborah Sadowski, “<i>Simulation with Arena</i>”, McGRAW-HILL.</li> </ol>
<b>TERM WORK</b>
<ol style="list-style-type: none"> <li>9. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.</li> </ol>
<b>ORAL EXAMINATION</b>
An oral examination is to be conducted based on the above syllabus.

**B.E. COMPUTER ENGINEERING**  
**FOURTH YEAR SEMISTER VII**

**SUBJECT: ADVANCED COMPUTER NETWORKS**  
**(ELECTIVE-I)**

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

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

**Objectives:** In first part, Advanced technologies like High speed Devices etc. are to be considered. Second part Network programming is to be studied. Not just SOCKETS but also protocols, Drivers, Simulation Programming. In third part we should study Network Design, Protocols designs and analysis considering deterministic and non-deterministic approach. We expect natural thinking from student. For example he should able to consider different constraints and assume suitable data and solve the problems.

**Pre-requisites:** Computer networks

**DETAILED SYLLABUS**

1. **Data Communications:** Business Drivers and Networking Directions : Data communication Past and future.
2. **Understanding the standards and their maker:** Creating standards: players and Process, Current forums, Standard protocols, Layered reference models: The OSIRM, Standard computer architectures.
3. **Introduction to Transmission Technologies:** Hardware selection in the design process.
4. **Optical Networking:** SONET/SDH standards, Dense wavelength division multiplexing (DWDM), Performance and Design considerations.
5. **Physical Layer Protocols and Access Technologies:** Physical Layer Protocols and Interfaces, Accessing the Network, Copper access technologies, Cable Access Technologies, Fiber Access Technologies, Air Access Technologies.
6. **Common Protocols and Interfaces in the LAN environment:** Data link layers protocols, LLC and MAC sub layer protocol, Ethernet, Token Ring, Token Bus and FDDI, Bridge protocols, Switching in the LAN environment.
7. **Frame Relay:** FR specification and design, VoFR: Performance and Design considerations, Advantages and disadvantages of FR.
8. **Common WAN Protocol:** ATM: Many faces of ATM, ATM protocol operation (ATM cell and Transmission), ATM networking basics, Theory of operations, B-ISDN protocol reference model, PHY layer, ATM layer (Protocol model), ATM layer and cell (Definition), Traffic descriptors and parameters, Traffic and Congestion control defined, AAL Protocol model, Traffic contract and QoS, User plane overview, Control plane AAL, Management plane, Sub-DS3 ATM, ATM public services.
9. **Common Protocols and Interfaces in the Upper Layers(TCP/IP):** Background (Routing protocols), TCP/IP suite, Network layer (Internetwork layer), Transport layer, Application layer, Addressing and routing design.
10. **Mature Packet Switched Protocol:** ITU Recommendation X.25, User connectivity, Theory of Operation, Network layer functions, X.75 Internetworking protocol, switched multimegabit data service (SMDS), SMDS and IEEE 802.6, Subscriber Interface and Access protocol, Addressing and Traffic control.

<p>11. <b>Requirements Definition:</b> User requirements, Traffic sizing, Traffic characteristics, Protocols, Time and Delay considerations, Connectivity, Availability, Reliability and Maintainability, Service aspects, Budget constraints,.</p> <p>12. <b>Traffic Engineering and Capacity planning:</b> Background (Throughput calculations) , Traffic engineering basics (Traffic characteristics), Traditional Traffic engineering, Queued data and packet switched traffic modeling, Designing for peaks, Delay or Latency, Availability and reliability, Network performance modeling, Creating the traffic matrix, Capacity planning and Network vision, Design tool, Categories of tools, Classes of design tool, Components of design projects, Types of design projects.</p> <p>13. <b>Technology Comparisons:</b> Circuits-message-packet and cell switching methods, Packet switching service aspects, Generic packet switching network characteristics, Private versus public networking, Public network service selection, Business aspects of Packet-Frame and cell switching services, High speed LAN protocols comparisons, Application performance needs.</p> <p>14. <b>Access Network Design:</b> Network design layers, Access layer design, Access network capacity, network topology and hardware, completing the access network design.</p> <p>15. <b>Backbone Network Design:</b> Backbone requirements, Network capacities, Topologies, Topologies strategies, Tuning the network.</p>
<b>BOOKS</b>
<b>Text Books:</b>
<ol style="list-style-type: none"> <li>1. Darren L Spohn, “Data Network Design”, TMH</li> <li>2. D. Bertsekas, R. Gallager, “Data Networks”, PHI</li> </ol>
<b>References:</b>
<ol style="list-style-type: none"> <li>1. W.R. Stevens, “<i>Unix Network Programming</i>”, Vol.1, Pearson Education</li> <li>2. J.Walrand, P. Varaiya, “High Performance Communication Networks”, Morgan Kaufmann</li> <li>3. Y. Zheng, S. Akhtar, “Networks for Computer Scientists and Engineers”, Oxford</li> <li>4. A.S. Tanenbaum, “Computer Networks”</li> <li>5. Peterson &amp; Davie, “Computer Networks”, Harcourt Asia.</li> <li>6. James D. McCabe , “Practical Computer Analysis and Design”, Harcourt Asia.</li> </ol>
<b>TERM WORK</b>
10. Term work should consist of at least 10 practical experiments and two assignments covering all the topics of the syllabus.
<b>ORAL EXAMINATION</b>
An oral examination is to be conducted based on the above syllabus.

**B.E. COMPUTER ENGINEERING**  
**FOURTH YEAR SEMISTER VII**

**SUBJECT: PROJECT-A**

**Tutorial: 2 Hrs per week**

**Term Work: 25 Marks**

**Oral: 25 Marks**

**GUIDELINES**

1. Project-A exam be conducted by two examiners appointed by university. Students have to give seminar on the project-A for the term work marks. All the students of the class must attend all the seminars. Seminars should be conducted continuously for couple of days.
2. Project-A should preferably contain abstract, existing system, problem definition, scope, proposed system, its design, introduction to programming tools, hardware and software platforms requirements etc.
3. Out of the total projects 35 percent may be allowed as to be industry projects. 65 percent projects must be in-house. Head of dept and senior staff in the department will take decision regarding projects.
4. Every student must prepare hand written synopsis in the normal journal format.
5. Internal guide has to interact at least once in fortnight and maintain the progress and attendance report during both the terms.
6. Two research projects may be allowed only for outstanding students with research aptitude.
7. In case of industry projects, visit by internal guide will be preferred. Industry project will attract demos either at site or in college.
8. Make sure that external project guides are BE graduates.
9. Number of students for a project should be preferably 2 to 4. Only one student should be avoided and up to 6 may be allowed only for exceptional and complex projects.