UNIVERSITY OF MUMBAI

No. UG/241 of 2010

CIRCULAR:-

A reference is invited to the Ordinances, Regulations and syllabi relating to the Bachelor of Engineering (B.E.) degree course **vide** this office Circular No.UG/60 of 2004, dated 24th February, 2004 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 9th December, 2009 has been accepted by the Academic Council at its meeting held on 27th July, 2010 **vide** item No. 4.6 and that, in accordance therewith, the revised syllabus of Fourth Year (Semester VII & VIII) of the B.E. Degree Course in branch of Computer Engineering is as per **Appendix** and that the same has been brought into force with effect from the academic year 2010-2011.

MUMBAI-400 032
12th August, 2010

L. R. Mane
Offg. Registrar

To,

The Principals of the affiliated Colleges in Engineering.

A.C./4.6/27/07/2010

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No. UG/241-A of 2010, MUMBAI-400 032 12th August, 2010

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. N. Jadhav)
Ag. Deputy Registrar
(UG/PG 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 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 Finance and Accounts Officer (2 copies), Record Section (5 copies), Publications Section (5 copies), the Deputy Registrar, Enrolment, Eligibility and Migration Section (3 copies), the Deputy Registrar, Statistical Unit (2 copies), the Deputy Registrar (Accounts Section), Vidyanagari (2 copies), the Deputy Registrar, Affiliation Section (2 copies), the Professor-cum- Director, Institute of Distance and Open Learning Education, (10 copies) the Director University Computer Center (IDE Building), Vidyanagari, (2 copies), the Deputy Registrar, (PRO) the Assistant Registrar, Academic

Enclosure to Item No.4.6
27/07/2010

UNIVERSITY OF MUMBAI

Revised Syllabus for the Final Year (Semester VII & VIII) of the B.E. Degree Course in Computer Engineering

(With effect from the academic year 2010-2011)

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

Sr. No.	Subject	Scheme of Instructions Periods per Week Each Period of 60 Min.		Scheme of Evaluation				
		Theory	Practical	Paper Hours	Paper Marks	TW	Oral/ practical	Total
1.	Digital Signal & Image Processing	4	2	3	100	25	25	150
2.	Robotics and AI	4	2	3	100	25	25	150
3.	Mobile Computing	4	2	3	100	25	25	150
4.	System Security	4	2	3	100	25	25	150
5.	Elective-I	4	2	3	100	25	25	150
6.	Project-I	--	2	--	--	25	25	50
		20	12		500	150	150	800

Elective- I

1) Computer Simulation and Modeling
2) E-commerce
3) Project Management
4) Soft Computing

Evaluation System			
	Theory	03	100
	Oral	---	25
	Term Work	---	25
	Total	---	150

DETAILED SYLLABUS

Module	Content	Lect	Weil -age
Chapter 1	**Discrete Time Signal and System :** Introduction:Signals, Systems and Signal processing, classification of signals, system, LTI system,Freqency domain representation of DTS & Signals. Convolution , Correlation.	06 L	10%
Chapter 2	**Z-Transforms:** Introduction, Z-transforms , Inverse Z-Transforms, properties,System Function , Application of Z-Transform, Unilateral Z-Transform	06L	10%
Chapter 3	**Discrete Fourier Transform:** Introduction , DFT and its properties, FFT algorithms – direct, divide and conquer approach, radix-2 algorithm(Decimation In Time), 2-D DFT & FFT .	05 L	15%
Chapter 4	**Introduction to Digital Image Processing Systems**: Introduction, Brightness adoption and discrimination , Image sampling and quantization, basic relationship between pixels.	02L	5%
Chapter 5	**Image Transforms :** Introduction to Fourier Transform, properties of Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Slant Transform, Optimum Transform: Karhunen- Loeve (Hotelling) Transform , Radon , Comparison of Transform. Introduction to wavelet transform	08L	15%
Chapter 6	**Image Enhancement:** Image Enhancement in the Spatial domain : Spatial domain point operation and Neighbourhood Operation , Gray-Level Transformation,Median Filter , Bit plane slicing , Histogram Processing, Arithmetic and Logic Operation, Spatial filtering: Introduction, smoothing and sharpening filters., Image Enhancement in the frequency domain: Frequency-domain filters: smoothing and sharpening filters, homomorphic filtering	08L	15%
Chapter 7	**Image Restoration and Denoising :** Introduction,Image Degradation, Types of Image Blur ; Classification of image restoration Techniques , Image Restoration Model , Linear and non-Linear image restoration Technique, Blind deconvolution ; Image Denoising , Classification of Noise in	5L	10%

	Image, Trimmed Average Filter, Applications of Image restoration.		
Chapter 8	**Image segmentation:** Detections of discontinuities, edge-linking and boundary detection, thresholding, region-based segmentation, Hough's transform	4L	10%
Chapter 9	**Image Data Compression:** Fundamentals, redundancies: coding, inter-pixel, psychovisual, fidelity criteria, image compression models, error-free compression, lossy Compression	4L	10%
	BOOKS		
1	Introduction to Digital signal processing – John G. Proakis, D.G. Manolakis (Maxwell Macmillan Int.)		
2	R. C.Gonsales R.E.Woods, "Digital Image Processing",Second edition, Pearson ·Education		
	REFERANCE :		
1	S.Salivahanan " Digital Signal processing " TMH		
2	Anil K.jain, 'Fundamentals of Image Processing', PHI		
3	s.Jayaraman , S Esakkirajan , T Veerakumar " Digital Image Processing " Mc Graw Hill.		
4	TAMAL BOSE " Digital Signal and Image Processing " John Wiley & Sons , Inc.		

TERM WORK

1.Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus (15 marks)

A term Work test of 10 marks must be conducted .

List of Practicals

1.	Write Matlab Program for generation and Manipulation of signal.
2	Write Matlab Program for convolution and correlation.
3	Write C/C++ Program for Discrete Fourier Transform.
4	Write Matlab Program for Image negative , Gray level Slicing

5	Write Matlab Program for Dynamic range compression &Bit plane slicing
6	Write Matlab Program for Histogram Processing
7	Write Matlab Program for Image smoothing.
8	Write Matlab Program for Image sharpening.
9	Write Matlab Program for Edge detection.
10	Write Matlab Program for Trimmed Average Filter.
11	Write Matlab Program for lossless Image Compression.
12	Write Matlab Program for lossy Image Compression.

Robotics and Artificial Intelligence (Abbreviated as RAI)

CLASS B.E. (COMPUTER ENGINEERING) SEMESTER VII

HOURS PER WEEK	LECTURES	:	04	
	TUTORIALS	:	--	
	PRACTICALS	:	02	
			HOURS	**MARKS**
EVALUATION SYSTEM:	THEORY		3	100
	PRACTICAL		--	
	ORAL		--	25
	TERM WORK		--	25

Prerequisite: : Data Structures, Analysis of Algorithms.

Objective: This course will introduce the basic ideas and techniques underlying intelligent robotics. Students will be familiar with terminologies used in Robotic Systems and understand Robotic Arm movements, Commonly used sensing techniques, Basic understanding about Intelligent agent, knowledge representation and reasoning.

Module	Contents	Hrs	Text book referred
1	**Introduction to Robotics:** Robot Classification, Robot Specification, notation	3	Ch-1 Schilling
2	Direct and Inverse Kinematics : Co-ordinates Frames, Rotations ,Homogeneous Coordinates, Arm Equation of four Axis SCARA Robot ,TCV, Inverse Kinematics of Four Axis SCARA Robot.	8	Ch-2 and Ch-3 Schilling
3	**Intelligent Agents:** Concept of Rational Agent, Structure of Intelligent agents, Agent Environments	4	Ch-2 Russel-Norvig
4	**Common Sensing Techniques for reactive robots:** Overview, Logical sensors, Attributes of a sensor, Proprioceptive Sensors, GPS, Proximity Sensors, Sonar ,Infrared ,CCD Cameras, Stereo camera pairs, Light stripers, Laser.	2	Ch-6 Robin Murphy
5	**Problem Solving**: Solving problems by searching, Problem Formulation,Search Strategies, Uninformed Search Techniques- DFS, BFS, Uniform cost search, Iterative Deepening, Comparing Different Techniques, Informed search methods – Best First Search , heuristic Functions, Hill Climbing, A*,IDA*. Crypt Arithmetic, Backtracking for CSP.	7	Ch-3 and Ch-4 Russel Norvig
6	**Knowledge and Reasoning**: A knowledge Based Agent, WUMPUS WORLD Environment,	4	Ch-6 ,7 and 8,9

	Propositional Logic, First Order Predicate Logic Syntax and Semantics, PROLOG , Unification, Forward and backward chaining, Resolution., General Ontology.		**Russel - Norvig**
7	**Uncertain Knowledge and Reasoning**: Uncertainty, Representing knowledge in an Uncertain Domain, Belief Networks, Simple Inference in Belief Networks	4	**Ch-14,15 Russel Norvig**
8	**Learning:** Learning from Observations,General Model of Learning Agents, Inductive learning, learning Decision Trees	3	**Ch-18 Russel-Norvig**
9	**Planning:** A Simple Planning Agent, Planning in Situation calculus, Basic representation for planning, A Partial Order Planning example , A partial order planning algorithm , Knowledge engineering for planning , Blocks world Shaky's world **Metric Path Planning:** Configuration Space , Representation , Graph based planners	3	**Ch – 11 Russel Norvig** **Ch – 10 Robin Murphy**
10	**Introduction and overview of Robotics paradigms**: Reactive Paradigms **Designing a Reactive Implementation:** Overview, Behaviors as objects in OOP, Steps in Designing a Reactive Behavioral System, Case Study: Unmanned Ground Robotics Competition, Assemblages of Behaviors	4	**Ch – 4 , 5 Robin Murphy**

Text Book:

1. Stuart Russell and Peter Norvig. Artificial Intelligence: A Modern Approach. 2nd Edition, Pearson Publication.
2. Robin R Murphy. Introduction to AI Robotics ISBN-81-203-2458-7 PHI Publication.
3. Robert J. Schilling, Fundamentals of Robotics: Analysis and Control, PHI Publication.

Reference Books:

1. George Lugar, "AI-Structures and Strategies for Complex Problem Solving", 4/e, 2002, Pearson Educations.
2. Fu, Gonzales and Lee, Robotics, McGraw Hill
3. Patrick H. Winston, Artificial Intelligence, 3rd edition, Pearson.
4. Nils J. Nilsson, Principles of Artificial Intelligence, Narosa Publication.
5. Dan W. Patterson, Introduction to Artificial Intelligence and Expert System, PHI.
6. Efraim Turban Jay E.Aronson, "Decision Support Systems and Intelligent Systems" PHI.
7. Elaine Rich, Kevin Knight, Artificial Intelligence, 2nd Edition, TataMcGraw-Hill Publication.

TERMWORK

Term work should consist of at least 8 experiments, TWO assignments and at least ONE written test based on above mentioned syllabus. Practical Experiments must be implemented in Prolog/ Lisp and C++.

Distribution of marks for term work shall be as follows:

1. Laboratory work (Experiments and Journal) 15 Marks
2. 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.

ORAL

Oral / Practical Examination should be of 25 Marks must be based on the syllabus

Suggested list of experiments but not restricted to

1. Development of Composite Rotation Matrix
2. Develop an arm matrix for Adept-1 SCARA robot.
3. Inverse Kinematics for Adept-1 SCARA Robot.
4. Eight Queen Problem
5. Graph Structures and Paths
6. Wumpus world problem
7. Water Jug Problem
8. Knight's Tour
9. Crypto Arithmetic Problems
10. Implementing Searching algorithm

University of Mumbai			
Class : B.E.	Branch : Computer Engineering	Semester : VII	
Subject :: MOBILE COMPUTING (Abbreviated as MC)			
Periods per Week(Each 60 Min)	Lecture	04	
	Practical	02	
	Tutorial	-----	
		Hours	Marks
Evaluation System	Theory	03	100

	Oral	---	25
	Term Work	---	25
	Total	---	150

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.

	Topic to be covered	Hrs
1	**Introduction**: Short history of wireless communication, Applications, Frequency for radio transmission, Signals, Antennas, Signal propagation, Multiplexing, Modulation, Spread Spectrum, Cellular systems (DSSS & FHSS). **Motivation for a specialized MAC**: Hidden and Exposed terminals. Near and Far terminals; Multiple access with collision avoidance, Polling, Inhibit sense multiple access; CDMA: Spread Aloha multiple access	05
2.	**Telecommunication Systems I:** PCS Architecture, **Cellular Telephony**: Advanced Mobile Phone Service(AMPS); Global System for Mobile Communication (GSM); EIA/TIA IS-136 Digital Cellular System; EIA/TIA IS-95 Digital Cellular System, **Cordless Telephony and Low-Tier PCS**: Cordless Telephone, Second Generation (CT2); Digital European Cordless Telephone (DECT); UMTS, Personal Handy Phone System (PHS); Personal Access Communications System (PACS) ; Unlicensed Systems. 3G Wireless systems. **Mobility Management**: Handoff (Inter-BS, Intersystem), Roaming Management, Handoff Management - Detection and Assignment: Strategies for Handoff Detection, Channel Assignment, Handoff Management – Radio Link Transfer: Hard and Soft Handoff, Network Signaling : Signaling System No.7, Interconnection and Message Routing, Mobility Management.	05
3.	**Telecommunication Systems II: GSM:** Mobile services, System Architecture, Radio interface, Protocols, Localization and Calling, Handover, Security, New data services, GSM Short Message Service, VOIP service for Mobile Networks : GSM on the Net, The iGSM Wireless VoIP Solution, The H.323 Network, iGSM Architecture, iGSM Procedures and Message Flows: Registration, Deregistration, Call Delivery to the IP Network: Implementation Issues; International Roaming for GSM, GSM Operations, Administration, & Maintenance, Mobile Number Portability. **GPRS**: Functional Groups, GPRS Architecture, GPRS Network Nodes:18.3.1 Mobile Station; Base Station System; GPRS Support Node; HLR and VLR, GPRS Interfaces: Um Interface; EDGE;Gb Interface; Gn and Gp Interfaces; Gs Interface; Gi Interface, GPRS Procedures. **Third-Generation Systems** :W-CDMA and cdma2000; Improvements on Core Network; Quality of Service in 3G, Wireless Local Loop: Wireless Local Loop Architecture; Deployment Issues; TR-45 Service Description; Wireless Local Loop Technologies. TETRA, UMTS, and IMT-2000: UMTS Basic Architecture, UTRA FDD mode, UTRA TDD mode.	09
4	**Satellite Systems:** History, Applications, Basics: GEO, LEO, MEO; Routing, Localization, Handover, Examples.	01
5	**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	08

	and Networking. **Bluetooth:** User Scenarios, Physical Layer, MAC layer, Networking, Security, link management, Enterprise PCS: Office Level , Local Area Wireless: An Example of WPBX, Capacity Planning for WPBX, IrDA ZigBee, RFID, Wireless Broadband (WiMax)	
6	**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 .	05
7.	**Mobile Network and Transport Layer:** 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 MANET: Routing, Destination sequence distance vector, Dynamic source routing, Hierarchical algorithms, Alternative metrics. Mobile Transport Layer: 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. **Wireless Sensor Networks:** Applications, Mobile Internet Connectivity, and Personal Area Network	06
8.	**Support for Mobility:** **Mobile Computing Architecture:** Three Tier Architecture for mobile computing, Design considerations, Mobile Computing through Internet. **File systems:** Consistency, Examples; World Wide Web: Hypertext transfer protocol, Mobile File System, Mobile databases. **Language Support:** Hypertext markup language (XHTML)-MP, Wireless markup language; WML script,Mobile Application Languages-XML, Voice XML. Java, J2ME and JavaCard. **Wireless application protocol:** Architecture, Wireless datagram protocol, Wireless transport layer security, Wireless transaction protocol, Wireless session protocol, WAP UAProf and Caching , User Agent Profile , Caching Model , Wireless Bearers for WAP , WAP Developer Toolkits and application environment, Wireless telephony application, Mobile agents, Application Server, Gateways, Portals, Service Discovery, Device Management **Wireless devices and their Operating System :** PalmOS; Windows CE; EPOC; Symbian OS; Linux for Mobile Devices. Mobile Agents **Synchronization :** Synchronization Software for Mobile Devices , Synchronization Protocols, SyncML-Synchronization Language for Mobile Computing, Sync4J (Funambol) Synchronized Multimedia Markup Language (SMIL), Security, m-commerce. **Threats and Security Issues in Mobile Computing:**	09

Books

Text Books:

1. Jochen Schiller, *"Mobile communications"*, Addison wisely, Pearson Education

2. Wireless and Mobile Network Architecture : Yi Bang Lin and Imrich Chlamtech (Wiley).
3. Mobile Computing by RajKamal (Oxford).

References :

1. Rappaort, *"Wireless Communications Principals and Practices'*
2. YI Bing Lin, *"Wireless and Mobile Network Architectures'*, John Wiley
3. P. Nicopolitidis, *"Wireless Networks'*, John Wiley
4. K. Pahlavan, P. Krishnamurthy, *"Principles of Wireless Networks"*
5. Introduction to Wireless Telecommunication System and Networks by Mallett (Cengage Learning)
6. Uwe Hansmann, Lothar Merk, Martin S. Nicklous, Thomas Stober, " *Principles of Mobile Computing*, Springer

Term work

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

Suggested Laboratory Exercises of Mobile Computing:

1. Setup & Configuration of Wireless Access Point (AP)
2. Study of WLAN : Ad Hoc & Infrastructure Mode
3. Study of Bluetooth Protocol and Applications
4. GSM modem study (Nokia 30) and SMS client-server application
5. Implementation of Mobile Network using Network Simulator (NS2)
6. Mobile Internet and WML
7. J2ME Program for Mobile Node Discovery
8. Mobile protocol study using omnet++
9. Design and Program Income Tax and Loan EMI Calculator for Mobile Phones.
10. Wireless Network Security : kismet and Netstumbler

Distribution of marks for term work shall be as follows:
Laboratory work (Experiments and Journal) 15 Marks
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.

Orals

Oral examination is to be conducted based on the above syllabus

University of Mumbai		
Class: B.E .	**Branch** : Computer Engineering	**Semester** : VII
Subject :: SYSTEM SECURITY (Abbreviated as SS)		
Periods per Week(Each 60 Min)	Lecture	04
	Practical	02

Evaluation System		Hours	Marks
	Tutorial	-----	
	Theory	03	100
	Oral	---	25
	Term Work	---	25
	Total	---	150

Module	Content	Hours
Chapter 1	**Introduction to Information Security:** Security Goals	03
Chapter 2	**Cryptography:** i. Crypto Basic, Classic Cryptography ii. Symmetric Key Cryptography: Stream Ciphers, A5/1, RC4, Block Ciphers, Feistel Cipher, DES, Triple DES, AES iii. Public Key Cryptography: Kanpsack, RSA, Defiie-Hellman, use of public key crypto- Signature and Non-repudiation, .Confidentiality and Non-repudiation, Public Key Infrastructure. iv. Hash Function: The Birthday Problem, MD5, SHA-1, Tiger Hash, Use of Hash Function	10
Chapter 3	**Access control - Authentication and Authorization:** i. Authentication Methods, Passwords, Biometric, Single –sign on, Authentication Protocol, Kerberos. ii. Access control Matrix, ACLs, Multiple level security model, Multilateral security, Covert channel, CAPTCHA	08
Chapter 4	**Software security:** i. Software Flaws, Buffer Overflow, Incomplete Mediation, Race conditions ii. Malware, Salami attack, Linearization Attacks, Trusting Software iii. Software reverse engineering, Digital Rights management. iv. Operating System and Security	10
Chapter 5	**Network Security:** i. Network security basics ii. TCP/IP Model and Port No., Protocol flaws iii. Enterprise wide network Design and Vulnerabilities. iv. Reconnaissance of network v. Packet sniffing, Session Hijacking, ARP Spoofing vi. Web site and web server vulnerabilities vii. Denial of Service viii. SSL and IPSec protocol ix. Firewall. Intrusion Detection System, and Honey pots	15

Text Books

1) Cryptography and Network Security by Behrouz A. Forouzan, TATA McGraw hill.

2) Security in Computing by Charles P. Pfleeger , Pearson Education

Reference Books

1) Information security Principles and Practice by Mark Stamp, Wiley publication
2) Cryptography and Network Security, William Stalling, Prentice hall
3) Principles of Information Security, Michael E., cengage learning
4) Information Systems Security, Nina Godbole, Wiley
5) Network security bible 2nd edition, Eric Cole

TERM WORK

i. Term work should consist of at least 8 practical experiments and two assignments covering the topics of the syllabus.

ii.A term Work test of 10 marks must be conducted.

Distribution of marks for term work shall be as follows:

Laboratory work (Experiments and Journal) 15 Marks

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.

ORAL

Oral / Practical Examination must be based upon the syllabus of 25 marks.

University of Mumbai			
Class: B.E.	Branch: Computer Engineering	Semester: VII	
Subject: COMPUTER SIMULATION AND MODELING(**Abbreviated CSM**)			
Periods per Week (each 60 min)	Lecture Practical Tutorial	04 02 --	
		Hours	Marks
Evaluation System	Theory	03	100
	Oral	--	25
	Term Work	--	25
	Total	03	150

Objectives of the course: The objective of this course is to teach students methods for modeling of systems using discrete event simulation. Emphasis of the course will be on modeling and on the use of simulation software. The students are expected to understand the importance of simulation in IT sector, manufacturing, telecommunication, and service industries etc. By the end of the course students will be able to formulate simulation model for a given problem, implement the model in software and perform simulation analysis of the system.

Pre-requisites: Probability and Statistics

1. **Introduction to Simulation and Modeling:** Simulation – introduction, appropriate and not appropriate, advantages and disadvantage, application areas, history of simulation software, an evaluation and selection technique for simulation software, general – purpose simulation packages. System and system environment, components of system, type of systems, model of a system, types of models and steps in simulation study.

2. **Manual Simulation of Systems:** Simulation of Queuing Systems such as single channel and multi channel queue, lead time demand, inventory system, reliability problem, time-shared computer model, job-shop model.

3. **Discrete Event Formalisms:** Concepts of discrete event simulation, model components, a discrete event system simulation, simulation world views or formalisms, simulation of single channel queue, multi channel queue, inventory system and dump truck problem using event scheduling approach.

4. **Statistical Models in Simulation:** Overview of probability and statistics, useful statistical model, discrete distribution, continuous distribution, empirical distribution and Poisson process.

5. **Queueing Models:** Characteristics of queueing systems, queueing notations, long run measures of performance of queueing systems, Steady state behavior of Markovian models (M/G/1, M/M/1, M/M/c) overview of finite capacity and finite calling population models, Network of Queues.

6. **Random Number Generation:** Properties of random numbers, generation of true and pseudo random numbers, techniques for generating random numbers, hypothesis testing, various tests for uniformity (Kolmogorov-Smirnov and chi-Square) and independence (runs, autocorrelation, gap, poker).

7. **Random Variate Generation:** Introduction, different techniques to generate random variate:- inverse transform technique, direct transformation technique, convolution method and acceptance rejection techniques.

8. **Input Modeling:** Introduction, steps to build a useful model of input data, data collection, identifying the distribution with data, parameter estimation, suggested estimators, goodness of fit tests, selection input model without data, covariance and correlation, multivariate and time series input models.

9. **Verification and Validation of Simulation Model:** Introduction, model building, verification of simulation models, calibration and validation of models:- validation process, face validity, validation of model, validating input-output transformation, t-test, power of test, input output validation using historical data and Turing test.

10. **Output Analysis:** 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.

11. **Case Studies:** Simulation of manufacturing systems, Simulation of Material Handling system, Simulation of computer systems, Simulation of super market, Cobweb model, and any service sectors.

Text Book:

Banks J., Carson J. S., Nelson B. L., and Nicol D. M., "Discrete Event System Simulation", 3rd edition, Pearson Education, 2001.

Reference Books:

1. Gordon Geoffrey, "System Simulation", 2nd edition, PHI, 1978.
2. Law A. M., and Kelton, W. D., "Simulation Modeling and Analysis", 3rd edition, McGraw-Hill, 2000.
3. Narsing Deo, "System Simulation with Digital Computer", PHI.
4. Frank L. Severance, "System Modeling and Simulation"
5. Trivedi K. S., "Probability and Statistics with Reliability, Queueing, and Computer Science Applications", PHI, 1982.
6. Wadsworth G. P., and Bryan, J. G., "Introduction to Probability and Random Variables", McGraw-Hill, 1960.
7. Donald W. Body, "System Analysis and Modeling", Academic Press Harcourt India.
8. Bernard, "Theory Of Modeling and Simulation"
9. Levin & Ruben, "Statistics for Management".
10. Aczel & Sounderpandian, "Business Statistics".

Term Work:

Term work shall consist of at least 10 experiments covering all topics and one written test. Distribution of marks for term work shall be as follows:

Laboratory work (Experiments and Journal)	15 Marks
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.

Suggested Experiment list

The experiments should be implemented using Excel, simulation language like GPSS and/or any simulation packages. Case studies from the reference book can be used for experiment.

1. Single Server System
2. Multi serve system like Able – Baker
3. (M, N) - Inventory System
4. Dump Truck Problem
5. Job-Shop Model
6. Manufacturing System
7. Cafeteria
8. Telecommunication System
9. Uniformity Testing
10. Independence Testing

Class: B.E.	Branch : Computer Engineering	Semester : VII	
Subject: E-Commerce (Abbreviated as e-com.) Elective-I			
Periods per Week (Each 60 Min)	Lecture	04	
	Practical	02	
	Tutorial	-----	
Evaluation System		Hours	Marks
	Theory	03	100
	Oral	--	25
	Term Work	--	25
	Total	--	150

Objectives of the course:

- To understand Technical aspect of E-commerce and E-Business
- To describe the process of E-commerce and E-business
- To understand Infrastructure design issues of E-commerce

Contents of the Course

Part 1: E-commerce

1. **Introduction:** Electronic commerce and Physical Commerce, different type of e-commerce, some e-commerce scenario, Advantages of e-commerce
2. **Basic technologies of Ecommerce:** Client side Programming, Server Side Programming, Database connectivity, session tracking techniques.
3. **Advance technologies of E-commerce:** Mobile Agent, WAP, XML, Data Mining, Rich Internet Application, Web 2.0, REST Web Services, Web Mashup, Working of Search Engines, Internet Security.
4. **Internet Payment System:** Characteristics of payment system, SET Protocol for credit card payment, E-cash, E-check, Micropayment system
5. **E-commerce strategies:** Strategies for marketing, Sales and Promotions, Strategies for Purchasing and support activities, Strategies for Web Auctions, Virtual Communities, and web portals
6. **E-Business -Introduction:** E-Business vs E-commerce,, Characteristics of e-Business, e-Business role and their challenges, e-business Requirements, impacts of e-business
7. **E-business strategies:** Strategic positioning, Levels of e-business strategies, Strategic planning process, Strategic alignment, the consequences of e-Business, Success factors for implementation of e-business strategies: Business models, Business process and collaborations
8. **Integration of Application:** Approaches to Middleware, RPC and RMI, Enterprise Application Integration, e-business Integration, loosely Coupled e-Business solutions for integration, Service Oriented Architecture, EAI and web Services,WS-security.
9. **E-commerce Infrastructure** Cluster of Servers, Virtualization Techniques, Cloud computing, Server consolidation using cloud, Introduction to Hadoop, HDFS, Google Apps engine

TEXT BOOKS:

1. E-Commerce Fundamentals and application (Henry Chan) Wiley publication
2. Electronics Commerce (Gary.Schneider) Thomson Course technology
3. E-Business Organizational and technical foundation (Michael P) Wiley Publication

REFERENCES:

1. E- Commerce Strategies, Technology and applications (David) Tata McGrawHill
2. Introduction to E-commerce (Jeffrey) Tata- Mcgrawhill
3. E-Business and Commerce- Strategic Thinking and Practice (Brahm) biztantra
4. Using Google Aps engine (Severance) O'reilly
5. Hadoop : The Definitive Guide (White) O'reilly

Term Work

Term work shall consist of at least 6 assignments/programming assignments and one written test.

Marks

1. Laboratory work (Experiments and Journal) 15 Marks
2. 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.

Suggested List of Experiments

Exp 1: All experiments should be part of final e-commerce portal development

1. Home page design
2. Form validation (Ajax enabled)
3. Catalog design and Search techniques (Web mining , and Ajax enabled)
4. Access control mechanism (session management)
5. Creating Web Site to integrate at least five REST web Services (Web Mashups)
6. Server side using Web Services

Exp 2: Creating Hadoop clusters on Ubuntu

Project Management (Elective-II)				
CLASS B.E. (Computer Engineering) Elective			SEMESTER VIII	
HOURS PER WEEK	LECTURES	:	04	
	TUTORIALS	:	--	
	PRACTICALS	:	02	
			HOURS	**MARKS**
EVALUATION SYSTEM:	THEORY		3	100
	ORAL		-	25
	TERM WORK		-	25

Objectives of the course:

- To understand Much of the unique knowledge needed to manage projects.

- To understand the Life cycle and phases of project management.
- To understand knowledge areas and tools-techniques for efficient project management focusing IT projects.

Contents of the Course

1. Introduction to Project Management
   - 1.1 What is project
   - 1.2 The triple constraint
   - 1.3 What is project management
     - 1.3.1 Stakeholders
     - 1.3.2 Project Management Knowledge Area
     - 1.3.3 Project Management tools and techniques
   - 1.4 Role of a Project Manager
     - 1.4.1 Project Manager's job description
     - 1.4.2 Suggested Skills for Project Manager
     - 1.4.3 Importance of people and leadership skills

2. Project Management and IT context
   - 2.1 Organizational Structure
   - 2.2 Project Life Cycle and Phases
   - 2.3 Nature of IT projects
   - 2.4 Characteristics of IT project Team members
   - 2.5 Trends affecting IT Project Management
     - 2.5.1 Globalization
     - 2.5.2 Outsourcing
     - 2.5.3 Virtual Teams

3. Project Integration Management
   - 3.1 Project Selection
   - 3.1 Developing Project Charter
   - 3.3 Developing Project Management Plan

4. Project Scope Management
   - 4.1 Collecting Requirements
   - 4.2 Defining Scope
   - 4.3 Creating Work Breakdown Structure
   - 4.4 Controlling Scope

5. Project Time Management
   - 5.1 Defining and Sequencing Project Activities and Dependencies
   - 5.2 Developing Schedule
     - 5.2.1 Gantt Chart
     - 5.2.2 Critical Path Method
     - 5.2.3 Incorporating Project Uncertainty - PERT
     - 5.2.4 Critical Chain Method
   - 5.3 Resource loading and Resource Leveling
   - 5.4 Schedule Controlling

6. Project Cost Management
   - 6.1 Estimating Techniques
   - 6.2 Earned Value Management

7. Project Quality Management
   7.1 Planning Quality
   7.2 Performing Quality Assurance
   7.3 Quality Control – Tools and Techniques

8. Project Resource Management
   8.1 Development of Human Resource Plan
   8.2 Project Organizational Chart and Responsibility Assignment
   8.3 Multi project Scheduling and Resource Allocation

9. Project Communication Management
   9.1 Identifying Stakeholders
   9.2 Planning Communication

10. Project Risk Management
    10.1 Identifying Risks ;Common Sources of Risk in IT Projects
    10.2 Qualitative Risk Analysis : Probability and Impact Matrix
    10.3 Quantitative Risk Analysis : Decision Trees
    10.4 Planning Risk Response

11. Project Procurement Management
    11.1 Planning and conducting procurement

TEXT BOOKS:

1. PMP Project Management Professional Study Guide, Third Edition by Joseph Phillips
2. Project Management – Core Text Book ; Samuel J. Mantel et.al. With M.R. Gopalan; Wiley
India Edition.
3. Project Management Handbook by Uddesh Kohli, K. K. Chitkara

Term Work

Term work shall consist of at least 6 assignments/1 project which will contain detailed documentation of each of the project management phases and one written test.

Marks

1. Laboratory work (Experiments and Journal) 15 Marks
2. 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.

University of Mumbai			
Class : B.E .	**Branch** : Computer Engineering		**Semester** : VII
Subject : SOFT COMPUTING (Abbreviated as SC) (Elective-I)			
Periods per Week(Each 60 Min)	Lecture	04	
	Practical	02	
	Tutorial	-----	
		Hours	Marks
Evaluation System	Theory	03	100
	Oral	---	25
	Term Work	---	25
	Total	03	150

AIM :
To introduce the techniques of soft computing and adaptive neuro-fuzzy inferencing systems which differ from conventional AI and computing in terms of its tolerance to imprecision and uncertainty.

Objectives :

- To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience
- To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems
- To provide the mathematical background for carrying out the optimization associated with neural network learning
- To familiarize with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations
- To introduce case studies utilizing the above and illustrate the intelligent behavior of programs based on soft computing

DETAILED SYLLABUS

Sr. No	Topics	Hours
1.	FUZZY SET THEORY: Introduction to Neuro – Fuzzy and Soft Computing – Fuzzy Sets – Basic Definition and Terminology – Set-theoretic Operations – Member Function Formulation and Parameterization – Fuzzy Rules and Fuzzy Reasoning – Extension Principle and Fuzzy Relations – Fuzzy If-Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.	10

2.	OPTIMIZATION Derivative-based Optimization – Descent Methods – The Method of Steepest Descent – Classical Newton's Method – Step Size Determination – Derivative-free Optimization – Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search	08
3.	NEURAL NETWORKS Supervised Learning Neural Networks – Perceptrons - Adaline – Backpropagation Mutilayer Perceptrons – Radial Basis Function Networks – Unsupervised Learning Neural Networks – Competitive Learning Networks – Kohonen Self-Organizing Networks – Learning Vector Quantization – Hebbian Learning.	10
4.	NEURO FUZZY MODELING Adaptive Neuro-Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – Learning Methods that Cross-fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling – Framework Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.	09
5.	APPLICATIONS OF COMPUTATIONAL INTELLIGENCE Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction – Soft Computing for Color Recipe Prediction.	08

TEXT BOOK

1. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson Education 2004.

REFERENCES

1. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 1997.
2. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.
3. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.
4. R.Eberhart, P.Simpson and R.Dobbins, "Computational Intelligence - PC Tools", AP Professional, Boston, 1996.

TERM WORK

iii.Term work should consist of at least 8 practical experiments and two assignments covering the topics of the syllabus.

iv.A term Work test of 10 marks must be conducted.

Distribution of marks for term work shall be as follows:

Laboratory work (Experiments and Journal)	15 Marks
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.

Oral Examination must be based upon the syllabus of 25 marks.

PROJECT – I

CLASS B.E. (COMPUTER ENGINEERING) SEMESTER VII

HOURS PER WEEK	LECTURES	:	--	
	TUTORIALS	:	--	
	PRACTICALS	:	02	
			HOURS	MARKS
EVALUATION SYSTEM:	THEORY		--	--
	PRACTICAL		--	--
	ORAL		--	25
	TERM WORK		--	25

Objective: The Project work enables students to develop further skills and knowledge gained during the programme by applying them to the analysis of a specific problem or issue, via a substantial piece of work carried out over an extended period. For students to demonstrate proficiency in the design of a research project, application of appropriate research methods, collection and analysis of data and presentation of results.

Guidelines:

1. **Project Topic:**
   - To proceed with the project work it is very important to select a right topic. Project can be undertaken on any subject addressing IT programme. Research and development projects on problems of practical and theoretical interest should be encouraged.
   - Project work must be carried out by the group of at least two students and maximum three and must be original.
   - Students can certainly take ideas from anywhere, but be sure that they should evolve them in the unique way to suit their project requirements.
   - The project work can be undertaken in a research institute or organization/company/any business establishment.
   - Student must consult internal guide along with external guide (if any) in selection of topic. Out of the total projects 35 percent may be allowed as to be industry projects, 65 percent projects must be in house.
   - Head of department and senior staff in the department will take decision regarding projects.
   - Student has to submit weekly progress report to the internal guide and where as internal guide has to keep track on the progress of the project and also has to maintain attendance report. This progress report can be used for awarding term work marks.
   - In case of industry projects, visit by internal guide will be preferred.
   - Make sure that external project guides are BE graduates.

2. **Project Report Format:**
   At the end of semester a project report should preferably contain at least following details:-
   - Abstract
   - Introduction
   - Aims and objectives
   - Literature Surveyed
   - Existing system (if any)
   - Problem Statement

- Scope
- Proposed System
- Methodology (your approach to solve the problem)
- Analysis
- Details of Hardware & Software
- Design details
- Implementation Plan for next semester

3. **Term Work:**
Distribution of marks for term work shall be as follows:

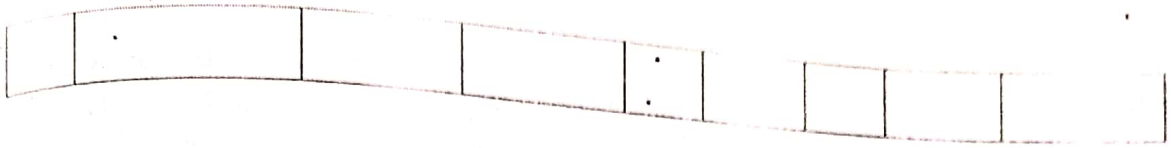
1. Project Report — 15 Marks
2. Term End Presentation (Internal) — 10 Marks

The final certification and acceptance of TW ensures the satisfactory performance on the above three aspects.

4. **Final Assessment:**
Project – I examination should be conducted by two examiners appointed by university. Students have to give demonstration and seminar on the Project – I.

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

Sr. No.	Subject	Scheme of Instructions Periods per Week Each Period of 60 Min.		Scheme of Evaluation				
				Paper		TW	Oral/ practical	Total
		Theory	Practical	Hours	Marks			
1.	Digital Signal & Image Processing	4	2	3	100	25	25	150
2.	Robotics and AI	4	2	3	100	25	25	150
3.	Mobile Computing	4	2	3	100	25	25	150
4.	System Security	4	2	3	100	25	25	150
5.	Elective-I	4	2	3	100	25	25	150
6.	Project-I	--	2	--	--	25	25	50
		20	12		500	150	150	800



Elective- I

1) Computer Simulation and Modeling
2) E-commerce
3) Project Management
4) Soft Computing

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

Semester-VIII

Sr. No.	Subject	Scheme of Instructions Periods per Week Each Period of 60 Min.		Scheme of Evaluation				
				Paper		TW	Oral/practical	Total
		Theory	Practical	Hours	Marks			
1.	Distributed Computing	4	2	3	100	25	25	150
2.	Multimedia System Design	4	2	3	100	25	25	150
3.	Software Architecture	4	2	3	100	25	25	150
4.	Elective-II	4	2	3	100	25	25	150
5.	Project-II	--	4	--	--	50	50	100
		16	12		400	150	150	700

Elective-II

1) Human Computing Interaction
2) Advanced Internet Technology
3) Computer Vision
4) Embedded System

University of Mumbai			
Class: B. E.	**Branch** : Computer Engineering	**Semester** : VIII	
Subject :: Distributed System (Abbreviated as DS)			
Periods per Week(Each 60 Min)	Lecture	04	
	Practical	02	
	Tutorial	-----	
		Hours	Marks
Evaluation System	Theory	03	100
	Oral	--	25
	Term Work	--	25
	Total	03	150

Objective: This course aims to build concepts regarding the fundamental principles of distributed systems. The design issues and distributed system concepts are covered

Pre-requites: Operating Systems and Computer network

DETAILED SYLLABUS

1. **Fundamentals:** Distributed computing, system model, distributed operating system, designing operating system, Introduction to DCE

2. **Message Passing :** Desirable features message passing system, Issues in message passing, synchronization, buffering, multidatagram messages , Encoding and decoding of message data, Process addressing, Failure handling, Group communication.

3. **Remote procedure call:** RPC model, Transparency of RPC, implementing RPC mechanism, Stub generation, Marshaling arguments and Results, Server Management, Parameter-passing Semantics , call Semantics, Communication protocols for RPCs, Complicated RPC Client server binding, Exception Handling , Security, special types of RPCs, RPCs in Heterogeneous Environments, Lightweight RPC, Optimizations for better performance.

4. **Distributed Shared Memory:** General architecture of DSM systems, Design and implementation of DSM, Granularity, structure of shared memory space, consistency models, Replacement Strategy, Thrashing, other approaches to DSM, Heterogeneous DSM, and Advantages of DSM

5. **Synchronization:** clock synchronization, event ordering, mutual exclusion, Deadlock, Election Algorithm

6. **Resource and Process Management:** Desirable Features of global Scheduling algorithm, Task assignment approach, Load balancing approach, load sharing approach, Introduction to process management, process migration, Threads

7. **Distributed File Systems:** Introduction, good features of DFS, File models, File Accessing models, File sharing Semantics, File-Caching Schemes, File Replication, Fault Tolerance, Atomic Transactions and design principles.

8. **Naming :** Introduction, Desirable features of Naming system, Fundamental concepts, System oriented Names, Object locating mechanisms, human oriented Names, Name Caches and Naming and Security

BOOKS

Text Books:

1. Pradeep K Sinha " Distributed Operating Systems : Concepts and design" IEEE computer society press
2. A. Tanuenbaum "Distributed Operating System" Pearson Edition
3. PUDER, ROMER "Distributed Systems Architecture : Middleware approach" ELSEVIER publication

References:

1. G. Coulouris, J. Dollimore and T. Kindberg "Distributed Systems : Concepts and design" Pearson Edition
2. M. Singhal, N. Shivaratri " Advanced Concepts in Operating Systems" TMH

TERM WORK

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

Distribution of marks for term work shall be as follows:

Laboratory work (Experiments and Journal) 15 Marks

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.

ORAL EXAMINATION

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

List of assignment (Minimum 10)

1. Implementation of Election Algorithm
2. Implementation of Deadlock
3. Java socket programming.
4. Client-server implementation using RPC/RMI.
5. Client server implementation using CORBA architecture.
6. Implementation of Clock synchronization
7. Study of data centric & client centric consistency model.
8. Case study/implementation of DCOM
9. Study project on Java Beans
10. R.S. A. for Distributed System
11. Study experiment on Network operating system and Distributed operating system with example
12. Implementation name resolution
13. Study/ implementation of stateful server and stateless server

University of Mumbai			
Class : B.E .	**Branch** : Computer Engineering	**Semester** : VIII	
Subject :: Multimedia System Design (Abbreviated as MSD)			
Periods per Week(Each 60 Min)	Lecture	04	
	Practical	02	
	Tutorial	-----	
		Hours	Marks
Evaluation System	Theory	03	100
	Oral	--	25
	Term Work	--	25
	Total	03	150

Module	Content	Lect
Chapter 1	**Introduction:** What is multimedia, Properties of multimedia systems: Independency, computer support, communication systems, Global structure, Multimedia system Architecture:- IMA, workstation , network architecture Evolving Technologies, Applications of multimedia	06
Chapter 2	**Multimedia data and interactions** Data Streams:-Elements of multimedia systems, Objects of multimedia systems, Types: Traditional Vs Continuous, Medium: perception, representation, presentation, storage, transmission, information exchange Multimedia communication system Model:- Interpersonal communication,	06

	Interactive application over internet, Entertainment and application Requirements : User, network Architectural Issues Multimedia communication subsystems :- Application subsystem, Transport subsystem. QoS and resource management, basic concepts establishing and closing multimedia call ,Managing resources during multimedia transmission	
Chapter 3	**Compression & Decompression** Introduction to digitization principle -text ,image, audio, video, File formats – RTF, TIFF,RIFF, Need , types of data compression , Binary (Text) compression scheme, Packbit encoding (RLE), CCITT group 3 1D,3 21D and 4 2D compression, Color Image,JPEG methodology, JPEG 2000 standard, Performance comparison of JPEG and JPEG2000	05
Chapter 4	**Video** Introduction to digital video: Types – Chromasub sampling, CCIR , HDTV Computer Video format, Video compression: Based on motion compression Motion vector search technique : Sequential, 2D logarithmic, Hierarchal search, Standards used – H.261,Comparison of MPEG and H.264 , MPEG 1,2,4,7 and File formats – DVI	05
Chapter 5	Audio/Sound Basic sound concepts :Computer representation of sound, Audio formats- MIDI,WAV Music: MIDI concepts, MIDI Devices, MIDI Messages, MIDI SMPTE timing standard MIDI Software:Speech, Speech Generation, Speech Analysis, Speech Transmission Audio Compression: ADPCM in speech coding, MPEG audio	05
Chapter 6	**Storage Requirements** Basic technology: Video disk :Audio data rate – SNR wrt VCD player , CD player, DVD, Juke box, Peripherals and databases required for multimedia Input devices :- Electronic pen, Scanner, digital camera Output devices :- Printers (Inkjet, laser) , plotters Multimedia database system :Characteristics, Data structures Operations, Models : Object oriented, relational databases	07
Chapter 7	Distributed Multimedia Systems Components of distributed MM system, MM object server , managing distributed objects, Distributed C.S operations, synchronization, Real time multimedia, Requirement, Designing, Streaming protocols	07
Chapter 8	**Multimedia presentation and Authoring** Multimedia system design & its Issues, Authoring Systems, Design Issues Approaches, Types, User Interface Issues, Architecture, Information characteristics for presentation, Presentation design knowledge, Effective HCI	04
Chapter 9	**Applications** Copyright Act for multimedia and method of licensing Applications:-Multimedia animation, Virtual Reality, Knowledge based multimedia systems	04

Textbooks :-

1) " Multimedia: Computing, Communications and Applications", Steinmetz Ralf and Nahrstedt
Klara, Pearson Education
2) "Multimedia System design ", Prabhat K. Andheigh, Kiran Thakrar
3) " Multimedia Systems", Koegel Buford, Pearson Education
3) " Fundamentals of Multimedia , Ze-Nian Li, Mark.S.Drew
4) " Multimedia Communication Systems: Techniques, standards and networks, K.R.Rao,D.Milovanovic

References:-

1) Multimedia database systems :- Subramanian,M.Kaufman
2) Computer Networking :- J.F.Kurose , Pearson Edu
3) Multimedia communications, Halshall, Pearson,Edu
4) Multimedia Systems – Koegel Buford, Pearson Edu.

List of Experiments (reference) :-

At least 10 experiments to clear the concepts behind multimedia system design needs to be performed.

Distribution of marks for term work shall be as follows:

Laboratory work (Experiments and Journal) 15 Marks
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.

Sr.No.	List of Practical Experiments
1	Study of MAYA software
2	Study of FLASH software
3	Creating a banner
4	Creating a ghost (unshaped) 2D object
5	Create animation using (expt 3,4)
6	Add sound to above expt (with play button)
7	Create moving objects (using expt 5)
8	Create a game using action script
9	Create a flash based presentation (4/5 frames) with UI controls
10	Study of VLC player, its setting, streaming and non streaming techniques.
11	Study of streaming audio/video for distrlbuted network
12	Study of VRML
13	Create a 3D object using 2D and show special effects for the same

Oral / Practical Examination must be based upon the syllabus

University of Mumbai		
Class: B.E.	Branch: Computer Engineering	Semester: VIII
Subject: Software Architecture (Abbreviated as SA)		

Periods per Week (each 60 min)	Lecture	04	
	Practical	02	
	Tutorial	--	
Evaluation System	Theory	Hours	Marks
	Oral	03	100
	Term Work	--	25
	Total	--	25
		03	150

Objectives of the course: Software architecture is foundational to the development of large, practical software-intensive applications. Critically, this course focuses on supporting creation of real implemented systems. Hence the course details not only modeling techniques, but design, implementation, deployment, and system adaptation -- as well as a host of other topics -- putting the elements in context and comparing and contrasting them with one another. Rather than focusing on one method, notation, tool, or process, this new course widely surveys software architecture techniques, enabling us to choose the right tool for the job at hand.

Pre-requisites: Object Oriented Software Engineering

Module	Contents	Hours
1	**Basic Concepts** 1.1 Concepts of Software Architecture 1.2 Models. 1.3 Processes. 1.4 Stakeholders.	03
2	**Designing Architectures** 2.1 The Design Process. 2.2 Architectural Conception. 2.3 Refined Experience in Action: Styles and Architectural Patterns. 2.4 Architectural Conception in Absence of Experience.	02
3	**Connectors** 3.1 Connectors in Action: A Motivating Example. 3.2 Connector Foundations. 3.3 Connector Roles. 3.4 Connector Types and Their Variation Dimensions. 3.5 Example Connectors.	06
4	**Modeling** 4.1 Modeling Concepts. 4.2 Ambiguity, Accuracy, and Precision. 4.3 Complex Modeling: Mixed Content and Multiple Views. 4.4 Evaluating Modeling Techniques. 4.5 Specific Modeling Techniques.	04
5	**Analysis** 5.1 Analysis Goals. 5.2 Scope of Analysis. 5.3 Architectural Concern being Analyzed. 5.4 Level of Formality of Architectural Models. 5.5 Type of Analysis.	08

	5.6 Analysis Techniques.	
6	**Implementation and Deployment** 6.1 Concepts. 6.2 Existing Frameworks. 6.3 Software Architecture and Deployment. 6.4 Software Architecture and Mobility.	04
7	**Conventional Architectural styles** 7.1 Pipes and Filters 7.2 Event- based, Implicit Invocation 7.3 Layered systems 7.4 Repositories 7.5 Interpreters 7.6 Process control	05
8	**Applied Architectures and Styles** 8.1 Distributed and Networked Architectures. 8.2 Architectures for Network-Based Applications. 8.3 Decentralized Architectures. 8.4 Service-Oriented Architectures and Web Services.	08
9	**Designing for Non-Functional Properties** 9.1 Efficiency. 9.2 Complexity. 9.3 Scalability and Heterogeneity. 9.4 Adaptability. 9.5 Dependability.	04
10	**Domain-Specific Software Engineering** 10.1 Domain-Specific Software Engineering in a Nutshell. 10.2 Domain-Specific Software Architecture. 10.3 DSSAs, Product Lines, and Architectural Styles.	04

TOPICS FOR EXPERIMENT

1. Modeling using xADL
2. Analysis – Case study
3. Visualization using xADL 2.0
4. Integrate software components using a middleware
5. Use middleware to implement connectors
6. Wrapper to connect two applications with different architectures
7. Creating web service
8. Architecture for any specific domain

BOOKS

Text Books:

1. "Software Architecture: Foundations, Theory, and Practice" by Richard N. Taylor, Nenad Medvidovic, Eric Dashofy , ISBN: 978-0-470-16774-8
2. M. Shaw: Software Architecture Perspectives on an Emerging Discipline, Prentice-Hall.
3. Len Bass, Paul Clements, Rick Kazman: Software Architecture in Practice, Pearson

References:

1. "Pattern Oriented Software Architecture" by Frank Buchnan etal, Wiley India.

2. "The Art of Software Architecture" by Stephen T. Albin

University of Mumbai			
Class : B.E .	**Branch** : Computer Engineering	**Semester** : VIII	
Subject : HUMAN COMPUTER INTERACTION (Abbreviated as HCI) (Elective-I)			
Periods per Week(Each 60 Min)	Lecture	04	
	Practical	02	
	Tutorial	-----	
		Hours	Marks
Evaluation System	Theory	03	100
	Oral	--	25
	Term Work	---	25
	Total	---	150

TERM WORK

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

PRACTICAL/ORAL EXAMINATION

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

DETAILED SYLLABUS		
Sr. No	**Topics**	**Hours**
1.	Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design,	04
2.	The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.	06

Objectives

- To facilitate communication between students of psychology, design, and computer science on user interface development projects.
- To provide the future user interface designer with concepts and strategies for making design decisions.
- To expose the future user interface designer to tools, techniques, and ideas for interface design.
- To introduce the student to the literature of human-computer interaction.
- To stress the importance of good user interface design

3.	Design process –Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, and understanding business junctions.	05
4.	Screen Designing:- Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.	10
5	Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls.	04
6	Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.	04
7	Software tools – Specification methods, interface – Building Tools.	03

8	Interaction Devices – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.	06

TEXT BOOKS :

1. The essential guide to user interface design, Wilbert O Galitz, Wiley DreamTech.
2. Designing the user interface. 3rd Edition Ben Shneidermann , Pearson Education Asia.

REFERENCE BOOKS:

1. Human – Computer Interaction. Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg, Pearson Education
2. Interaction Design Prece, Rogers, Sharps. Wiley Dreamtech,
3. User Interface Design, Soren Lauesen , Pearson Education.

TERM WORK

v.Term work should consist of at least 8 practical experiments and two assignments covering the topics of the syllabus.

vi.A term Work test of 10 marks must be conducted.

Distribution of marks for term work shall be as follows:

Laboratory work (Experiments and Journal)	15 Marks
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.

Oral Examination must be based upon the syllabus of 25 marks.

Advanced Internet Technology (Elective-II) Abbreviated as (AINT)				
Class: B.E. (Computer Engineering)			SEMESTER VIII	
HOURS PER WEEK	LECTURES	:	04	
	TUTORIALS	:	--	
	PRACTICALS	:	02	
			HOURS	**MARKS**
EVALUATION SYSTEM:	THEORY		3	100
	ORAL		-	25
	TERM WORK		-	25

Objectives of the course:

- To understand Technical aspect of Internet Technology

- To learn Advanced web programming

Contents of the Course

Section 1: Advanced Internet Protocols
DNS, Working of DNS, DNS Header, Type of Records in DNS, forward and Reverse lookup, Configuration of Open Source (OS) DNS, working of DDNS - DHCP, DHCP header, Working of DHCP, Configuration of OS DHCP - FTP, Working of FTP, Configuration of OS Public FTP server and Private FTP server
Understanding IPv6, CIDR, Hierarchical Routing, and Routing Protocol over internet.
Multimedia over Internet, Voice over IP, Virtual Private network

Section 2: Internet as a Distributed computing platform
1) Understanding Web Services technology, REST based web services (Resource Oriented Architecture) and Service oriented Architecture.
2) Introduction to cloud computing, case study and working of Google App engine and Amazon cloud.
3) Working of Peer to Peer over internet with case study of Bittorent ,

Section 3; Advanced Internet programming
1) HTML 5.0, Rich Internet Technology, AJAX, FLEX , Integrating PHP and AJAX, Consuming Web Service with AJAX, Resource Syndication (RSS), Working principle of search engines

Section 4: Internet Security
Public Key Infrastructure, Client side Vulnerabilities, Server Side Vulnerabilities, Database Vulnerabilities, Secure Payment Mechanism, Security issues in cloud

TEXT BOOKS /REFERENCE BOOKS:

Section1:

1) TCP/IP Protocol Suite : By Behrouz A. Forouzan : Tata McGraw-Hill

Section 2:

1) Cloud Computing : A practical Approach: By Anthony T. Velte : Tata McGraw-Hill
2) Using Google App Engine: By Charles : O'reilly Press
3) Cloud Application Architecture: By George: O'reilly Press
4) RESTful web services: By Leonard: O'Reilly Press
5) Web Services Essentials:By Ethan: O'Reilly

Section 3:

1) Rich Internet Application AJAX and Beyond: B y Dana moore : Wrox press
2) Web 2.0 Programming : By Eric : Wrox Press
3) HTML 5.0: By Mark: O'reilly Press
4) Web Technologies NEW :Black Book : Dreamtech

Section 4:

1) Information Security :By Mark Stamp : Wiley Publication
2) Cloud Security and Privacy: By Tim : O'Reilly

Marks

1. Laboratory work (Mini Projects and Journal) 15 Marks
2. 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.

Suggested List of Experiments

Students need to perform three Mini projects based on the syllabus. Time duration for each project will be three weeks.

Suggested List of Mini Projects

1) **Configuration of Private cloud using open source technology**
2) **Development of DMZ for the college**
3) **Creating RIA web Site**
4) **Working with SOA and REST based Web Services**
5) **Working With Goggles APP engine (In Python)**

University of Mumbai			
Class: B.E.	Branch: Computer Engineering	Semester: VIII	
Subject: Computer Vision(Elective-II)			
Periods per Week (each 60 min)	Lecture Practical Tutorial	04 02 --	
		Hours	Marks
Evaluation System	Theory	03	100
	Oral	--	25
	Term Work	--	25
	Total	03	150

Objectives of the course: To introduce the student to computer vision algorithms, methods and concepts
which will enable the student to implement computer vision systems with emphasis on applications and problem solving

Pre-requisites: Introduction to Image Processing.

Module	Contents	Hours
1	Recognition Methodology: Conditioning, Labeling, Grouping, Extracting, Matching.	02

2	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, Thinning, Thickining , Region growing, region shrinking.	04
3	Image Representation and Description: Representation schemes, Boundary descriptors, Region descriptors	04
4	Binary Machine Vision: Thresholding, Segmentation, Connected component labeling, Hierarchal segmentation, Spatial clustering, Split & merge, Rule-based Segmentation, Motion-based segmentation.	06
5	Area Extraction: Concepts, Data-structures, Edge, Line-Linking, Hough transform, Line fitting, Curve fitting (Least-square fitting).	05
6	.Region Analysis: Region properties, External points, Spatial moments, Mixed spatial gray-level moments, Boundary analysis: Signature properties, Shape numbers.	05
7	Facet Model Recognition: Labeling lines, Understanding line drawings, Classification of shapes by labeling of edges, Recognition of shapes, Consisting labeling problem, Back-tracking Algorithm	04
8	Perspective Projective geometry, Inverse perspective Projection, Photogrammetry - from 2D to 3D, Image matching : Intensity matching of ID signals, Matching of 2D image, Hierarchical image matching.	04
9	Object Models And Matching: 2D representation, Global vs. Local features	02
10	General Frame Works For Matching: Distance relational approach, Orderedstructural matching, View class matching, Models database organization..	03
11	General Frame Works: Distance -relational approach, Ordered - Structural.matching, View class matching, Models database organization.	03
12	Knowledge Based Vision: Knowledge representation, Control-strategies, Information Integration.	03
13	**Object recognition** • Hough transforms and other simple object recognition methods • Shape correspondence and shape matching • Principal component analysis • Shape priors for recognition	02

BOOKS

Text Books:

1.Robert Haralick and Linda Shapiro, "Computer and Robot Vision", Vol I, II, Addison-Wesley, 1993.

2. David A. Forsyth, Jean Ponce, "Computer Vision: A Modern Approach"

References:

3. 1. Milan Sonka,Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis, and Machine Vision" Thomson Learning

TERM WORK

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

Elective – II: EMBEDDED SYSTEMS			
CLASS: B.E. (COMPUTERS)		SEMESTER – VIII (Elective)	
HOURS PER WEEK	LECTURES	04	
	TUTORIALS	--	
	PRACTICALS	02	
		Hours	Marks
EVALUATION SYSTEM	THEORY	03	100
	PRACTICAL		
	ORAL	-	25
	TERM WORK	-	25

1. **Introduction to Embedded Systems**

Review of microcontrollers and Digital Signal Processors (DSP), architecture, peripheral modules. Embedded micro controller cores (ARM, RISC, CISC, SOC), addressing modes, interrupts structure, hardware multiplier, pipelining. Hardware/Software co-design. Architecture of embedded systems.

2. **Embedded Software Development**

Assemblers, linkers and loaders. Binary file formats for processor executable files. Typical structure of timer-interrupt driven programs. GNU-GCC compiler introduction, programming with Linux environment and gnu debugging, gnu insight with step level trace debugging, make file interaction, building and execution.

3. **Design with ARM Processor**

Introduction to ARM instruction set, addressing modes, operating modes with ARM core, ARMTDMI modes, ADC, Timers, Interrupt structure. Byte ordering (LE, BE), Thumb mode normal mode instructions changes, Pipeline utilization with all register allocations. Compare with ARM7, ARM9, and ARM11 with new features additions. System design with ARM processor.

4. **Input / Output Interfacing**

Interfacing with switches, keyboards, LED's, LCD's, transistors used for digital-controlled current switches, digital-controlled relays, solenoids, DC, AC and stepper motors, analog interfacing and data acquisition systems.

5. **Real-time Operating System**

Real Time Operating System Concepts, Kernel Structure, Critical Sections, Multitasking, Task Management, Time Management, Schedulers, Event Control

Blocks, Priorities, Deadlocks, Synchronization, Semaphore Management, Mutual Exclusion, Message Mailbox Management, Message Queue Management, Memory Management, RTOS implementation. Examples of OSs for embedded systems - RT Linux, uC/OS.

6. **Applications of Embedded Systems**

Database applications; Image processing, Process-control, Robotics, Automation, Security and communication.

Text Books:

1. Embedded / Real-Time Systems: Concepts, Design & Programming – Dr. K. V. K. K. Prasad – dreamtech Press, India.
2. An Embedded Software Primer – David E. Simon – Pearson Education South Asia.
3. Embedded Microcomputer Systems Real Time Interfacing - Jonathan W. Valvano – Thomson Asia Pte Ltd.
4. ARM System Developer's Guide Designing and Optimizing System Software – Andrew N. Sloss, Dominic Sysmes and Chris Wright – Elsevier Inc.

Reference Books:

1. Embedded Systems, Architecture, Programming and Design – Raj Kamal – Tata McGraw Hill.
2. Embedded Linux – Hollabaugh, Pearson Education.
3. Embedded Realtime Systems Programming - Sriram V Iyer, Pankaj Gupta – Tata McGraw Hill.
4. Fundamentals of Microcontrollers and Applications in Embedded Systems – Ramesh Gaonkar – Penram International Publishing (India) Pvt. Ltd.

Term Work:

Term work should consist of at least 8 practicals and one mini project. Objective type term work test shall be conducted with a weightage of 10 marks.

Marks:

Distribution of marks for term work shall be as follows:

- Laboratory work (Experiments and Project) 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 term work.

List of Experiments:

Topic-1: Troubleshooting Tools [Any Two]

12. In-Circuit Emulator (ICE) and In-Circuit Debugger (ICD)
13. Logic Analyzer
14. Spectrum Analyzer
15. Pattern generator and Digital Storage Oscilloscope

Topic -2: ARM Processors & Interfaces [Any Two]

1. LEDs and Keyboard Interface
2. 16x2 LCD Interface
3. Counting external events with on chip counters
4. DC Motor Control
5. Relay and Buzzer Control for alarm events
6. Unipolar and Bipolar Stepper Motor Control
7. On chip ADC
8. SPI / I2C / CAN Interface
9. Blue tooth/Zig-bee interface

Topic-3: Device Driver Development [Any Two]

1. Drivers for RS-232
2. Drivers for USB2.0
3. Drivers for Ethernet
4. Drivers for Graphics LCD/Touch Screen

Topic-4: Real Time Operating System (RTOS) [Any Two]

1. RTLinux porting to x86 Architecture
2. uCLinux porting to ARM Architecture
3. GCC porting to RISC Architecture

PROJECT – II				
CLASS B.E. (COMPUTER ENGINEERING)			SEMESTER VIII	
HOURS PER WEEK	LECTURES	:	--	
	TUTORIALS	:	--	
	PRACTICALS	:	04	
			HOURS	MARKS
EVALUATION SYSTEM:	THEORY		--	--
	PRACTICAL		--	--
	ORAL		--	50
	TERM WORK		--	50

Objective: The primary objective is to meet the milestones formed in the overall project plan decided in Project - I. The idea presented in Project – I should be implemented in Project – B with results, conclusion and future work. The project will culminate in the production of a thesis by each individual student.

Guidelines:

5. **Project Report Format:**
   At the end of semester a student need to prepare a project report which should preferably contain at least following details:-
   Abstract, Project overview, Introduction and Motivation, Problem Statement, Requirement Analysis, Project design, Implementation Details, Technologies used , Test cases, Project time line, Task Distribution, conclusion & future work, references, and Appendix consisting of user Manuals. Every student must prepare well formatted, printed and hard bound report. Along with project report a CD containing: project documentation, Implementation code, required utilities, Software's and user Manuals need to be attached.

6. **Term Work:**
   Student has to submit weekly progress report to the internal guide and where as internal guide has to keep track on the progress of the project and also has to maintain attendance report. This progress report can be used for awarding term work marks. In case of industry projects, visit by internal guide will be preferred to get the status of project.

   Distribution of marks for term work shall be as follows:
   1. Project Report (Hard Bound) 25 Marks
   2. Term End Presentation (Internal) 25 Marks

   The final certification and acceptance of TW ensures the satisfactory performance on the above three aspects.

7. **Final Assessment:**
   Project – II examination should be conducted by two examiners appointed by university. Students have to give demonstration and seminar on the Project – II.

Computer Engineering
Equivalent subjects

Semester VII R 2001	Semester VII R2007
i) Digital signal processing	i) Digital signal processing (R2001)
ii) Advanced Microprocessor	ii) Advanced Microprocessor(R2001
iii) software Engineering	iii) Project Management (Sem 7-R2007)
iv)Inteligent system	iv) Inteligent system (R2001)
v)**Elective –I**	v) **Elective -I**
a) Mobile computing	a)Mobile computing (Sem VII R2007)
b)Computer Simulation & modeling	b) Computer simulation & modeling (sem VII R2007)
c) Pattern Recognition	c) Pattern Recognition (R2001)
d)Embeded system	d) Embeded system (R2001)
e) Advanced Computer Network	e) Advanced computer network (R2001)
f) Image Processing	f) Image processing (R2001)
vi) Project A	vi) Project A

Semester VIII 2001	Semester VIII R 2007
i) System Security	i) System security (Sem VII R 2007)
ii) Multimedia system	ii) Multimedia system design (R 2007)

iii) Distributed Computing
iv) **Elective –II**
a) Data ware housing and Mining

b) Computer Vision
c) Software testing
d)Neural network & fuzzy system

e) Parallel Processing
v) Project B

iii) Distributed Computing (R2007)
iv) **Elective –II**
a) Data ware housing and Mining (R2001)
b) Computer vision (R2007)
c) Software Testing (R2001)
d) Neural network & fuzzy system (R 2001)
e) Parallel Processing (R2001)
v) Project B