

UNIVERSITY OF MUMBAI

No. UG/244 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. 4.11 and that, in accordance therewith, the revised syllabus of Fourth Year (Semester VII & VIII) of the B.E. Degree Course in branch of Information Technology 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./4.11/27/07/2010

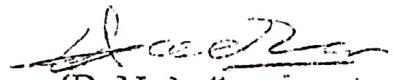
No. UG/244-A of 2010,

MUMBAI-400 032

12th August, 2010

Copy forwarded with compliments for information to:-

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


(D. N. Jadhav)
Ag. Deputy Registrar
(UG/PG Section)

12/8
X

Copy to:-

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

The Controller of Examinations (10 copies), the Finance and Accounts Officer (2 copies), Record Section (5 copies), Publications Section (5 copies), the Deputy Registrar, Enrolment, Eligibility and Migration Section (5 copies), the Deputy Registrar, Statistical Unit (2 copies), the Deputy Registrar (Accounts Section), Vidyanaagari (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), Vidyanaagari, (2 copies) the Deputy Registrar (Special Cell), the Deputy Registrar, (PRO) the Assistant Registrar, Academic Authorities Unit (2 copies) and the Assistant Registrar, Executive Authorities Unit (2 copies). They are requested to treat this as action taken report on the same.

UNIVERSITY OF MUMBAI



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

(With effect from the academic year 2010-2011)

University of Mumbai
Board of studies in IT

Information Technology Syllabus Revision

Preamble

It is the opportune time for revamping the “content” of the course Titled Information Technology. It is all about finding the right stimulus to develop a different set of core competency to enable the market to accept and acknowledge the same. Academicians can not be ignorant of prevailing market forces. The requirement of the time is to design course curriculums which instill confidence in students and industrial entrepreneurs. Reorient the process of education to the need of the society by imparting skill sets rather than motivating the students to pursue academic excellence which is non-existent.

It is right time to subject ourselves to unlearning process so that we will be in a position to comprehend the Industrial, technological and social dynamics. This is the time to hold the entire act together. Innovation and value addition should be the center theme in the process of syllabus design.

Try to minimize the process of reinventing the wheel every time. Statistics shows that investment in research in the realm of middleware, implementation and customization of technology product by world bodies is in a state of up swing which is an indication of core competence to be developed by graduates.

Our mission should be creation of intellectual capital and design newer product, which the market itself failed to recognize at this juncture.

B.E (Information Technology) Semester VII and Semester VIII revised syllabus starting from 2010-2011 Academic year

University of Mumbai
B.E Information Technology
Scheme of Instruction and Evaluation

Fourth Year -Semester VII									
Scheme of Instructions				Scheme of Examinations					Tot Mar
Subjects	Lect/ Week	Pract/ Week	Tuto/ Week	Theory Hours	Marks	T/W Marks	Practical Marks	Oral Marks	
Data Warehousing, Mining & Business Intelligence	4	2	--	3	100	25	--	25	15
Digital Signal & Image processing	4	2	--	3	100	25	--	25	14
Simulation and Modeling	4	2	--	3	100	25	25	--	1
Software testing & Quality Assurance	4	2	--	3	100	25	--	25	1
Elective - I	4	2	--	3	100	25	--	25	1
Project - I	--	4	--	--	--	25	--	25	1
TOTAL	20	14	2	3	500	150	25	125	8

Elective - I (Semester VII)

1. Wireless Network
2. Multimedia Systems
3. Evolutionary Algorithms
4. IT in Construction
5. Nanotechnology
6. Geographical Information Systems
7. Artificial Intelligence

Fourth Year -Semester VIII										
Scheme of Instructions					Scheme of Examinations					Total Marks
Sr. No	Subjects	Lect/ Week	Pract/ Week	Tuto/ Week	Theory		T/W	Practical	Oral	
					Hours	Marks	Marks	Marks	Marks	
1	Information Storage Management and Disaster Recovery	4	2	--	3	100	25	--	25	150
2	Gaming Architecture and programming	4	2	--	3	100	25	--	25	150
3	Software Project Management	4	2	--	3	100	25	--	25	150
4	Elective - II	4	2	--	3	100	25	--	25	150
5	Project - II		4	--	--	--	50	--	50	100
	TOTAL	16	12	--	--	400	150	--	150	700

Elective - II (Semester VIII)

1. Cloud Computing
2. IT for Health Care
3. Service Oriented Architecture
4. E-Government
5. ERP & CRM
6. Mobile & Ecommerce
7. Robotics and Machine Intelligence

EQUIVALENT SUBJECTS FOR IT

SEM-III

Sl No	SEM-III (R-2001)	Equivalent subject	Remark
1	Applied Maths III	Applied Maths III (Sem III R-2007)	
2	Electronics Devices and Circuits	Electronics Devices and Circuits (Sem III R-2007)	
3	Electrical Network	No Equivalence	
4	Discrete Structures	No Equivalence	
5	Digital logic design and application	Digital logic design and application (Sem III R-2007)	
6	Foundation of Information Tecnology	No Equivalence	

Sem IV

1	Applied Maths IV	Computational Mathematics (Sem IV R-2007)	
2	Principles of communication Engineering	Principles of communication Engineering (Sem IV R-2007)	
3	Computer Organisation and Architecture	No Equivalence	
4	Data structure and Algorithm	Data structure and Algorithm (Sem III R-2007)	
5	Information Theory and coding	No equivalence	
6	Industrial Economics and Management	Financial accounting & Management of technology innovation (Sem IV R-2007)	

EQUIVALENT SUBJECTS FOR IT SEM-V

1	Applied Maths V	No Equivalence	
2	Digital communication	No Equivalence	
3	Automata Theory	No Equivalence	
4	Internet technology and applications	Internet programming (Sem IV R-2007)	
5	Systems software	Operating system for computing Devices (Sem V R-2007)	
6	Presentation and communication techniques	Communication & presentation techniques (Sem III R-2007)	
7	Computer programming laboratory	Open source software laboratory (Sem V R-2007)	

SEM VI

1	Computer network	Networking technology for digital devices (Sem IV R-2007)	
2	Software Engineering	Software Engineering (Sem VI R-2007)	
3	Object oriented analysis and Design	Object oriented analysis and Design (Sem V R-2007)	
4	Microprocessors	Microprocessors & Microcontrollers (Sem IV R-2007)	
5	Database systems	GUI and Database Management (Sem III R-2007)	
6	Digital signal processing	No Equivalence	

DATA WAREHOUSING AND MINING & BUSINESS INTELLIGENCE				
CLASS B.E. (INFORMATION TECHNOLOGY)			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 Base Management System				
Objective: Today is the era characterized by Information Overload – Minimum knowledge. Every business must rely extensively on data analysis to increase productivity and survive competition. This course provides a comprehensive introduction to data mining problems concepts with particular emphasis on business intelligence applications. The three main goals of the course are to enable students to: 1. Approach business problems data-analytically by identifying opportunities to derive business value from data. 2. know the basics of data mining techniques and how they can be applied to extract relevant business intelligence.				

1. **Introduction to Data Mining:** Motivation for Data Mining, Data Mining-Definition & Functionalities, Classification of DM systems, DM task primitives, Integration of a Data Mining system with a Database or a Data Warehouse, Major issues in Data Mining.
2. **Data Warehousing – (Overview Only):** Overview of concepts like star schema, fact and dimension tables, OLAP operations, From OLAP to Data Mining.
3. **Data Preprocessing:** Why? Descriptive Data Summarization, Data Cleaning: Missing Values, Noisy Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Data Discretization and Concept hierarchy generation for numerical and categorical data.
4. **Mining Frequent Patterns, Associations, and Correlations:** Market Basket Analysis, Frequent Itemsets, Closed Itemsets, and Association Rules, Frequent Pattern Mining, Efficient and Scalable Frequent Itemset Mining Methods, The Apriori Algorithm for finding Frequent Itemsets Using Candidate Generation, Generating Association Rules from Frequent Itemsets, Improving the Efficiency of Apriori, Frequent Itemsets without Candidate Generation using FP Tree, Mining Multilevel Association Rules, Mining Multidimensional Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.

5. **Classification & Prediction:** What is it? Issues regarding Classification and prediction:
 - **Classification methods:** Decision tree, Bayesian Classification, Rule based
 - **Prediction:** Linear and non linear regression
 Accuracy and Error measures, Evaluating the accuracy of a Classifier or Predictor.
6. **Cluster Analysis:** What is it? Types of Data in cluster analysis, Categories of clustering methods, Partitioning methods – K-Means, K-Medoids. Hierarchical Clustering Agglomerative and Divisive Clustering, BIRCH and ROCK methods, DBSCAN, Outlier Analysis
7. **Mining Stream and Sequence Data:** What is stream data? Classification, Clustering Association Mining in stream data. Mining Sequence Patterns in Transactional Databases.
8. **Spatial Data and Text Mining:** Spatial Data Cube Construction and Spatial OLAP. Mining Spatial Association and Co-location Patterns, Spatial Clustering Methods. Spatial Classification and Spatial Trend Analysis. Text Mining Text Data Analysis and Information Retrieval, Dimensionality Reduction for Text, Text Mining Approaches.
9. **Web Mining:** Web mining introduction, Web Content Mining, Web Structure Mining, Web Usage mining, Automatic Classification of web Documents.
10. **Data Mining for Business Intelligence Applications:** Data mining for business Applications like Balanced Scorecard, Fraud Detection, Clickstream Mining, Market Segmentation, retail industry, telecommunications industry, banking & finance and CRM etc

Text Books:

1. Han, Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann 2nd Edition
2. P. N. Tan, M. Steinbach, Vipin Kumar, "Introduction to Data Mining", Pearson Education

Reference Books:

1. MacLennan Jamie, Tang ZhaoHui and Crivat Bogdan, "Data Mining with Microsoft SQL Server 2008", Wiley India Edition.
2. G. Shmueli, N.R. Patel, P.C. Bruce, "Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner", Wiley India.
3. Michael Berry and Gordon Linoff "Data Mining Techniques", 2nd Edition Wiley Publications.
4. Alex Berson and Smith, "Data Mining and Data Warehousing and OLAP", McGraw Hill Publication.
5. E. G. Mallach, "Decision Support and Data Warehouse Systems", Tata McGraw Hill.
6. Michael Berry and Gordon Linoff "Mastering Data Mining- Art & science of CRM", Wiley Student Edition
7. Arijay Chaudhry & P. S. Deshpande, "Multidimensional Data Analysis and Data Mining", Dreamtech Press.
8. Vikram Pudi & Radha Krishna, "Data Mining", Oxford Higher Education.
9. Chakrabarti, S., "Mining the Web: Discovering knowledge from hypertext data",
10. M. Jarke, M. Lenzerini, Y. Vassiliou, P. Vassiliadis (ed.), "Fundamentals of Data Warehouses", Springer-Verlag, 1999.

Term Work:

Term work shall consist of at least 10 experiments covering all topics Term work should consist of at least 6 programming assignments and one mini project in Business Intelligence and two assignments covering the topics of the syllabus. One written test is also to be conducted. Distribution of marks for term work shall be as follows:

1. Laboratory work (Experiments and Journal)
2. Test (at least one)

15 Marks

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

1. Students can learn to use WEKA open source data mining tool and run data mining algorithms on datasets.
2. Program for Classification – Decision tree, Naïve Bayes using languages like JAVA
3. Program for Clustering – K-means, Agglomerative, Divisive using languages like JAVA
4. Program for Association Mining using languages like JAVA
5. Web mining
6. BI projects: any one of Balanced Scorecard, Fraud detection, Market Segmentation etc.
7. Using any commercial BI tool like SQLServer 2008, Oracle BI, SPSS, Clementine, and XLMiner etc.

ORAL EXAMINATION

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

DIGITAL SIGNAL AND IMAGE PROCESSING			
CLASS: B.E. (INFORMATION TECHNOLOGY)		SEMESTER – VII	
HOURS PER WEEK	LECTURES	04	
	TUTORIALS	--	
	PRACTICALS	02	
EVALUATION SYSTEM		Hours	Marks
	THEORY	03	100
	PRACTICAL		
	ORAL	-	25
	TERM WORK	-	25

- 1. Introduction to Discrete Time Signals & System:** Discrete-Time Signals representation and Manipulation, Discrete-Time IIR and FIR Systems, Impulse Response, Transfer Function, Difference Equation, Frequency Domain and Time Domain Analysis of IIR filter and FIR filter, Correlation, Linear and Circular and Convolution Algorithm,
- 2. Discrete Fourier Transform:** DTFT, Frequency Domain Sampling, Properties of DFT, DIT-FFT algorithm, Spectral Analysis using FFT, Linear FIR filtering using FFT based Overlap Save and Overlap Add Method,
- 3. Image Transforms :** Introduction to Unitary Transform, DFT, Properties of 2-D DFT, FFT, IFFT, Walsh transform, Hadamard Transform, Discrete Cosine Transform, Discrete Wavelet Transform,
- 4. Image Enhancement :** Gray Level Transformations, Histogram Processing, Spatial Filtering: Introduction, Smoothing and Sharpening Filters. Colour Image Enhancement.
- 5. Image Segmentation and Representation :** Detection of Discontinuities, Laplacian of Gaussian, Derivative of Gaussian, Canny Edge Detection, Thresholding in Hierarchical Data Structures, Border Tracing, Edge linking and Boundary Detection, Thresholding, Region Based Segmentation. Representation Schemes.
- 6. Image Data Compression:** Fundamentals, Redundancies: Coding, Interpixel, Psycho-visual, Error Free Compression, Lossy Image Compression : Lossy Predictive Coding, JPEG, MPEG, Subband Coding using Wavelet Transform, Vector Quantization
- 7. Morphological Image Processing:** Introduction, Dilation, Erosion, Opening, Closing, Hit-or-Miss transformation, Basic Morphological Algorithms on binary images
- 8. Applications of Image Processing :** Case Study on Digital Watermarking, Biometric Authentication (Face, Finger Print, Signature Recognition), Vehicle Number Plate Detection and Recognition, Object Detection using Correlation Principle, Person Tracking using DWT, Handwritten and Printed Character Recognition, Content Based Image Retrieval, Text Compression.

Text Books :

1. J.G. Proakis, "Introduction to Digital Signal Processing", PHI
2. R.C.Gonsales R.E.Woods, "Digital Image Processing", Second Edition, Pearson Education
3. Anil K.Jain, "Fundamentals of Image Processing", PHI

Reference Books :

1. S Sallivahanan, "Digital Signal Processing", TMH.
2. Milan Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing Analysis and Machine Vision" Second Edition, Thomson Learning Inc,
3. William Pratt, "Digital Image Processing", John Wiley.

Term Work:

Term work should consist of at least 10 Practical and Assignments on every topic of the syllabus A term work test shall be conducted with a weightage of 10 marks

Marks :

Distribution of marks for term work shall be as follows:

- | | |
|--|----------|
| 1. Laboratory work(Experiment and Journal) | 15 Marks |
| 2. 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 Digital Signal Processing [Any two Experiments]**

1. To find Linear Convolution, Circular Convolution
2. To find output of Digital FIR filter using convolution principle..
3. To find output of Digital IIR filter using recursive difference equation.
4. To plot Magnitude spectrum using DFT/ FFT
5. To find output of real time signal using FFT based Overlap Add Method
6. To find output of real time signal using FFT based Overlap Save Method

Topic-2 Image Transform [Any two Experiments]

1. To find DFT/FFT forward and Inverse Transform of Image.
2. To find DCT forward and Inverse Transform of Image.
3. To find DWT forward and Inverse Transform of Image.
4. To find Walsh-Hadamard forward and Inverse Transform of Image.

Topic-3 Image Enhancement [Any two Experiments]

1. To enhance image using Histogram Equalization
2. To enhance image using Contrast Stretching
3. To perform Colour Image Enhancement
4. To enhance image using Smoothing and Sharpening Filters

Topic-4 : Image Segmentation and Morphology [Any two Experiments]

1. To find edges using LOG and DOG
2. To find Edges using Prewit/ Sobel/ Fri-chen / Robert operators.
3. To find edges using canny Edge Detection.
4. To implement Image Border Tracing

Topic-5 : Application using OpenCV Library / Java [Any Two Experiments]

1. Digital Watermarking
 2. Biometric Authentication such as Face / Finger Print / Signature Recognition)
 3. Vehicle Number Plate Detection and Recognition,
 4. Object Detection using Correlation Principle,
 5. Person Tracking using DWT,
 6. Handwritten and Printed Character Recognition,
 7. Contend Based Image Retrieval,
 8. Text file Compression. .
 9. Morphological Toolkit Development
 10. Currency Recognition
 11. Human Expression Detection
 12. Image Enhancement using Adaptive Histogram Equalization(AHE), Modified AHE(MAHE), Technique.
 13. Image Compression using Vector Quantization
 14. Image Compression using DWT
-

SIMULATION AND MODELING				SEMESTER VII	
CLASS B.E. (INFORMATION TECHNOLOGY)					
HOURS PER WEEK	LECTURES	:	04		
	TUTORIALS	:	--		
	PRACTICALS	:	02		
			HOURS	MARKS	
EVALUATION SYSTEM:	THEORY		3	100	
	PRACTICAL		--	25	
	ORAL		--	--	
	TERM WORK		--	25	
Prerequisite: Probability and Statistics					
Objective: 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.					

- 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. Bödy, "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:

- | | |
|--|----------|
| 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 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

SOFTWARE TESTING & QUALITY ASSURANCE				
CLASS B.E. (INFORMATION TECHNOLOGY)			SEMESTER VII	
HOURS PER WEEK	LECTURES	:	04	
	TUTORIALS	:	--	
	PRACTICALS	:	02	
EVALUATION SYSTEM:			HOURS	MARKS
	THEORY		3	100
	PRACTICAL		--	
	ORAL		--	25
	TERM WORK		--	25
Prerequisite: Software Engineering				
Objective: This course equips the students with a solid understanding of: • Practices that support the production of quality software • Software testing techniques • Life-cycle models for requirements, defects, test cases, and test results • Process models for units, integration, system, and acceptance testing • Quality Models				

1. **Introduction:** Software Quality, Role of testing, verification and validation, objectives and issues of testing, Testing activities and levels, Sources of Information for Test Case Selection, White-Box and Black-Box Testing , Test Planning and Design, Monitoring and Measuring Test Execution, Test Tools and Automation, Test Team Organization and Management .
2. **Unit Testing:** Concept of Unit Testing , Static Unit Testing , Defect Prevention , 3.4 Dynamic Unit Testing , Mutation Testing , Debugging , Unit Testing in eXtreme Programming
3. **Control Flow Testing:** Outline of Control Flow Testing, Control Flow Graph, Paths in a Control Flow Graph, Path Selection Criteria, All-Path Coverage Criterion , Statement Coverage Criterion, Branch Coverage Criterion, Predicate Coverage Criterion, Generating Test Input, Examples of Test Data Selection.
4. **Data Flow Testing:** Data Flow Anomaly,. Overview of Dynamic Data Flow Testing, Data Flow Graph, Data Flow Terms, Data Flow Testing Criteria, Comparison of Data Flow Test Selection Criteria, Feasible Paths and Test Selection Criteria, Comparison of Testing Techniques.
5. **System Integration Testing:** Concept of Integration Testing, Different Types of Interfaces and Interface Errors, Granularity of System Integration Testing, System Integration Techniques, Software and Hardware Integration, Test Plan for System Integration, Off-the-Shelf Component Integration, Off-the-Shelf Component Testing, Built-in Testing

6. **System Test Categories:** Basic Tests, Functionality Tests, Robustness Tests, Interoperability Tests, Performance Tests, Scalability Tests, Stress Tests, Load and Stability Tests, Reliability Tests, Regression Tests, Documentation Tests.
7. **Functional Testing:** Equivalence Class Partitioning, Boundary Value Analysis, Decision Tables, Random Testing, Error Guessing, Category Partition.
8. **System Test Design:** Test Design Factors, Requirement Identification, Characteristics of Testable Requirements, Test Design Preparedness Metrics, Test Case Design Effectiveness.
9. **System Test Planning And Automation:** Structure of a System Test Plan, Introduction and Feature Description, Assumptions, Test Approach, Test Suite Structure, Test Environment, Test Execution Strategy, Test Effort Estimation, Scheduling and Test Milestones, System Test Automation, Evaluation and Selection of Test Automation Tools, Test Selection Guidelines for Automation, Characteristics of Automated Test Cases, Structure of an Automated Test Case, Test Automation Infrastructure
10. **System Test Execution:** Preparedness to Start System Testing, Metrics for Tracking System Test, Metrics for Monitoring Test Execution, Beta Testing, First Customer Shipment, System Test Report, Product Sustaining, Measuring Test Effectiveness.
11. **Acceptance Testing:** Types of Acceptance Testing, Acceptance Criteria, Selection of Acceptance Criteria, Acceptance Test Plan, Acceptance Test Execution, Acceptance Test Report, Acceptance Testing in eXtreme Programming.
12. **Software Quality:** Five Views of Software Quality, McCall's Quality Factors and Criteria, Quality Factors Quality Criteria, Relationship between Quality Factors and Criteria, Quality Metrics, ISO 9126 Quality Characteristics, ISO 9000:2000 Software Quality Standard ISO 9000:2000 Fundamentals, ISO 9001:2000 Requirements

Text Book

1. "Software Testing and Quality Assurance: Theory and Practice", Sagar Naik, University of Waterloo, Piyu Tripathy, Wiley, 2008

References:

1. "Effective methods for Software Testing" William Perry, Wiley.
2. "Software Testing - A Craftsman's Approach", Paul C. Jorgensen, CRC Press, 1995.
3. "The Art of Creative Destruction", Rajnikant Puranik, SPD.
4. "Software Testing", Srinivasan Desikan and Gopalaswamy Ramesh - Pearson Education 2006.
5. "Introducing to Software Testing", Louis Tanres, Addison Wesley Publications, First Edition.
6. "Software Testing", Ron Patton, SAMS Techmedia Indian Edition, Pearson Education 2001.
7. "The Art of Software Testing", Glenford J. Myers, John Wiley & Sons, 1979.
8. "Testing Object-Oriented Systems: Models Patterns and Tools", Robert V. Binder, Addison Wesley, 2000.
9. "Software Testing Techniques", Boris Beizer, 2nd Edition, Van Nostrand Reinhold, 1990.
10. "Software Quality Assurance", Daniel Galin, Pearson Education.

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:

- | | |
|--|----------|
| 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.

Elective - I : WIRELESS NETWORKS				
CLASS B.E. (INFORMATION TECHNOLOGY)			SEMESTER VII	
HOURS PER WEEK	LECTURES	:	04	
	TUTORIALS	:	--	
	PRACTICALS	:	02	
			HOURS	MARKS
EVALUATION SYSTEM:	THEORY	:	3	100
	PRACTICAL	:	--	--
	ORAL	:	--	25
	TERM WORK	:	--	25
Prerequisite: Networking Technology for Digital Devices, Convergence Technology for Networking in communication, C/C++/Java				
Objective: The main objective of this course is to get acquainted of Wireless Communication Systems and their Applications through today's technologies.				

1. **Introduction to Wireless Networks:** Evolution of Wireless Networks, Challenges, Overview of various Wireless Networks.
2. **Wireless Communications Principles and Fundamentals:** Introduction, The Electromagnetic Spectrum, The Cellular Concept, The Ad Hoc and Semi Ad Hoc Concepts, Wireless Services, Data Delivery Approaches, Overview of Basic Techniques and Interactions Between the Different Network Layers
3. **First Generation (1G) Cellular Systems:** Introduction, Advanced Mobile Phone System (AMPS), Nordic Mobile Telephony (NMT).
4. **Second Generation (2G) Cellular Systems:** Introduction, D-AMPS, cdmaOne (IS-95), GSM, IS-41, Data Operations, Cordless Telephony (CT).
5. **Third Generation (3G) Cellular Systems:** Introduction, 3G Spectrum Allocation, Third Generation Service Classes and Applications, Third Generation Standards.
6. **Fourth Generation (4G):** Introduction, Design Goals for 4G and Beyond and Related Research Issues, 4G Services and Applications, Challenges.
7. **Satellite Networks:** Introduction, Satellite Systems, VSAT Systems, Examples of Satellite-based Mobile Telephony Systems, Satellite based Internet Access.
8. **Fixed Wireless Access Systems:** Wireless Local Loop versus Wired Access, Wireless Local Loop, Wireless Local Loop Subscriber Terminals (WLL), Wireless Local Loop Interfaces to the PSTN, IEEE 802.16 Standards.
9. **Wireless Local Area Networks:** Introduction, Wireless LAN Topologies, Wireless LAN Requirements, The Physical Layer, The Medium Access Control (MAC) Layer, Latest Developments.

10. **Wireless ATM and Ad Hoc Routing:** Introduction, Wireless ATM Architecture, HIPERLAN 2: An ATM Compatible WLAN, Routing in Wireless Ad Hoc Networks.
11. **Personal Area Networks (PANs):** Introduction to PAN Technology and Applications, Commercial Alternatives: Bluetooth, Commercial Alternatives: HomeRF.
12. **Security Issues in Wireless Systems:** The Need for Wireless Network Security, Attacks on Wireless Networks, Security Services, Wired Equivalent Privacy (WEP) Protocol, Mobile IP, Weaknesses in the WEP Scheme, Virtual Private Network (VPN).
13. **Economics of Wireless Networks:** Introduction, Economic Benefits of Wireless Networks, The Changing Economics of the Wireless Industry, Wireless Data Forecast, Charging Issues.
14. **Case Studies on Simulation of Wireless Network Systems:** Performance Evaluation of IEEE 802.11 WLAN Configurations Using Simulation, Simulation Analysis of the QoS in IEEE 802.11 WLAN System, Simulation Comparison of the TRAP and RAP Wireless LANs Protocols, Simulation Modeling of Topology Broadcast Based on Reverse-Path Forwarding (TBRPF) Protocol Using an 802.11 WLAN-based MONET Model.

Text Book:

"Wireless Networks", P. Nicopolitidis, M. S. Obaldat, G. I. Papadimitriou, A. S. Pomportsis, John Wiley & Sons, Ltd.

References:

1. "Wireless Communications Principles and Practices", T. S. Rappaport, Pearson Education.
2. "Wireless Communications and Networks", William Stallings, Pearson Education.
3. "Wireless and Mobile Network Architectures", Yi-BaNG Lin and Imrich Chlamtac, Wiley.
4. "Wireless and Mobile Communication", Sanjeev Kumar, New Age International Publications.
5. "Wireless Network Evolving :2G to 3G", Garg, Pearson Education.
6. "Mobile Communication System", Y. C. Lee.
7. "Guide to Wireless Network Security", John R. Vacca, Springer.
8. "The Wireless Application Protocol", Steve Mann, Scott Sbihli, Wiley.
9. "Mobile Communications", Jochen Schiller, Pearson, Second Edition.
10. "Mobile Computing- Technology, Applications and Service Creation", A. K. Talukder, R.R. Yavagal, TMH.

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:

- | | |
|--|----------|
| 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 Experiment List

1. Study and analysis of wireless device and product specifications.
2. Implementation of spread spectrum techniques like DSSS and FHSS.
3. Use simulation tools like ANSim to study and simulate Ad-Hoc Network.
4. Implementation of MACA as RTS/CTS communication.
5. Study the wireless markup language and develop small application using it.
6. Study and implementation of wireless access and wireless application protocol.
7. Study and implementation of security issues in wireless network.
8. Case study implementation given in the syllabus.

Elective – I: MULTIMEDIA SYSTEMS				
CLASS B.E. (INFORMATION TECHNOLOGY)			SEMESTER VII	
HOURS PER WEEK	LECTURES	:	04	
	TUTORIALS	:	--	
	PRACTICALS	:	02	
EVALUATION SYSTEM:			HOURS	MARKS
	THEORY		3	100
	PRACTICAL		--	--
	ORAL		--	25
	TERM WORK		--	25
Prerequisite: Computer Graphics				
Objective: Students will be able to understand the relevance and underlining infrastructure of multimedia system. The purpose of the course for the students is to apply contemporary theories of multimedia learning to the development of multimedia products. Analyze instructional and informational media (audio/ visual materials, web based materials, games and simulations etc).				

- Multimedia Basics, Multimedia Authoring and Tools:** What is Multimedia?, Multimedia and Hypermedia, . World Wide Web, Overview of Multimedia Software Tools, Further Exploration, Multimedia Authoring, Some Useful Editing and Authoring Tools, VRML.
- Graphics and Image Data Representation:** Graphics/Image Data Types 60, Popular File Formats.
- Concepts in Video and Digital Audio:** Color Science, Color Models in Images, Color Models in Video. Types of Video Signals, Analog Video, Digital Video, Digitization of Sound, MIDI: Musical Instrument Digital Interface, Quantization and Transmission of Audio.
- Lossless & Lossy Compression Algorithms:** Introduction, Basics of Information Theory, Run-Length Coding, Variable-Length Coding, Dictionary-Based Coding, Arithmetic Coding, Lossless Image Compression. Distortion Measures, The Rate-Distortion Theory, Quantization, Transform Coding, Wavelet-Based Coding, Wavelet Packets, Embedded Zerotree of Wavelet Coefficients. Set Partitioning in Hierarchical Trees (SPIHT).
- Image Compression Standards:** The JPEG Standard, The JPEG2000 Standard, The JPEG-LS Standard, Bilevel Image Compression Standards.
- Basic Video Compression Techniques:** Introduction to Video Compression, Video Compression Based on Motion Compensation, Search for Motion Vectors, H.261, H.263 303.
- MPEG Video Coding:** Overview, MPEG-1, MPEG-2, Object-Based Visual Coding in MPEG-4, Synthetic Object Coding in MPEG, MPEG-4 Object types, Profiles and Levels, MPEG-4 Part10/H.264, MPEG-7.

8. **Basic Audio & MPEG Audio Compression Techniques:** ADPCM In Speech Coding, G.726 ADPCM, Vocoders, Psychoacoustics, MPEG Audio, Other Commercial Audio Codecs, future: MPEG-7 and MPEG-2.
9. **Computer and Multimedia Networks:** Basics of Computer and Multimedia Networks, Multiplexing Technologies, LAN and WAN, Access Networks, Common Peripheral Interfaces.
10. **Multimedia Network Communications and Applications:** Quality of Multimedia Data Transmission, Multimedia over IP, Multimedia over ATM Networks, Transport of MPEG-4, Media-on-Demand (MOD), Multimedia over Wireless Networks.
11. **Content-Based Retrieval in Digital Libraries:** How Should We Retrieve Images?, C. BIRD— A Case Study, Synopsis of Current Image Search Systems, Relevance Feedback, Quantifying Results, Querying on Videos, Querying on Other Formats, Outlook for Content-Based Retrieval.
12. **Image Databases:** Raw Images, Compress Image Presentations, Image Processing Segmentation, Similarity- Based Retrieval, Alternating Image DB Paradigms, Representing Image DBs with Relations and R Trees, Retrieving Images by Special Layout, Implementations, Selected Commercial Systems.
13. **Text/Document Databases:** Precision and Recall, Stop Lists, Word Stems and Frequency tables, Latent Semantic Indexing, TV-Trees, Other Retrieval Techniques, Selected Commercial Systems.
14. **Video & Audio Databases:** Organizing content of a Single video, Querying content of Video Libraries, Video Segmentation, Video Standard and Selected Commercial Systems. A general Model of Audio Data, Capturing Audio Content through Discrete Transformation, Indexing Audio Data and Selected Commercial Systems.
15. **Multimedia Databases:** Design and Architecture of a Multimedia Database, Organizing Multimedia Data based on the Principle of Uniformity, Media Abstractions, Query Languages for Retrieving Multimedia Data , Indexing SMDSS with Enhanced Inverted Indices, Query Relaxation/ Expansion, Conclusions and Selected Commercial Systems.

Text Books:

1. Ze-Nian Li and M. S. Drew, "Fundamental of Multimedia", Pearson Education.
2. V. S. Subrahmanian, "Principles of Multimedia Database Systems", Morgan Kaufmann Publication.

Reference Books:

1. K. R. Rao, Zoran S. Bojkovic, D. A. Milovanovic, "Introduction to Multimedia Communications", Wiley.
2. R. Steinmetz and K. Nahrstedt "Multimedia: Computing, Communication & Applications, Pearson Education.
3. Buford, "Multimedia Systems", Pearson Education.

4. C. T. Bhunia, "Multimedia and multimedia Communications", New Age International Publishers.
5. Prabhat K. Andheigh, Kiran Thakrar, "Multimedia Systems design", PHI.
6. Koegel Buford, "Multimedia Systems", Pearson Eduaction.
7. J. D. Gibson, 'Multimedia Communications: Directions and Innovations', Academic Press, Hard-court India.
8. Free Halshal, 'Multimedia Communications', PEA.

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:

- | | |
|--|----------|
| 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 Experiment List

1. Study of multimedia I/O devices.
2. Calculator for blind
3. Media player application
4. Design advertisement using flash/macromedia
5. Design a web application using dream viewer and fireworks
6. Create multimedia database for student ID card preparation
7. Study and use of different MPEG file formats.
8. Construction of website using pictures, videos, audio etc with proper layout.
9. Implementation Huffman algorithm for six character long string.
10. Edit the movie clip using adobe premlere.
11. Record a speech and perform compression and decompression.
12. Design a game/application in flash.
13. Convert BMP file to JPG file using any programming language.

Elective – I : EVOLUTIONARY ALGORITHMS				
CLASS B.E. (INFORMATION TECHNOLOGY)			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 and Algorithms, Knowledge of Programming Language / Tool (c / c++ / Java).				
Objective: The objective of the course is to understand the working of Evolutionary algorithms such as Genetic Algorithm, Genetic Programming, Evolutionary Algorithms and Evolutionary Programming with their application is the various aspects of Computer engineering.				

- 1. Evolutionary Computation (EC):** The Historical Development of EC, Principles of Darwinian natural selection, Overview of Genetic Algorithms (GA), Genetic Programming (GP), Evolutionary Strategies (ES), Evolutionary Programming (EP), Features of Evolutionary Computation, Genes and Population Genetics, The Genotype/Phenotype Dichotomy, Broad Applicability, Hybridization with Other Methods, Parallelism, Applications of Evolutionary Computation.
- 2. Genetic Algorithms (GA):** Overview of Conventional Optimization and Search Techniques, Simple Genetic Algorithm, Comparison with Other Optimization Techniques, Application of GA (Data analysis and prediction, Genetic algorithms in financial markets, GA in search, optimization, and machine learning), GA Terminologies: Individual, Genes, Fitness, Population, Encoding, Breeding, Termination Implicit Parallelism, Case Study of Traveling Salesman Problem.
- 3. Advanced Operators in GA:** Diploidy, Dominance and Abeyance, Multiploid, Inversion and Reordering, Niche and Speciation, Micro-operators, Non-binary Representation, Multi-objective Optimization, Combinatorial Optimization, GA classifications: SGA, Parallel GA, Hybrid GA.
- 4. Genetic Programming (GP):** Introduction, Comparison with GA, Primitives of GP, Attributes, Terminals, Function set, Operators in GP, Steps in GP, Improving genetic programming with statistics, Genetic programming with tree genomes, linear genomes, and graph genomes, Implementation of genetic programming, GP Applications. Case study of Santa-Fe-trail, Case study of John Muir Trail.
- 5. Foundations of Evolutionary Algorithms:** Schemas and the two-armed bandit problem, Mathematical models for simple genetic algorithms, Where to use evolutionary algorithms? Theoretical advantages and disadvantages of evolutionary algorithms over alternative methods (hill-climbing, simulated annealing, etc.), Co-evolutionary

Algorithms: Cooperative co-evolution, Competitive co-evolution, Swarm Intelligence and ant colony optimization.

6. **Evolutionary Strategies (ES):** Introduction, Comparison with GA & GP, Operators, Gaussian Mutation Operator, Intermediate Recombination Operator, Application of ES for Image Enhancement.
7. **Evolutionary Programming (EP):** Introduction. Comparison with GA, GP & ES. Selection mechanism, Applications of ES.
8. **Multi-Objective Evolutionary Optimization:** Pareto optimality. Multi-objective evolutionary algorithms. Learning Classifier Systems: Basic ideas and motivations, Main components and the main cycle. Theoretical Analysis of Evolutionary Algorithms: Schema theorems, Convergence of EAs, Computational time complexity of EAs, No free lunch theorem.
9. **Application of Genetic Algorithm to Image Processing:** Designing Texture Filters with Genetic Algorithms, Genetic Algorithm Based Knowledge Acquisition on Image Processing, Object Localization in Images Using Genetic Algorithm, Problem Description, Image Preprocessing, The Proposed Genetic Algorithm Approach.

Text Book:

1. Sivanandam, Deepa "Introduction to Genetic Algorithm", Springer.
2. Melanie Mitchell: "An Introduction to Genetic Algorithm", PHI.

Reference Books:

1. D. E. Goldberg, "Genetic Algorithms in Search, Optimisation and Machine Learning", Addison-Wesley.
2. Zbigniew Michalewics, "Genetic Algorithms + Data Structures = Evolution Programs", Springer Verlag, 1997.
3. Goldberg, "Genetic Algorithms", Pearson Education.
4. T. Back, D. B. Fogel and Michalewicz, "Evolutionary Computation1: Basic Algorithms and Operators", 2000.
5. A. E. Eiben and J.E. Smith, "Introduction to Evolutionary Computing", Springer, 2003.
6. W. Banzhaf et al. Morgan Kaufmann, "Genetic Programming: An Introduction", 1999.
7. J. R. Koza, "Genetic Programming: On the Programming of Computers by Means of Natural Selection", 1992
8. Vose Michael D, "The Simple Genetic Algorithm --- Foundations And Theory", Phi.
9. Rajasekaran S., Pai G.A. Vijayalakshmi, "Neural Networks, Fuzzy Logic, and Genetic Algorithms: Synthesis and Applications", Phi.
10. Reeves, C. R. and Rowe, J. E., "Genetic Algorithms - Principles and Perspectives: A Guide to GA Theory", 2003.
11. Falkenauer. E., "Genetic Algorithms and Grouping Problems", 1998.

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:

- | | |
|--|----------|
| 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 Experiment list

A mini-project based on the following (not Restricted to) topic:

- Flow Shop Scheduling Problem.
- Traveling Sales-person Problem.
- Santa-Fe-trial.
- John Muir Trail.
- Designing Texture Filters with Genetic Algorithm.
- Knowledge Acquisition on Image Processing.
- Object Localization in Images Using Genetic Algorithm.
- Finite Automata Construction Using Genetic Algorithm.
- Russian Roulette

Elective – I: IT APPLICATIONS IN CIVIL ENGINEERING				
CLASS B.E. (INFORMATION TECHNOLOGY)			SEMESTER VII	
HOURS PER WEEK	LECTURES	:	04	
	TUTORIALS	:	--	
	PRACTICALS	:	02	
			HOURS	MARKS
EVALUATION SYSTEM:	THEORY		3	100
	PRACTICAL		--	--
	ORAL		--	25
	TERM WORK		--	25

Unit 1: Introduction to construction Industry

Introduction to various aspects of Civil Engineering; Overview of present practices in Structural, Hydraulics, Geotechnical, Surveying, Environmental & construction Management and their field applications. Perspectives and definition of the construction firms for the future; New trends in organization for the construction firm.

Unit 2: Software Applications in construction Projects

Use of advanced spread sheet and advanced autocad in civil engineering projects; Understanding the basics of developing software for the purpose of structural analysis, Geotechnical analysis, surveying, water resource management and Project Management. Overview of GIS & GPS.

Unit 3: IT applications in construction project management.

Overview of Construction equipments; Developing simple programs for calculating equipment output, cycle time, strength of concrete using any of the procedural languages.(BASIC, COBAL or FORTRAN). Developing applications with file and database software; Developing simulations for various civil engineering operations. Management of information; Web based material procurement, e-auctions and e-tendering.

Unit 4: Intelligent Buildings & Building Automation

Concept of Intelligent Building. Building Automation, Controls and Protocols IT tools for Illumination, HVAC load calculation, Acoustics, Fire etc. Energy Efficiency in Buildings. Passive Architecture. Green Building concepts. Overview of Building Management System Software

Unit 5: IT applications in Construction quality & safety.

Use of sensors and wireless communication technologies on construction sites for safe operations. Use of lasers and sensors in defect detections and construction quality improvement.

Recommended Text Book:

1. **Boyd C Paulson, JR "Computer applications in construction"**, Mc Graw Hill International Editions, Civil Engineering Series.

Students should be demonstrated capabilities of present software in structural and Construction Management areas (Minimum one source code from each) Students shall also be encouraged to write programs for simple problems of construction field applications

Term Work:

Term work shall consist of at least 10 experiments/ presentations/ assignments covering all topics and one written test.

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.

Elective I - NANOTECHNOLOGY				
CLASS B.E. (INFORMATION TECHNOLOGY)			SEMESTER VII	
HOURS PER WEEK	LECTURES	:	04	
	TUTORIALS	:	--	
	PRACTICALS	:	02	
EVALUATION SYSTEM:			HOURS	MARKS
	THEORY		3	100
	PRACTICAL		--	--
	ORAL		--	25
TERM WORK			--	25
Prerequisite: -				
Objective: Students are expected to learn both some basic science and technology and at the same time, some techniques for understanding the social and cultural significance, role, and possible effects of this emerging science.				

1. **Introduction to Physics of the Solid States:** Structure, energy bands, localized particles.
2. **Methods of Measuring Properties:** Introduction, structures, microscopy, spectroscopy.
3. **Properties of Individual Nanoparticles:** Introduction, metal nanoclusters, semiconducting nanoparticles, rare gas and molecular clusters, methods of synthesis.
4. **Mechanical & Magnetic Properties:** Strength of nano crystalline SiC, preparation for strength measurements, mechanical properties, magnetic properties. Super-paramagnetism, material preparation, magnetization of nano particles of magnetite, Mossbauer data of nano particles of magnetite, ESR spectroscopy, small angle neutron scattering.
5. **Electrical & Optical Properties:** Switching glasses with nanoparticles, Electronic conduction with nano particles. Optical properties, special properties and the coloured glasses.
6. **Investigating and Manipulating materials in the Nanoscale:** Electron microscopies, scanning probe microscopies, optical microscopies for nano science and technology, X-ray diffraction.
7. **Optics and Electronics:** Light energy, its capture, and photovoltaics, light production, light transmission, light control and manipulation, electronics, carbon nano tubes, soft molecule electronics, memories, gates & switches, architectures.
8. **NanoTechnology-Enabled Sensor:** Possibilities, relentless integration, advances in processing, diverse nanomaterials, new tools, realities, intensified design problems, the risk of commercialization, diverse applications.

9. **Microelectronics:** Introduction, nano manufacturing product strategy, considering future impacts, identifying potential synergies, existing technologies, future nano electronic device technologies, photonics.
10. **Smarter Computers, Faster Internet, Cheaper Energy:** Building a better Digital brain, routing information at the speed of light, nano flying electronics, getting energy and a cleaner environment with nanotech.
11. **Nano Medicines:** Developing of Nanomedicines, Nanosystems in use, Protocols for nanodrug Administration, Nanotechnology in Diagnostics applications, materials for used in Diagnostics and Therapeutic applications, Molecular Nanomechanics, Molecular devices, Nanotribology, studying tribology at nanoscale, Nanotribology applications.
12. **Nanobusiness:** Boom, Bust, and nanotechnology:- the next industrial revolution? nanobusiness today, high tech, bio tech, nanotech.
13. **Nanotechnology and You:** Nanotechnology:- here and now, the nature of ethics, ethics of individual behavior, nano ethics, converging technologies, practical responses, promise of nanotechnology.

Reference Books:

1. "Introduction to Nanotechnology", C. P. Poole and F. J. Owens, Wiley.
2. "Nano Materials", A. K. Bandyopadhyay, New Age International Publishers.
3. "Nano Essentials", T. Pradeep, TMH.
4. "Nanotechnology: A Gentle Introduction to the Next Big Idea", M. Ratner and D. Ratner, Pearson Education.
5. "Nanotechnology – Science, Innovation, and Opportunity", L. E. Foster, Pearson Education.
6. "Nanotechnology – the fun and easy way to explore the science of matter's smallest particles", Richard Booker and Earl Boysen, Wiley.
7. Nanotechnology: Content and Context, Christopher Kelty and Kristen Kulinowski.

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:

- | | |
|--|----------|
| 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 Experiment list

A group of maximum three students should be formed to carry out the research in various application areas of nano technology as mentioned in the syllabus. As a term work they need to submit a report of maximum five pages on each application they explored on top of the syllabus.

Elective – I: GEOGRAPHICAL INFORMATION SYSTEMS				
CLASS B.E. (INFORMATION TECHNOLOGY)			SEMESTER VII	
HOURS PER WEEK	LECTURES		04	
	TUTORIALS		--	
	PRACTICALS		02	
			HOURS	MARKS
EVALUATION SYSTEM:	THEORY		3	100
	PRACTICAL		--	--
	ORAL		--	25
	TERM WORK		--	25
Prerequisite: Computer Graphics				
Objective: To understand fundamental concepts and principles of Geographical Information Systems.				

- Fundamentals of GIS:** Introduction, Definition of GIS, Evolution of GIS, Roots of GIS, Four M's, Definition, GIS Architecture, Models of GIS, Framework for GIS, GIS Categories, Map as a Model, Spatial Referencing System, Map Projections, Commonly Used Map Projections, Grid Systems, Cartographic Symbolization, Types of Maps, Typography, Map Design, Map Productions, Map Applications.
- Data Management, Models and Quality Issues:** Conceptual Models, Geographical Data Models, Data Primitives, Data Types - Raster and Vector Approach, Digital Terrain Modeling , Approaches to digital terrain data modeling , Acquisition of digital terrain data, Data Modeling and Spatial Analysis, Sources of Geographical Data, Data Collectors and Providers, Creating Digital Data Sets, Data Presentation, Data Updating, Data Storage, Spatial Data Costs, Quality of GIS Output, Sources of Errors in Spatial Data, Factors affecting Reliability of Spatial Data, Faults from Assumptions, spatial autocorrelation, Quadrat counts and Nearest – Neighbour analysis, Trend surface analysis, Gravity models.
- GIS Data Processing, Analysis and Visualization:** Raster based GIS data processing, Vector based GIS data processing, Human computer interaction and GIS, Visualization of geographic information, principles of cartographic design in GIS, Generation of information product, Image Classification and GIS, Visual Image Interpretation, Types of Pictorial Data Products, Image Interpretation Strategy, Image Interpretation Process, Overview of Image Interpretation Equipments.
- Terrain Mapping, Geocoding and Segmentation:** Interpolation, Visualization of Continuous Surfaces, Data Sources for Interpolations, Methods for Interpolations, Global Interpolation, Local Deterministic Methods, Comparison of Global and Local Method, Optimal Interpolation Using Geo Statistics -- Kriging, Variogram, Geocoding, Applications of Geocoding, Dynamic Segmentation, Applications of Dynamic Segmentation.
- Remote Sensing Fundamentals:** Remote Sensing - Basic Principles, Electromagnetic Remote Sensing, Energy Sources, Energy Interactions with Earth's Surface Materials,

Microwave Remote Sensing, The Radar Principle, Factors Affecting Microwave Measurements, Radar Wavebands, SLAR Systems, Sar, Interpreting Sar Images, Geometrical Characteristics, Remote Sensing, Platform and Sensors, Satellite System Parameters, Sensor Parameters, Imaging Sensor Systems, Earth Resources Satellites, Meteorological Satellites.

6. GIS Project Design and Management: Software engineering as applied to GIS, GIS project planning, System analysis and study of user requirement, Geographic database design methodology, GIS application software design methodology, system implementation, system maintenance and support.
7. Issues and Applications in GIS: Changes in Technology, Data Supply and Users, Role of Satellite Imagery and Data Sets, Trends in GIS, GIS users, Urban and Municipal Applications, Other Applications.

Reference Books:

1. Peter A Burrough and McDonell, "Principles of Geographical Information Systems", Oxford University Press, 1998.
2. M. N. DeMers, "Fundamentals of Geographic Information Systems", 3rd edition, Wiley.
3. M. Anji Reddi, "Remote Sensing and Geographical Information Systems", B. S. Publications, Second Edition, 2001.
4. George B Korte, "The GIS Book", Onword press, Thomson Learning, 5th Edition, 2003.
5. Kang-tsung Chang, "Introduction to Geographical Information Systems", Tata McGraw Hill, Third Edition, 2003.
6. Tor Bernhardsen, "Geographic Information Systems – An Introduction", 3rd edition, Wiley.
7. Ian Heywood, Sarah Cornelius & etal., "An Introduction to Geographical Information Systems", 2nd Edition, Pearson Education.

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:

- | | |
|--|----------|
| 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.

ELECTIVE – I : ARTIFICIAL INTELLIGENCE				
CLASS B.E. (INFORMATION TECHNOLOGY)			SEMESTER VII	
HOURS PER WEEK	LECTURES	:	04	
	TUTORIALS	:	--	
	PRACTICALS	:	02	
EVALUATION SYSTEM:			HOURS	MARKS
	THEORY		3	100
	PRACTICAL		--	--
	ORAL		--	25
	TERM WORK		--	25
Prerequisite: programming language like JAVA or Python				
Objective: This course will introduce the basic ideas and techniques underlying the design of intelligent computer systems. Students will develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents. This course will attempt to help students understand the main approaches to artificial intelligence such as heuristic search, game search, logical inference, decision theory, planning, machine learning, neural networks and natural language processing. Students will be able to recognize problems that may be solved using artificial intelligence and implement artificial intelligence algorithms for hands-on experience				

1. **Artificial Intelligence:** Introduction to AI, History of AI, Emergence Of Intelligent Agents
2. **Intelligent Agents:** PEAS Representation for an Agent, Agent Environments, Concept of Rational Agent, Structure of Intelligent agents, Types of Agents.
3. **Problem Solving:** Solving problems by searching, Problem Formulation, Uninformed Search. Techniques- DFS, BFS, Iterative Deepening, Comparing Different Techniques, Informed search methods – heuristic Functions, Hill Climbing, Simulated Annealing, A*, Performance Evaluation.
4. **Constrained Satisfaction Problems:** Constraint Satisfaction Problems like, map Coloring, Crypt Arithmetic, Backtracking for CSP, Local Search.
5. **Adversarial Search:** Games, Minimax Algorithm, Alpha Beta pruning.
6. **Knowledge and Reasoning:** A knowledge Based Agent, Introduction To Logic, Propositional Logic, Reasoning in Propositional logic, First Order Logic: Syntax and Semantics, Extensions and Notational Variation, Inference in First Order Logic, Unification, Forward and backward chaining, Resolution.
7. **Knowledge Engineering:** Ontology, Categories and Objects, Mental Events and Objects.
8. **Planning:** Planning problem, Planning with State Space Search, Partial Order Planning, Hierarchical Planning, Conditional Planning.

9. **Uncertain Knowledge and Reasoning:** Uncertainty, Representing knowledge in an Uncertain Domain, Overview of Probability Concepts, Belief Networks, Simple Inference in Belief Networks
10. **Learning:** Learning from Observations, General Model of Learning Agents, Inductive learning, learning Decision Trees, Introduction to neural networks, Perceptrons, Multilayer feed forward network, Application of ANN, Reinforcement learning: Passive & Active Reinforcement learning.
11. **Agent Communication:** Communication as action, Types of communicating agents, A formal grammar for a subset of English

Text Book:

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 2nd Edition, Pearson Publication.

Reference Books:

1. George Luger, "AI-Structures and Strategies for Complex Problem Solving", 4/e, 2002, Pearson Educations
2. Robert J. Schalkoff, Artificial Intelligence: an Engineering approach, McGraw Hill, 1990.
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. M. Tim Jones, Artificial Intelligence – A System Approach, Infinity Science Press - Firewall Media.
8. Christopher Thornton and Benedict du Boulay, "Artificial Intelligence – Strategies, Applications, and Models through Search, 2nd Edition, New Age International Publications.
9. Elaine Rich, Kevin Knight, Artificial Intelligence, Tata McGraw Hill, 1999.
10. David W. Rolston, Principles of Artificial Intelligence and Expert System Development, McGraw Hill, 1988.

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:

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 Experiment list: (Can be implemented in JAVA)

1. Problem Formulation Problems.
2. Programs for Search
3. Constraint Satisfaction Programs
4. Game Playing Programs
5. Assignments on Resolution
6. Building a knowledge Base and Implementing Inference

7. Assignment on Planning and reinforcement Learning
8. Implementing Decision Tree Learner
9. Neural Network Implementation
10. Bayes' Belief Network (can use Microsoft BBN tool)
11. Assignment on Agent Communication --- Grammar Representation For Simple Domains

ORAL EXAMINATION

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

PROJECT - I			SEMESTER VII	
CLASS B.E. (INFORMATION TECHNOLOGY)				
HOURS PER WEEK	LECTURES			
	TUTORIALS		04	
	PRACTICALS			
EVALUATION SYSTEM:			HOURS	MARKS
	THEORY			
	PRACTICAL			25
	ORAL			25
	TERM WORK			

Objective: To help students to develop some of the following

- Relate theory with real time applications
- Experiencing the issues involved with creation & design of simple products and processes
- Initiating them to technical writing and documentation for reuse
- Developing proficiency in carrying out critical analysis, review and study of existing Literature on technological experimentation and finding out of scholastic investigation

Guidelines to carry out project

1. Project Topic and group size:

- ➊ Project shall be carried out within the campus making use of library and laboratory facility and group size of students working on same project topic shall not exceed 4 (Four)
- ➋ Project shall be any one of the following
 - Creation of software, hardware or middleware related with all kinds of electronic, communication or control system devices
 - Critical study, analysis or review of Information Communication Technology literature in the public domain which is not part of your curriculum
 - Fabrication of devices preferably those devices energized from converging technologies
 - Creation of experimental setup and experimentation based on technological literature in the public domain
- ➌ Project can be undertaken on any subject taught through semester I to Semester VIII
- ➍ Students can certainly take ideas from anywhere, but be sure that they should evolve them in the unique way to suit their project requirements.
- ➎ Head of department and senior staff in the department will take decision regarding projects.

Project Report Format may consist of some of the following

- Introduction of the title
- 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

INFORMATION STORAGE MANAGEMENT AND DISASTER RECOVERY				
SEMESTER VIII				
CLASS B.E. (INFORMATION TECHNOLOGY)				
HOURS PER WEEK	LECTURES	:	04	
	TUTORIALS	:	--	
	PRACTICALS	:	02	
			HOURS	MARKS
			3	100
EVALUATION SYSTEM:	THEORY	:	--	--
	PRACTICAL	:	--	25
	ORAL	:	--	25
	TERM WORK	:	--	
Prerequisite: Operating Systems for Computational Devices, Networking Technology for Digital Devices, and Database Systems				
Objective: Evaluate storage architectures, including storage subsystems, DAS, SAN, NAS, and CAS. Define backup, recovery, disaster recovery, business continuity, and replication. Examine emerging technologies including IP-SAN. Understand logical and physical components of a storage infrastructure. Identify components of managing and monitoring the data center. Define information security and identify different storage virtualization technologies.				

1. **Introduction to Information Storage Technology:** Review data creation and the amount of data being created and understand the value of data to a business, Challenges in Data Storage and Management, Data Storage Infrastructure.
2. **Storage Systems Environment:** Components of a Storage System Environment: Disk drive components, Disk Drive Performance, Logical Components.
3. **Data protection:** Concept of RAID and its Components, Different RAID levels and their suitability for different application environments: RAID 0, RAID 1, RAID 3, RAID 4, RAID 5, RAID 0+1, RAID 1+0, RAID 6, Comparison of Levels.
4. **Intelligent Storage Systems;** Components, Intelligent Storage Array, High-level architecture and working of an intelligent storage system.
5. **Introduction to Networked Storage:** Evolution of networked storage, Architecture, Overview of FC-SAN, NAS, and IP-SAN. Network-Attached Storage (NAS): Benefits of NAS, Components, Implementations, File Sharing, I/O operations, Performance and Availability.
6. **Content Addressed Storage (CAS):** features and Benefits of a CAS. CAS Architecture, Storage and Retrieval, Examples.
7. **Storage Virtualization:** Forms, Taxonomy, Configuration, Challenges, Types of Storage Virtualizations.

8. **Information Availability & Monitoring & Managing Datacenter:** Information Availability, Business continuity, Failure Analysis, Business impact Analysis, Differentiate between business continuity (BC) and disaster recovery (DR).
9. **Disaster Recovery:** Backup, Methods, And Technologies, Replication technologies: Local replicas, Technologies, Restore and Restart, Multiple Replicas. Remote Replication. DR in practice.
10. **Storage Security and Management:** Security Framework, Storage security domains, List and analyzes the common threats in each domain, Security Implementations.
11. **Managing The Storage Infrastructure:** Monitoring the Storage Infrastructure, Storage Management Activities, Challenges and solutions.

Text Book:

1. EMC Educational Services, "Information Storage and Management", Wiley India.

Reference Books:

1. Richard Barker and Paul Massiglia, "Storage Area Network Essentials: A Complete Guide to Understanding and Implementing SANs", Wiley India.
2. Robert Spalding, "Storage Networks: The Complete Reference", Tata McGraw Hill Osborne, 2003.
3. Marc Farley, "Building Storage Networks", Tata McGraw Hill, Osborne, 2001.
4. Meet Gupta, "Storage Area Network Fundamentals", Pearson Education Limited, 2002.

Term Work:

Term work shall consist of a combination of 10 assignments and programs covering the topics of the syllabus. One written test is also to be conducted.

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 |

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Suggested Program/Assignment list

1. The website of the textbook has sample assignments for every chapter. These can be used as a guideline
2. Programming assignments can be done on simulators available at the website – RAID, Virtualization etc.
3. Two Case Studies like IBM Tivoli, EMC technologies etc.

ORAL EXAMINATION

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

GAME ARCHITECTURE & PROGRAMMING			
CLASS B.E. (INFORMATION TECHNOLOGY)			SEMESTER VIII
HOURS PER WEEK	LECTURES		04
	TUTORIALS		--
	PRACTICALS		02
EVALUATION SYSTEM:		HOURS	MARKS
	THEORY	3	100
	PRACTICAL	--	
	ORAL	--	25
	TERM WORK	--	25
Prerequisite Proficiency in C/C++ programming			
Objective: An important characteristic of technical education is an emphasis on their challenging nature, the structured character of the concepts, the critical role of quantitative problem solving, and the importance of qualitative reasoning. Much of the difficulty in mastering technical subjects lies in the importance of abstract variables and the constraints among them. Concepts of Modern game software architecture, Game worlds and game objects, Collision detection, Events and scripting, Introduction to animation and Implementing game play would help students acquire this knowledge. This course provides students with an introduction to the technologies and software engineering practices used in the video game industry today. Students will learn the basics of creating a PC game-based DirectX, through lecture material, hands-on labs, and a final project in which the students will actually build a simple game from the ground up.			

GAME ARCHITECTURE

1. **Core Design:** What Is a Game? Games Aren't Everything. Games Mean Gameplay. Creating the Game Spec. Example Game Spec.
2. **Initial Design:** The Beginning. Hardware Abstraction. The Problem Domain. Thinking in Tokens.
3. **Use of Technology:** The State of the Art. Blue-Sky Research. Reinventing the Wheel. Use of Object Technology.
4. **Building Bricks:** Reusability in Software.
5. **Initial Architecture Design:** The Birth of Architecture. The Tier System. Architecture Design.
6. **Development:** The Development Process. Code Quality. Coding Priorities. Debugging and Module Completion. The Seven Golden Gambits. The Three Lead Balloons.

GAME PROGRAMMING

1. **Technologies:** Display, Mixing 2D & 3D, DirectX, User Interface code, Resource caching, the main loop.
2. **Design Practices:** Smart & naked pointers, using memory correctly, Game scripting languages.
3. **Building your game:** Creating a project, source code repositories and version control, Building the game and scripts.
4. **User interface programming and input devices:** Getting the Device State, Working with the Mouse (and Joystick), Working with the Keyboard, User Interface Components, More Control Properties
5. **2D Drawing and DirectX:** 2D Drawing and DirectX, Basic 2D Drawing Concepts, Drawing Text, Working with Sprites, Graphics File Formats.
6. **Initialization and the Main Loop:** Initialization, Some C++ Initialization Pitfalls, Initializing your Game, the Main Loop, Stick the Landing: A Nice Clean Exit.
7. **Loading and Caching Game Resources:** Art and Sound Formats, Resource Files, Data Compression, IPac: A Resource File Builder, the Resource Cache, World Design and Cache Prediction.
8. **3D Graphics & 3D Engines:** 3D Graphics Pipeline, Setting Up a Project, Using a Scene Graph, 3D Middleware Review, Rolling Your Own 3D Engine.

Text Books:

1. "Game Architecture and Design", Andrew Rollings & Dave Morris
2. "Professional Game Programming" Mike McShaffry, Dreamtech Press.

Reference Book:

1. "Game Programming", Andy Harris, Wiley India.

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:

- | | |
|--|----------|
| 1. Laboratory work (Experiments and Journal) | 15 Marks |
| 2. Test (at least one) | 10 Marks |

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SOFTWARE PROJECT MANAGEMENT			
CLASS B.E. (INFORMATION TECHNOLOGY)			SEMESTER VIII
HOURS PER WEEK	LECTURES	:	04
	TUTORIALS	:	--
	PRACTICALS	:	02
		HOURS	MARKS
EVALUATION SYSTEM:	THEORY	3	100
	PRACTICAL	--	--
	ORAL	--	25
	TERM WORK	--	25
Prerequisite: Software Engineering			
Objective: At the end of the course, the student should get familiarize with the characteristics of a project, project management principles, risk in environment and the management challenges for effective project management. The student will be able to understand and use the project management principles across all phases of a project. They will be able to demonstrate competency in the management of a project plan, especially in monitor and controlling a project schedule and budget, tracking project progress. They will understand how to work as team member and as Individual without affecting the quality of project. The student should be able to coordinate the close out of a project contract. They will share best practices and tools related to project management			

1. **An overview of IT Project Management:** Introduction, the state of IT project management, context of project management, need of project management, project goals, project life cycle and IT development, extreme project management, PMBOK.
2. **Conceptualizing and Initializing the IT Project:** An information technology project methodology (ITPM), project feasibility, request for proposal (RFP), the business case, project selection and approval, project contracting, IT governance and the project office.
3. **The Human Side of Project Management:** Introduction, organization and project planning, the project team, the project environment.
4. **Developing the Project Charter and Project Plan:** Introduction, project management process, project integration management, the project charter, project planning framework, the contents of a project plan, the planning process, The Work Breakdown Structure (WBS), the linear responsibility chart, multidisciplinary teams.
5. **The Scope Management Plan:** Introduction, scope planning, project scope definition, project scope verification, scope change control.
6. **The Project's Schedule, Budget and Risk Management:** Introduction, developing the project schedule, project management software tools, methods of budgeting, developing the project budget, improving cost estimates, finalizing the project schedule and budget. IT project risk management planning process, identifying IT project risks, risk analysis

and assessment, risk strategies, risk monitoring, and control, risk responses and evaluation.

7. **Allocating Resources to the Project:** Resource loading, resource levelling, allocating scarce resources to projects and several projects, Goldratt's critical chain.
8. **The Project Communication Plan:** Introduction, monitoring and controlling the project, the project communications plan, project metric, project control, designing the control system, the plan-monitor-control cycle, data collection and reporting, reporting performance and progress, information distribution.
9. **Managing Change, Resistance and Conflicts:** Introduction, the nature of change, the change management plan, dealing with resistance and conflicts.
10. **Managing Project Procurement and Outsourcing:** Introduction, project procurement management, outsourcing.
11. **Project Leadership and Ethics:** Introduction, project leadership, ethics in projects, multicultural projects.
12. **The Implementation Plan and Project Closure:** Introduction, project implementation, administrative closure, project evaluation, project audit.

Text Book:

"Information Technology Project Management", Jack T. Marchewka, 3rd edition, Wiley India, 2009.

Reference Books:

1. S. J. Mantel, J. R. Meredith and etl., "Project Management" 1st edition, Wiley India, 2009.
2. John M. Nicholas, "Project Management for Business and Technology", 2nd edition, Pearson Education.
3. Joel Henry, "Software Project Management, A real-world guide to success", Pearson Education, 2008.
4. Gido and Clements, "Successful Project Management", 2nd edition, Thomson Learning
5. Hughes and Cornell, "Software Project Management", 3rd edition, Tata McGraw Hill
6. Joseph Phillips, "IT Project Management", end edition, Tata McGraw Hill
7. Robert K. Wyzocki and Rudd McGary, "Effective Project Management", 3rd edition, Wiley
8. Brown, K.A. Project Management, McGraw Hill, 2002.
9. E-Book – Project Management Body of Knowledge.
10. Dinsmore, P. C. (Ed.). (1993) The AMA Handbook of Project Management. AMACOM

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:

- | | |
|--|----------|
| 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 Experiment List

In practical, a group of maximum three students should be formed. Each group is supposed to complete all lab experiments on the case study given by the subject teacher. In lab experiments students can use the tools like MsWord to prepare document whereas MsProject to preparing WBS, N/w diagram, PERT, CPM, Variance analysis etc.

1. Project and System's Management
2. Feasibility study document
3. Project Proposal
4. Project Planning
5. Activity Planning
6. Analyzing the project network diagram
7. Cost estimation and budgeting
8. Risk management
9. Performance analysis of project
10. Project evaluation and closure

Elective II - CLOUD COMPUTING				
CLASS B.E. (INFORMATION TECHNOLOGY)			SEMESTER VIII	
HOURS PER WEEK	LECTURES	:	04	
	TUTORIALS	:	--	
	PRACTICALS	:	02	
			HOURS	MARKS
EVALUATION SYSTEM:	THEORY		3	100
	PRACTICAL		--	--
	ORAL		--	25
	TERM WORK		--	25
Prerequisite: Distributed Systems				
Objective: Students will have a comprehensive knowledge of cloud computing techniques, best practices in cloud computing. They will be able to understand the current challenges in cloud computing. They will be able to understand how to design and implement cloud-based applications.				

1. **Understanding Cloud Computing:** Introduction to cloud computing, are you ready for cloud computing?, surveying the Role of Cloud Computing, developing the cloud services.
2. **Understanding Windows Azure Platform Architecture:** The Windows Azure Developer Portal, Creating and running Projects in the Azure Development Platform, Using Azure Application Templates for Visual Studio 2008, Taking advantage of Auxiliary Cloud Services, Deploying Application and Services to the Azure Cloud.
3. **Analyzing the Windows Azure Operating System:** The Lifecycle, Securing and Isolating Services and Data, Assuring Fabric Controller Availability, Virtualizing Windows Server for Azure.
4. **Scaling Azure Table and Blob Storage:** Creating Storage Accounts, Using or Wrapping the Azure Storage Services' REST APIs, Understanding Azure Table Storage, Storing and retrieving Blobs.
5. **Minimizing Risk When Moving to the Azure Cloud Service:** Bypassing the Barrier to Cloud Computing, Implementing the Secure Sockets Layers Transmission, Encryption for Web Roles, Encrypting Personal Information in Azure Storage Services, Auditing Conformance to Regulatory and Industry Standards.
6. **Authenticating and Authorizing Service User:** Taking Advantage of ASP.NET Membership Services, Adapting ASP.NET Authentication and Role Management to Windows Azure Web Role, Analyzing the AspProviders Library's Classes, Moving the AspProvidersDemo's Data Source to the Cloud, Integrating Membership Services with an Azure Service, Authenticating users with Windows Live ID.
7. **Optimizing the Scalability and Performance of Azure Tables:** Assigning Primary Key Values to Entities, Handling Associated Entities, Taking Advantage of Entity Group

Transactions, Uploading the table data, Displaying the Data from Heterogeneous Tables in Grids.

8. **Massaging with Azure Queues: Creating and Processing Azure Queues and Messages, Enhancing the Thumbnails.sin Sample Solution.**
9. **Authenticating Users with .NET Access Control Services: Creating the .NET Services Solution, Installing the .NET Services SDK and other Tools, Crating the CardSpace Credentials at Federatedidentity.net, Using a Managed CardSpace Credential with ACS.**
10. **Interconnecting the Services with the .NET Service Bus: Creating .NET Service Solution and Installing Prerequisites, Relaying Message with SB, Analyzing the .NET Services SDK's EchoSample Solution, Using the Configuration File to Specify WSHttRelayBinding.**
11. **Exploring .NET Service Bus Queues and Routers: Persisting Messages in Service Bus Queues, Delivering Message with Service Bus Routers.**

Text Book:

"Cloud Computing with the Windows Azure Platform", Roger Jennings. Wiley.

Reference Books:

1. "Cloud Computing", Michael Miller, Pearson Education.
2. "AJAX Construction Kit: Building Plug-and-Play Ajax Applications," Michael Morrison.
3. "AJAX Security", Billy Hoffman and Bryan Sullivan.
4. "Parallel Programming", Barry Wilkinson and Michael Allen

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:

- | | |
|--|----------|
| 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 Experiment List

1. Collaboration on calendars, schedules, and task management
2. Collaboration on event management
3. Collaboration on contact management
4. Collaboration on project management
5. Collaboration on word processing
6. Collaboration on spreadsheets
7. Collaboration on databases
8. Collaboration on presentation
9. Collaboration on file sharing and any other on line content
10. Collaboration via web communication tools

Elective - II: IT FOR HEALTH CARE				
CLASS B.E. (INFORMATION TECHNOLOGY)			SEMESTER VIII	
HOURS PER WEEK	LECTURES	:	04	
	TUTORIALS	:	--	
	PRACTICALS	:	02	
EVALUATION SYSTEM:			HOURS	MARKS
	THEORY		3	100
	PRACTICAL		--	--
	ORAL		--	25
	TERM WORK		--	25
Prerequisite: Basic knowledge of IT and MIS				
Objective: The aim of this course is to make students aware of the use of information and communication technology in health care. Health IT can support patient care related activities using Health IT applications, such as desktop computer applications, cellular phones, personal digital assistants (PDAs), touch screen kiosks, and others. Examples of health IT applications are, electronic health records (EHR) electronic medical records (EMR), personal health records (PHR), telemedicine, clinical alerts and reminders, computerized provider order entry, computerized clinical decision support systems, consumer health informatics applications, and electronic exchange of health information. Widespread adoption of health information technology (health IT) can foster improvements in quality, safety, efficiency and access – key goals in today's national dialog on health reform.				

- Planning and Developing an IT Strategy:** Introduction - Mission of IT in Health Care - Creating a System - Managing the IT Strategic Planning -Process - Strategies in Consulting for the 21st Century - Baylor Health Care - Clarian Health care.
- Preparing For Organizational Change:** Informatics in Health Care: Managing Organizational Change - The Role of Ethics in IT Decisions - Cases in Redesign - Memorial Hermann Healthcare System: Redesign and Implementation of a Multifacility - Clinical Information System - UPMC Health System.
- Transformation:** IT- Transition Fundamentals in Care Transformation -The Role of the CIO - Northwestern Memorial Hospital, Chicago: Patients First from the Ground Up - The Jewish Home and Hospital Lifecare System - NYC.
- Patient-Centered Technologies:** Patient Outcomes of Health Care - Six Sigma Excellence - Electronic Health Record - Interviewing Patients with a Computer - Nursing Administration: A Growing Role in Systems Development - Computer-Enhanced Radiology - Information Technology and the New Culture of Patient Safety - A Component Based Clinical Information and Electronic Health Record.

5. **Outlook On Future Technologies:** Technologies in Progress - Evidence-Based Medicine - Aligning Process and Technology - Clinical Decision Support Systems - Quality Information and Care - Role for Health Information Systems - Clinical Practice - Connecting the Community for Better Health.

Text Book:

1. Ball, Marion; Weaver, Charlotte A.; Kiel, Joan M. (Eds.), "Healthcare Information Management Systems Cases, Strategies, and Solutions Series: Health Informatics", 3rd ed., Springer Berlin Heidelberg New York, 2004.

Reference:

1. Karen A. Wager, Frances Wickham Lee, John P. Glaser, "Managing Health Care Information Systems: A Practical Approach for Health Care Executives", Jossey-Bass, 2005.

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:

- | | |
|--|----------|
| 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 Experiment List

Case study can be given to a group of maximum three students. Students can conduct the literature survey on it and design and develop the small system which will be useful to health care department.

Elective- II: Service-Oriented Architecture				
CLASS B.E. (INFORMATION TECHNOLOGY)			SEMESTER VIII	
HOURS PER WEEK	LECTURES	:	04	
	TUTORIALS	:	--	
	PRACTICALS	:	02	
			HOURS	MARKS
EVALUATION SYSTEM:	THEORY		3	100
	PRACTICAL		--	--
	ORAL		--	25
	TERM WORK		--	25
Prerequisite: Middleware Technology and Enterprise Application Integration				
Objective: SOA has quickly become the industry standard for building next-generation software. This course begins with a look at the architectural principles needed to create successful applications and then goes on to examine the process for designing services and SOA implementations.				

- 1. Introduction:** The Promise of SOA, The Challenges of SOA, Reuse, Efficiency in Development, Integration of Applications and Data, Agility, Flexibility, and Alignment, Meeting the Challenge, Reference Architecture, Common Semantics, Governance, Business Process Modeling, Design-Time Service Discovery, Model-Based Development, Best Practices in SOA Analysis and Design.
- 2. Getting Started:** Overview of SOA Implementation Methodology, SOA Reference Architecture, Business Architecture, Business Processes, Information Design, Service Identification, Service Specification, Services Realization, Service Life Cycle, The Service Design Process.
- 3. Starting with the Business:** Business Architecture, Understanding the Business Motivation Model, Business Process Management and Modeling, How to Create Business Process Models, Use Cases, Conditional Business Process Models, Organizing Services, Domains, Types of Domains, The Service Inventory.
- 4. Service Context and Common Semantics:** The Importance of Semantics in SOA, Core Information Modeling, Defining Types, Beyond the Basics, Structuring, Information Models, Documents, Documents and XML, XML Schema, XML Patterns, Best Practices for the SOA Architect.
- 5. Designing Service Interfaces:** Services, Design Guidelines, Interface Design Illustrated, Solution Model.
- 6. Designing Service Implementations:** Basic Service Architecture, Implementing the Interface Layer, Implementing the Business Layer, Implementing the Resource Layer, Implementation Design Illustrated.
- 7. Composing Services:** Understanding Service Composition, Architectural Models in Service Composition, Service Composition Implementation, Service Composition and

Business Rules, Service Composition and Transactions, Incorporating Human Activities into Service Composition, Orchestration with BPEL.

8. **Using Services to Build Enterprise Solutions:** Enterprise Solutions versus Applications, Service-Based Enterprise Solutions, Layered SOA Architecture and Multitiered Application Architecture, Locating Services, Versioning: Dealing with Service Changes, Architecting Security for Service-Based Solutions, Exception Handling and Logging in Enterprise Solutions, Monitoring and Managing Enterprise Solutions, Enterprise Service Bus.
9. **Designing and Using Integration in SOA Solutions:** Challenges of Integration in SOA, Integration in SOA Defined, Special Considerations for Implementing of Integration.
10. **SOA Security:** SOA Security Goals and Fundamentals, Web Service Security Standards and Specifications, SOA Security Blueprints.
11. **SOA Governance:** SOA Management and Governance Defined, The Case for SOA Governance, SOA Governance and the Service Life Cycle, Design-Time Governance, Practical SOA Governance, Developing and Registering Run-Time Policies, Run-Time Policy Enforcement and Adaptation.

Text Book

1. "Applied SOA", Michael Rosen et al., Wiley India.

Reference:

1. "Service- Oriented Architecture for Enterprise Applications", Shankar Kambhampaty, Wiley
2. "SOA Principles of Service Design" by Thomas Erl, Prentice Hall
3. Norbert Bieberstein, Sanjay Bose, Marc Fiammante, Keith Jones, Rawn Shah, "Service-Oriented Architecture Compass: Business Value, Planning, and Enterprise Roadmap", IBM Press Publication, 2005.
4. Sandy Carter, "The New Language of Business: SOA & Web 2.0", IBM Press, 2007.
5. Sanjiva Weerawarana, Francisco Curbera, Frank Leymann, Tony Storey, Donald F.Ferguson, "Web Services Platform Architecture: SOAP, WSDL, WS-Policy, WS-Addressing, WS-BPEL, WS-Reliable Messaging, and More", Prentice Hall Publication, 2005.
6. Eric Newcomer, Greg Lomow, "Understanding SOA with Web Services", Addison Wesley Publication, 2004.
7. Dave Chappell, "Enterprise Service Bus", O'Reilly Publications, 2004.
8. Thomas Erl, "Service-Oriented Architecture: A Field Guide to Integrating XML and Web Services", Prentice Hall Publication, 2004.

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:

- | | |
|--|----------|
| 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.

Elective II - E-GOVERNMENT				
CLASS B.E. (INFORMATION TECHNOLOGY)			SEMESTER VIII	
HOURS PER WEEK	LECTURES		04	
	TUTORIALS		--	
	PRACTICALS		02	
			HOURS	MARKS
EVALUATION SYSTEM:	THEORY		3	100
	PRACTICAL		--	--
	ORAL		--	25
	TERM WORK		--	25
Prerequisite: Web Technology and Information Technology for Management of Enterprise				
Objective: This course explains Basic concepts of e-Government, the range of information, services, and activities that comprise e-government. Good practice approaches, tools and techniques widely used for Managing e-Government, such as models e-Government, theories of evolution of e-Government, e-Government assessment models, BPRs and change management, Program management, etc. The role of ICT as an enabler for structural and process changes in government and public services organizations. The technical implementation, management, and security of e-government. The critical analysis and assessment of e-Government projects.				

- 1. Introduction to e-Government:** Definitions, Domains, Taxonomy, Current status – Indian and global, Conceptual Foundations, Citizen Centric e-Government, e-Government Services, Definitions, differentiation of G2C, G2B, G2G, G2E services – a broad outline.
- 2. Managing e-Government – strategy and implementation:** Management Models - centralized, decentralized, hybrid, Implementation models - Back end automation, Front end only services, holistic, Business models - Self financed, PPP, JV, differed Payment, Facilities Management outsourcing, Management of Intellectual Property.
- 3. Theories of Evolution in e-Government:** Four stages of e-Government evolution, various models and discussion on these four stages, e-Government maturity model.
- 4. Managing e-Government:** Transformational Government for value Creation, Theory and practice of BPRs, Change management, Capacity Building, roles of political leadership, Media, and citizens, Technology - components and overview, procurement strategy and challenges, Challenges and strategies for Business Continuity, Data - Building Data Quality and Data culture, Challenges and strategies for data Preparedness and Data sustenance, Additional challenges in implementation of COTS Packages and ERP Packages. Security Policy, ISMS, Challenges of protecting citizen privacy, RTI and related challenges and strategies
- 5. E-Government Project Life Cycle and Program management:** Differences between general and e-Government Project Life cycle, Concepts behind and importance of each PLC stage, Overview of theory and practice of Program Management.

6. **Challenges in Implementation of e-Government Project:** Universally identified challenges, Challenges facing e-Government practitioners in India.
7. **E-Government – Performance Management:** Indian and Global assessment frameworks and variety of e-readiness indexes, and their usefulness, Outcome and Benefits management.
8. **E-Government – Case studies:** Global and Indian Case studies of Successful and Unsuccessful Projects.

Reference Books:

1. "Implementing and managing E-Government", Richard Heeks, Vistaar Publications, India.
2. "Information Technology and E-Governance", N. Gopalsamy, New Age International Publications.
3. "Digital government: Technology and Public Sector performance", West, Darell M., Princeton University Press.
4. "Public Information Technology and e-Governance: Managing the Virtual State", Garson G. David, Jones and Bartlett".
5. "E-Government: From vision to Implementation", Subhash Bhatnagar, Sage Publications India Pvt. Ltd.
6. "IT Experience in India: Bridging the Digital Divide", Kenneth Kenniston, Deepak Kumar, Sage Publications India Pvt. Ltd.
7. "E-Governance Case Studies", Ashok Agarwal, University Press India.
8. "Compendium of E-Governance Initiatives in India", Piyush Gupta, R. K. Bagga, University Press India.
9. "E-Government - The Science of the Possible", J Satyanarayana, Prentice Hall.
10. "Bridging the digital Divide: Gyandoot – The Model for Community Networks", Rajesh Rajora.
11. "Digital Divide or Digital Jumo: Beyond the IT Revolution", Mitshiro Kagami and Masatsugu Tsuji (ed.)
12. "E-Governance – Concepts and Case Studies", C. S. R. Prabhu.

Term Work:

Term work shall consist of project report preparation.

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.

Suggested Experiment List

- The project work shall be a group activity.
- Each group of students shall be expected to pick up either a successful E-Government project of national importance, or a state of India as a whole; as the topic for the project.
- The students shall gather information related to the selected topic from various sources.
- Students shall be expected to apply the theories learned during the course to the project and arrive at their own conclusions about the project along with justifications.

- At the end of semester each group has to submit the Project Report and A power point presentation of the project report.

Elective II - ERP & CRM				SEMESTER VIII	
CLASS B.E. (INFORMATION TECHNOLOGY)					
HOURS PER WEEK	LECTURES		04		
	TUTORIALS		--		
	PRACTICALS		02		
			HOURS	MARKS	
EVALUATION SYSTEM:	THEORY		3	100	
	PRACTICAL		--	--	
	ORAL		--	25	
	TERM WORK		--	25	
Prerequisite: Information Technology for Management of Enterprise					
Objective: The aim this course is to give an insight into the principles of enterprise planning systems, its utility and implementation issues. The course introduces ERP and beyond ERP applications. Also it gives idea of CRM, CRM strategy, CRM Systems and its Implementation, CRM In Different Markets, e-CRM, Current Trends In CRM & Future Of CRM.					

Part – I: ERP

- 1. A Foundation for understating Enterprise Resource Planning (ERP) Systems:** What is ERP?, what does it do?, the evolution of ERP, the applicability of ERP, ERP as a foundation, the ABCs of ERP implementation, class ABCD, implementers and reimplementers, the implementers' dilemma.
- 2. ERP Implementation (Company-Wide) and Challenges:** Catch-22, an aggressive implementation schedule, the three knobs, the proven path. Schedule by function, not software modules, cut the cloth to fit the pattern, time waster.
- 3. ERP. Softwares:** Introduction, category 1, category 2, category 3, enterprise software, software selection, configuration and enhancement, installation, on-going support, bolt-on support, selecting bolt-on support, managing request for changes.
- 4. Getting Ready and Project Launch:** Audit/Assessment 1, first-cut education, vision statement, cost/benefit analysis, go/no go decision, the implementers' checklist. Project organization, performance goals.
- 5. Initial Education:** Objective of education for ERP, criteria for a program to accomplish behavior change, the change process.
- 6. Sales and Operations Planning:** Where does it fit?, why is top management necessary?, the monthly S&OP process, the S&OP implementation steps, S&OP across the board.
- 7. Process Definition and Data Integrity:** Defining demand management, planning and scheduling process, creating the project schedule, maintaining the project schedule, managing the schedule, policies, defining and implementing finance and accounting

processes, timing. Inventory balances, scheduled receipts, allocations, bills of material, routings, customer orders, forecasting data, item data, worker center data, forecasts.

8. **ERP (phase I, II and III):** Three ways to implement systems, three kinds of pilots, cutover, the need for feedback during cutover, the potential inventory blip, don't starve the sources, the inadvertent big bang cutover, performance measurements, audit/assessment II. Supply chain integration, collaborative forecasting, audit/assessment III. Overview of Quick-Slice ERP, where quick slice applies, how can it be done so quickly?, quick-slice implementation details. Operating ERP, The Strategic Future See it, time and knowledge, zero inventory, internet, choices, selling ERP in strategy.
9. **Securing & Auditing ERP Systems:** Concepts, strategies, and various tools to promote security of an ERP System. They will configure, monitor, and trace various aspects of ERP vulnerability, evaluating security of database tables, identifying separation of duty concerns and isolating critical authorizations that pose risks to system security

Part – II: CRM

1. **Basics of CRM:** Introduction, Definition, CRM as a business strategy, Elements of CRM, CRM Processes and systems, Entrance, applications and success of CRM, Description of customer-supplier relationships, The dynamic in relationships, Communities.
2. **CRM as an Integral Business Strategy:** The nature of the CRM strategy, the context of the CRM strategy, the results of a successful CRM strategy. The relationship-oriented organization: Mission, Culture, Structure, People, Communication and Information, Systems, Where do we stand.
3. **Customer Knowledge:** The value of customer knowledge, The utilisation of data as an asset, From data to customer, knowledge, Privacy, Personal Data Protection Act, Information policy.
4. **Communications and Multi-channels:** Multi-channels defined, the channels, Customers and the use of the channels, Influence of the channels on pricing and the formation of relationships; Recommendations on multichannel communication. The Individualized Customer Proposition: Customisation, Individualisation of the product offering, Individualised pricing policy.
5. **The Relationship Policy & Relationship Data Management:** Improvement of the size and quality of the customer database. Relationship policy per segment, Relationship policy by relationship phase, Translating the relationship policy into contact moments, Loyalty programmes. Customer identification, Expanding the size of the customer database, Customer profiling, Data analyses and data mining, Experiences with data analysis, The analysis process, Data mining.
6. **Segmentation and Selection:** Segmentation and selections, Segmentation study as input for the formulation of the marketing strategy, Segmentation research used in compiling the list.
7. **Retention, cross-sell Analyses and the Effects of Marketing Activities:** Retention and cross-sell analyses, Retention, Cross-selling. The effects of marketing activities,

evaluating the effect of marketing activities on the customer value, Experiments, The learning organization. Reporting results, Lifetime value, Alternatives for lifetime value, Balanced score card.

8. **Call Centre Management:** Call centre management, Call centres described, Call centres and human resources, determining the service level, Capacity planning, managing satisfaction using telephone contact, managing the quality of contacts through other channels, Key performance indicators.
9. **Internet and the Website & Direct Mail:** Internet and the website, Traffic building, Starting points for providing quality during the visit, Creating quality during the visit, From visit to transaction, From transaction to delivery, From delivery to retention, Measuring the results, direct mail, the position of direct mail, The process of developing, producing, sending and following-up direct mailings, Effective direct mail messages.
10. **CRM Systems and its Implementation:** CRM systems, Overview of CRM systems, The call centre, The Internet and the website, Data warehouse and datamart, Campaign management systems, Content management system, Suppliers of CRM systems, Causes for disappointing results, An initial exploration with CRM and how companies handle this, The CRM road map, CRM project management, International or cross-division projects.
11. **CRM In Different Markets And e-CRM:** CRM In Different Markets, CRM In B2C Markets, CRM Systems In B2B Marketing, Value Added Partnerships (VAPs), Market Intelligent Enterprise, What Is e-CRM, e-CRM Vs CRM, The Six "E's" Of e-CRM, Key e-CRM Features, Evolving To e-CRM, e-CRM Assessment, e-CRM Strategy Alignment, e-CRM Architecture, Basic Components And Architecture Of e-CRM Solution.
12. **Current Trends In CRM & Future Of CRM:** Current Trends In CRM, Future Of CRM, Factors which influence the future of CRM, The continuation of the journey, Is CRM A Science Or An Art?, 20th And 21st Century Business Models.

Text Books:

1. T. F. Wallace and M. H. Kremzar, "ERP: Making It Happen", Wiley.
2. Ed Peelen, "Customer Relationship Management", Pearson Education.

Reference Books:

1. Mary Sumner, "Enterprise Resource Planning", Pearson Education.
2. Brady, Monk, Wagner, "Concepts in Enterprise Resource Planning".
3. Alexis Leon, "ERP Demystified", TMH.
4. S. Parthasarathy, "ERP – A managerial and Technical Perspective", New Age International Publications.
5. Jagdish N. Sheth, Atul Parvatiyar and G. Shalnes, "Customer Relationship Management", TMH.
6. R. K. Sugandhi, "Customer Relationship Management", New Age International Publications.
7. E-Business & ERP: Transforming the Enterprise Norris, Grant, Hurley, James R., Hartley, K.M., Dunleavy, John R. and Balls, John, D. Hardcover, Wiley.

Term Work:

All students are expected to develop an ERP source code for a virtual enterprise having at least four modules (departments) preferably in JAVA technology (swing JDBC, Servlets / JSP) and or a CRM source code for a virtual enterprise using visual Basic and SQL server

- | | |
|--|----------|
| 1. Laboratory work (Experiments and Journal) | 15 Marks |
| 2. On line test of developed source code | 10 Marks |

Elective – II: MOBILE AND E-COMMERCE				
CLASS B.E. (INFORMATION TECHNOLOGY)			SEMESTER VIII	
HOURS PER WEEK	LECTURES	:	04	
	TUTORIALS	:	--	
	PRACTICALS	:	02	
			HOURS	MARKS
EVALUATION SYSTEM:	THEORY		3	100
	PRACTICAL		--	--
	ORAL		--	25
	TERM WORK		--	25
Prerequisite: Wireless Networks				
Objective: The main objective of this course is to introduce participants to the new technologies, applications, services and business models of M-Commerce. In addition, we also look at mobile policy implications along with wireless spectrum auctions.				

- 1. Introduction to e-business and e-commerce:** Introduction, What is the difference between e-commerce and e-business?, How significant are e-commerce and e-business?, Business adoption of digital technologies for e-commerce and e-business, Introducing the B2B and B2C companies, Management responses to e-commerce and e-business.
- 2. E-commerce fundamentals:** Introduction, The e-commerce environment, The e-commerce marketplace, Focus on portals, Location of trading in the marketplace, Commercial arrangement for transactions, Focus on auctions, Business models for e-commerce, Revenue models, Focus on internet start-up companies-the dot-coms.
- 3. E-business infrastructure:** Introduction, What is the internet?, How does it work? Internet standards, Focus on who controls the internet, Managing e-business infrastructure, Focus on web service and service and service-oriented, Focus on new access devices,
- 4. E-environment:** Introduction, Social factors, Taxation, Economics and competitive factors, Focus on e-commerce and globalization, Political factors, Internet governance, E-governance, Technological innovation and technology assessment,.
- 5. E-business strategy:** Introduction, E-business strategy, Strategic analysis, Strategic objectives, Strategy definition, Strategy Implementation, Focus on information systems strategy and e-business strategy.
- 6. Supply chain management:** Introduction, What is supply chain management?, Focus on the value chain, Option for restructuring the supply chain, Using e-business to restructure the supply chain, Supply chain management implementation.

7. **E-procurement:** Introduction, What is e-procurement?, Drivers of e-procurement, Focus on estimating e-procurement cost savings, Risks and impacts of e-procurement, Implementing e-procurement, Focus on electronics B2B marketplaces, The future of e-procurement?
8. **E-marketing:** Introduction, What is e-marketing?, E-marketing planning, Situation analysis, Objective setting, Strategy, Focus on characteristics of new-media marketing communications, Tactics, Focus on online branding, Actions, Control.
9. **Customer relationship management:** Introduction. What is e-CRM?, conversion marketing, the online buying process, customer acquisition management, focus on marketing communications for customer acquisition, customer retention management focus on excellence in e-commerce service quality, customer extension
10. **Change management:** Introduction, The challenges of e-business transformation, different types of change in business, Planning change, Human resource requirements, Revisiting organizational structures, approaches to managing change, focus on knowledge management, risk management.
11. **Analysis and design:** Introduction, process modeling, Data modeling, Design for e-business. Focus on user-centred site design, Focus on security design for e-business.
12. **Implementation and maintenance:** Introduction, Alternatives for acquiring e-business systems, Development of web-based content and services, focus on developing dynamic web content, testing, Changeover, Content management and maintenance, Focus on measuring and improving performance of e-business systems.
13. **M-Commerce:** Introduction to m-commerce: Emerging applications, different players in m-commerce, m-commerce life cycle Mobile financial services, mobile entertainment services, and proactive service management.
14. **Management of mobile commerce services:** Content development and distribution to handheld devices, content caching, pricing of mobile commerce services The emerging issues in mobile commerce: The role of emerging wireless LANs and 3G/4G wireless networks, personalized content management, implementation challenges in m-commerce, futuristic m-commerce services.

Text Book:

Dave Chaffey, "E-Business and E-Commerce Management", Third Edition, 2009, Pearson Education.

Reference Books:

1. Henry Chan, Raymond Lee and etl., "E-Commerce Fundamental and Applications", Wiley.
2. Brian Mennecke and Troy Strader, "Mobile Commerce: Technology, Theory and Applications", Idea Group, 2003.

3. Nansi Shi, "Mobile Commerce Applications", IGI Global, 2004.
4. Gary P. Schneider, "Electronic Commerce", Seventh Edition, CENGAGE Learning India Pvt. Ltd., New Delhi.
5. K. K. Bajaj, D. Nag "E-Commerce", 2nd Edition, McGraw Hill Education, New Delhi
6. P. T. Joseph, "E-Commerce an Indian Perspective", PHI Publication, New Delhi.
7. Bhaskar Bharat, "Electronic Commerce-Technology and Application", McGraw Hill Education, New Delhi
8. Mary Sumner, "Enterprise Resource Planning", 2005, PHI Learning India Pvt. Ltd. / Pearson Education, Inc. New Delhi.
9. Chan, "E-Commerce fundamentals and Applications", Wiley India, New Delhi.
10. Pete Loshin, "Electronic Commerce", 4th Edition, Firewall media, An imprint of laxmi publications Pvt. Ltd., New Delhi, 2004.
11. Jeffrey F. Rayport and Bernard J. Jaworski, "Introduction to E-Commerce", 2nd Edition, Tata Mc-Graw Hill Pvt., Ltd., 2003.
12. Greenstein, "Electronic Commerce", Tata Mc-Graw Hill Pvt., Ltd., 2000.
13. Ravi Kalakota and Andrew B. Whinston, "Frontiers of Electronic Commerce", Addison-Wisely 1996.
14. Pete Loshin, Paul A. Murphy, "Electronic Commerce", 2nd Edition, Jaico Publishers, 1996.
15. David Whiteley, "e-Commerce: Strategy. Technologies and Applications", McGraw Hill, 2000.
16. Norman Sadeh, "M-Commerce: Technologies, Services, and Business Models", Wiley, 2002.

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:

- | | |
|--|----------|
| 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 Experiment list

Case study can be given to a group of maximum three students. Students can conduct the literature survey on it and design and develop the small system which will be useful to health care department.

Elective – II: ROBOTICS AND MACHINE INTELLIGENCE			
CLASS: B.E. (INFORMATION TECHNOLOGY)		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. Robotic Manipulation

Automation and Robots, Classification, Application, Specification Notations

2. Direct and Inverse Kinematics

Co-ordinate frames, Rotations, Link Co-ordination Arm Equation, (Two axis , Three axis, Four-axis robot SCARA, Five-axis only Rhino XR-3 Robot). General properties of solutions Tool configuration Two axis, Three axis planar articulated, Four axis SCARA , Five axis robots only Rhino XR-3 Robot.

3. Workspace Analysis and Trajectory Planning

Introduction to Workspace Analysis and Trajectory Planning, Work Envelop and examples, Pick and place operations, Continuous path motion, Interpolated motion, Straight-line motion.

4. Machine Intelligence

Object Detection using Adaboost, Object Recognition using Moments, Template Matching using correlation principle & Principal Component Analysis (PCA), Object Tracking using Discrete Wavelet Transform, Segmentation, Region Labeling, Shrink and Swell operators, Perspective Transformation, Stereo Vision, Depth Measurement with Vision Systems, Real Time Video Processing.

5. Embedded Systems and Real-time Operating System

Introduction to Embedded systems, Embedded Micro Controller cores (ARM, RISC, CISC, SOC), Embedded Memories, Architecture of Embedded Systems, Real-Time Operating Systems, Required RTOS services/capabilities (in contrast with traditional OS)..RT Linux, Programming languages for Embedded Systems

6. Robotics Convergence Technology

Telematic camera Robotic System, Non-Imaging Sensors, Artificial intelligence for robotics, Knowledge representation, planning, and task scheduling. Sound and touch sensing, People sensing, Autonomous mobile robot, humanoid robots and simulated humans, human-robot interaction.

7. Applications of Robotics

Robot Application in Manufacturing: Material Transfer - Material handling, loading and unloading Processing - spot and continuous arc welding & spray painting - Assembly Inspection, Selected Embedded System-based Applications: Database Applications (smart cards), Process-Control (Fuzzy logic), Robot application in Medical, Industrial Automation, Security

Text Books :

1. Robert Shilling, Fundamentals of Robotics-Analysis and control, Prentice Hall of India
2. Fu, Gonzales and Lee, Robotics, McGraw Hill
3. J.J, Craig, Introduction to Robotics, Pearson Education
4. Curtis D. Johnson, Process Control Instrumentation Technology, PHI Publication, Eighth Edition
5. An Embedded Software Primer -- David E. Simon -- Pearson Education
6. Embedded Microcomputer Systems -Jonathan W. Valvano - Thomson
7. Embedded Realtime Systems Programming- Sriram V Iyer, Pankaj Gupta - Tata McGraw Hill

Reference Books :

1. Staughard, Robotics and AI, Prentice Hall of India
2. Grover, Wiess, Nagel, Oderey, "Industrial Robotics", McGraw Hill
3. Niku, Introduction to Robotics, Pearson Education
4. Klafter, Chmielewski, Negin, Robot Engineering, Prentice Hall of India
5. Mittal, Nagrath, Robotics and Control, Tata McGraw Hill publications
6. George L Balten Jr., Programmable Controllers , Tata McGraw Hill publications
7. Embedded Linux – Hollabaugh, Pearson Education
8. Robotics / Fu K S/ McGraw Hill.
9. Robotic Engineering / Richard D. Klafter, Prentice Ha
10. Robot Analysis and Intelligence / Asada and Slow time / Wiley Inter-Science.

Term Work:

Term work should consist of at least 8 Practicals and Asslgnments on every topic of the syllabus A term work test shall be conducted with a weightage of 10 marks

Marks :

Distribution of marks for term work shall be as follows:

- | | |
|--|----------|
| 1. Laboratory work(Experiment and Journal) | 15 Marks |
| 2. 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 : Robotics Manipulation [Any Two]

1. Develop an arm matrix for Rnino XR-3 robot.
2. Inverse Kinematics for Adept-1 SCARA Robot.
3. Work space analysis for Two-axis planar articulated Robot arm.
4. Trajectory planning (Cubic Spline Method).

Topic-2 : Machine Vision [Any Two]

1. Object Tracking using Discrete Wavelet Transform,
2. Template Matching: - To find the best match using Performance Index and Normalized Cross Correlation.
3. Area Descriptors: - To find the different moments, centroid, and principal angle of a given image.
4. Real Time Video Processing.

Topic -3 Embedded Systems [Any Two]

1. DC Motor Control
2. Relay and Buzzer Control for alarm events
3. Unipolar and Bipolar Stepper Motor Control
4. Blue tooth/Zig-bee interface

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

1. Case Study (Lab Practicals) : RTLinux porting to x86 Architecture
 2. Case Study (Lab Practicals) : uCLinux porting to ARM Architecture
 3. Case Study (Lab Practicals) : MSPGCC porting to MSP RISC Architecture
-

PROJECT -- II				
CLASS B.E. (INFORMATION TECHNOLOGY)			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 work shall also result in the documentation of the work done to carryout the project				

Guidelines:

1. Project Report Format:

At the end of semester a student need to prepare a project report which preferably contain 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 project report on a CD containing: project documentation, Implementation code, required utilities, Software's and user Manuals need to be attached. For certification purpose few pages shall be bound together embodying the title of project, table of contents and certification pages

2. Term Work: Maximum Mark 50

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 and final documentation of the project can be used for awarding term work marks.

UNIVERSITY OF MUMBAI

No. UG/244 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. 4.11 and that, in accordance therewith, the revised syllabus of Fourth Year (Semester VII & VIII) of the B.E. Degree Course in branch of Information Technology 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./4.11/27/07/2010

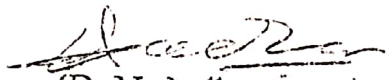
No. UG/244-A of 2010,

MUMBAI-400 032

12th August, 2010

Copy forwarded with compliments for information to:-

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


(D. N. Jadhav)
Ag. Deputy Registrar
(UG/PG Section)

sent
12/8
X

Copy to:-

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

The Controller of Examinations (10 copies), the Finance and Accounts Officer (2 copies), Record Section (5 copies), Publications Section (5 copies), the Deputy Registrar, Enrolment, Eligibility and Migration Section (5 copies), the Deputy Registrar, Statistical Unit (2 copies), the Deputy Registrar (Accounts Section), Vidyanaagari (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), Vidyanaagari, (2 copies) the Deputy Registrar (Special Cell), the Deputy Registrar, (PRO) the Assistant Registrar, Academic Authorities Unit (2 copies) and the Assistant Registrar, Executive Authorities Unit (2 copies). They are requested to treat this as action taken report on the same.

UNIVERSITY OF MUMBAI



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

(With effect from the academic year 2010-2011)

University of Mumbai
Board of studies in IT

Information Technology Syllabus Revision

Preamble

It is the opportune time for revamping the “content” of the course Titled Information Technology. It is all about finding the right stimulus to develop a different set of core competency to enable the market to accept and acknowledge the same. Academicians can not be ignorant of prevailing market forces. The requirement of the time is to design course curriculums which instill confidence in students and industrial entrepreneurs. Reorient the process of education to the need of the society by imparting skill sets rather than motivating the students to pursue academic excellence which is non-existent.

It is right time to subject ourselves to unlearning process so that we will be in a position to comprehend the Industrial, technological and social dynamics. This is the time to hold the entire act together. Innovation and value addition should be the center theme in the process of syllabus design.

Try to minimize the process of reinventing the wheel every time. Statistics shows that investment in research in the realm of middleware, implementation and customization of technology product by world bodies is in a state of up swing which is an indication of core competence to be developed by graduates.

Our mission should be creation of intellectual capital and design newer product, which the market itself failed to recognize at this juncture.

B.E (Information Technology) Semester VII and Semester VIII revised syllabus starting from 2010-2011 Academic year

University of Mumbai
B.E Information Technology
Scheme of Instruction and Evaluation

Fourth Year -Semester VII									
Scheme of Instructions				Scheme of Examinations					Tot Mar
Subjects	Lect/ Week	Pract/ Week	Tuto/ Week	Theory Hours	Marks	T/W Marks	Practical Marks	Oral Marks	
Data Warehousing, Mining & Business Intelligence	4	2	--	3	100	25	--	25	15
Digital Signal & Image processing	4	2	--	3	100	25	--	25	14
Simulation and Modeling	4	2	--	3	100	25	25	--	1
Software testing & Quality Assurance	4	2	--	3	100	25	--	25	1
Elective - I	4	2	--	3	100	25	--	25	1
Project - I	--	4	--	--	--	25	--	25	1
TOTAL	20	14	2	3	500	150	25	125	8

Elective - I (Semester VII)

1. Wireless Network
2. Multimedia Systems
3. Evolutionary Algorithms
4. IT in Construction
5. Nanotechnology
6. Geographical Information Systems
7. Artificial Intelligence

Fourth Year -Semester VIII										
Scheme of Instructions					Scheme of Examinations					Total Marks
Sr. No	Subjects	Lect/ Week	Pract/ Week	Tuto/ Week	Theory		T/W	Practical	Oral	
					Hours	Marks	Marks	Marks	Marks	
1	Information Storage Management and Disaster Recovery	4	2	--	3	100	25	--	25	150
2	Gaming Architecture and programming	4	2	--	3	100	25	--	25	150
3	Software Project Management	4	2	--	3	100	25	--	25	150
4	Elective - II	4	2	--	3	100	25	--	25	150
5	Project - II		4	--	--	--	50	--	50	100
	TOTAL	16	12	--	--	400	150	--	150	700

Elective - II (Semester VIII)

1. Cloud Computing
2. IT for Health Care
3. Service Oriented Architecture
4. E-Government
5. ERP & CRM
6. Mobile & Ecommerce
7. Robotics and Machine Intelligence

EQUIVALENT SUBJECTS FOR IT

SEM-III

Sl No	SEM-III (R-2001)	Equivalent subject	Remark
1	Applied Maths III	Applied Maths III (Sem III R-2007)	
2	Electronics Devices and Circuits	Electronics Devices and Circuits (Sem III R-2007)	
3	Electrical Network	No Equivalence	
4	Discrete Structures	No Equivalence	
5	Digital logic design and application	Digital logic design and application (Sem III R-2007)	
6	Foundation of Information Tecnology	No Equivalence	

Sem IV

1	Applied Maths IV	Computational Mathematics (Sem IV R-2007)	
2	Principles of communication Engineering	Principles of communication Engineering (Sem IV R-2007)	
3	Computer Organisation and Architecture	No Equivalence	
4	Data structure and Algorithm	Data structure and Algorithm (Sem III R-2007)	
5	Information Theory and coding	No equivalence	
6	Industrial Economics and Management	Financial accounting & Management of technology innovation (Sem IV R-2007)	

EQUIVALENT SUBJECTS FOR IT SEM-V

1	Applied Maths V	No Equivalence	
2	Digital communication	No Equivalence	
3	Automata Theory	No Equivalence	
4	Internet technology and applications	Internet programming (Sem IV R-2007)	
5	Systems software	Operating system for computing Devices (Sem V R-2007)	
6	Presentation and communication techniques	Communication & presentation techniques (Sem III R-2007)	
7	Computer programming laboratory	Open source software laboratory (SemV R-2007)	

SEM VI

1	Computer network	Networking technology for digital devices (Sem IV R-2007)	
2	Software Engineering	Software Engineering (Sem VI R-2007)	
3	Object oriented analysis and Design	Object oriented analysis and Design (SemV R-2007)	
4	Microprocessors	Microprocessors & Microcontrollers (Sem IV R-2007)	
5	Database systems	GUI and Database Management (Sem III R-2007)	
6	Digital signal processing	No Equivalence	

DATA WAREHOUSING AND MINING & BUSINESS INTELLIGENCE				
CLASS B.E. (INFORMATION TECHNOLOGY)			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 Base Management System				
Objective: Today is the era characterized by Information Overload – Minimum knowledge. Every business must rely extensively on data analysis to increase productivity and survive competition. This course provides a comprehensive introduction to data mining problems concepts with particular emphasis on business intelligence applications. The three main goals of the course are to enable students to: 1. Approach business problems data-analytically by identifying opportunities to derive business value from data. 2. know the basics of data mining techniques and how they can be applied to extract relevant business intelligence.				

1. **Introduction to Data Mining:** Motivation for Data Mining, Data Mining-Definition & Functionalities, Classification of DM systems, DM task primitives, Integration of a Data Mining system with a Database or a Data Warehouse, Major issues in Data Mining.
2. **Data Warehousing – (Overview Only):** Overview of concepts like star schema, fact and dimension tables, OLAP operations, From OLAP to Data Mining.
3. **Data Preprocessing:** Why? Descriptive Data Summarization, Data Cleaning: Missing Values, Noisy Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Data Discretization and Concept hierarchy generation for numerical and categorical data.
4. **Mining Frequent Patterns, Associations, and Correlations:** Market Basket Analysis, Frequent Itemsets, Closed Itemsets, and Association Rules, Frequent Pattern Mining, Efficient and Scalable Frequent Itemset Mining Methods, The Apriori Algorithm for finding Frequent Itemsets Using Candidate Generation, Generating Association Rules from Frequent Itemsets, Improving the Efficiency of Apriori, Frequent Itemsets without Candidate Generation using FP Tree, Mining Multilevel Association Rules, Mining Multidimensional Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.

5. **Classification & Prediction:** What is it? Issues regarding Classification and prediction:
 - **Classification methods:** Decision tree, Bayesian Classification, Rule based
 - **Prediction:** Linear and non linear regression
 Accuracy and Error measures, Evaluating the accuracy of a Classifier or Predictor.
6. **Cluster Analysis:** What is it? Types of Data in cluster analysis, Categories of clustering methods, Partitioning methods – K-Means, K-Medoids. Hierarchical Clustering Agglomerative and Divisive Clustering, BIRCH and ROCK methods, DBSCAN, Outlier Analysis
7. **Mining Stream and Sequence Data:** What is stream data? Classification, Clustering Association Mining in stream data. Mining Sequence Patterns in Transactional Databases.
8. **Spatial Data and Text Mining:** Spatial Data Cube Construction and Spatial OLAP. Mining Spatial Association and Co-location Patterns, Spatial Clustering Methods. Spatial Classification and Spatial Trend Analysis. **Text Mining** Text Data Analysis and Information Retrieval, Dimensionality Reduction for Text, Text Mining Approaches.
9. **Web Mining:** Web mining introduction, Web Content Mining, Web Structure Mining, Web Usage mining, Automatic Classification of web Documents.
10. **Data Mining for Business Intelligence Applications:** Data mining for business Applications like Balanced Scorecard, Fraud Detection, Clickstream Mining, Market Segmentation, retail industry, telecommunications industry, banking & finance and CRM etc

Text Books:

1. Han, Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann 2nd Edition
2. P. N. Tan, M. Steinbach, Vipin Kumar, "Introduction to Data Mining", Pearson Education

Reference Books:

1. MacLennan Jamie, Tang ZhaoHui and Crivat Bogdan, "Data Mining with Microsoft SQL Server 2008", Wiley India Edition.
2. G. Shmueli, N.R. Patel, P.C. Bruce, "Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner", Wiley India.
3. Michael Berry and Gordon Linoff "Data Mining Techniques", 2nd Edition Wiley Publications.
4. Alex Berson and Smith, "Data Mining and Data Warehousing and OLAP", McGraw Hill Publication.
5. E. G. Mallach, "Decision Support and Data Warehouse Systems", Tata McGraw Hill.
6. Michael Berry and Gordon Linoff "Mastering Data Mining- Art & science of CRM", Wiley Student Edition
7. Arijay Chaudhry & P. S. Deshpande, "Multidimensional Data Analysis and Data Mining Dreamtech Press
8. Vikram Pudi & Radha Krishna, "Data Mining", Oxford Higher Education.
9. Chakrabarti, S., "Mining the Web: Discovering knowledge from hypertext data",
10. M. Jarke, M. Lenzerini, Y. Vassiliou, P. Vassiliadis (ed.), "Fundamentals of Data Warehouses", Springer-Verlag, 1999.

Term Work:

Term work shall consist of at least 10 experiments covering all topics Term work should consist of at least 6 programming assignments and one mini project in Business Intelligence and two assignments covering the topics of the syllabus. One written test is also to be conducted. Distribution of marks for term work shall be as follows:

1. Laboratory work (Experiments and Journal)
2. Test (at least one)

15 Marks

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

1. Students can learn to use WEKA open source data mining tool and run data mining algorithms on datasets.
2. Program for Classification – Decision tree, Naïve Bayes using languages like JAVA
3. Program for Clustering – K-means, Agglomerative, Divisive using languages like JAVA
4. Program for Association Mining using languages like JAVA
5. Web mining
6. BI projects: any one of Balanced Scorecard, Fraud detection, Market Segmentation etc.
7. Using any commercial BI tool like SQLServer 2008, Oracle BI, SPSS, Clementine, and XLMiner etc.

ORAL EXAMINATION

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

DIGITAL SIGNAL AND IMAGE PROCESSING			
CLASS: B.E. (INFORMATION TECHNOLOGY)		SEMESTER – VII	
HOURS PER WEEK	LECTURES	04	
	TUTORIALS	--	
	PRACTICALS	02	
EVALUATION SYSTEM		Hours	Marks
	THEORY	03	100
	PRACTICAL		
	ORAL	-	25
	TERM WORK	-	25

- 1. Introduction to Discrete Time Signals & System:** Discrete-Time Signals representation and Manipulation, Discrete-Time IIR and FIR Systems, Impulse Response, Transfer Function, Difference Equation, Frequency Domain and Time Domain Analysis of IIR filter and FIR filter, Correlation, Linear and Circular and Convolution Algorithm,
- 2. Discrete Fourier Transform:** DTFT, Frequency Domain Sampling, Properties of DFT, DIT-FFT algorithm, Spectral Analysis using FFT, Linear FIR filtering using FFT based Overlap Save and Overlap Add Method,
- 3. Image Transforms :** Introduction to Unitary Transform, DFT, Properties of 2-D DFT, FFT, IFFT, Walsh transform, Hadamard Transform, Discrete Cosine Transform, Discrete Wavelet Transform,
- 4. Image Enhancement :** Gray Level Transformations, Histogram Processing, Spatial Filtering: Introduction, Smoothing and Sharpening Filters. Colour Image Enhancement.
- 5. Image Segmentation and Representation :** Detection of Discontinuities, Laplacian of Gaussian, Derivative of Gaussian, Canny Edge Detection, Thresholding in Hierarchical Data Structures, Border Tracing, Edge linking and Boundary Detection, Thresholding, Region Based Segmentation. Representation Schemes.
- 6. Image Data Compression:** Fundamentals, Redundancies: Coding, Interpixel, Psycho-visual, Error Free Compression, Lossy Image Compression : Lossy Predictive Coding, JPEG, MPEG, Subband Coding using Wavelet Transform, Vector Quantization
- 7. Morphological Image Processing:** Introduction, Dilation, Erosion, Opening, Closing, Hit-or-Miss transformation, Basic Morphological Algorithms on binary images
- 8. Applications of Image Processing :** Case Study on Digital Watermarking, Biometric Authentication (Face, Finger Print, Signature Recognition), Vehicle Number Plate Detection and Recognition, Object Detection using Correlation Principle, Person Tracking using DWT, Handwritten and Printed Character Recognition, Content Based Image Retrieval, Text Compression.

Text Books :

1. J.G. Proakis, "Introduction to Digital Signal Processing", PHI
2. R.C.Gonsales R.E.Woods, "Digital Image Processing", Second Edition, Pearson Education
3. Anil K.Jain, "Fundamentals of Image Processing", PHI

Reference Books :

1. S Sallivahanan, "Digital Signal Processing", TMH.
2. Milan Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing Analysis and Machine Vision" Second Edition, Thomson Learning Inc,
3. William Pratt, "Digital Image Processing", John Wiley.

Term Work:

Term work should consist of at least 10 Practical and Assignments on every topic of the syllabus A term work test shall be conducted with a weightage of 10 marks

Marks :

Distribution of marks for term work shall be as follows:

- | | |
|--|----------|
| 1. Laboratory work(Experiment and Journal) | 15 Marks |
| 2. 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 Digital Signal Processing [Any two Experiments]**

1. To find Linear Convolution, Circular Convolution
2. To find output of Digital FIR filter using convolution principle..
3. To find output of Digital IIR filter using recursive difference equation.
4. To plot Magnitude spectrum using DFT/ FFT
5. To find output of real time signal using FFT based Overlap Add Method
6. To find output of real time signal using FFT based Overlap Save Method

Topic-2 Image Transform [Any two Experiments]

1. To find DFT/FFT forward and Inverse Transform of Image.
2. To find DCT forward and Inverse Transform of Image.
3. To find DWT forward and Inverse Transform of Image.
4. To find Walsh-Hadamard forward and Inverse Transform of Image.

Topic-3 Image Enhancement [Any two Experiments]

1. To enhance image using Histogram Equalization
2. To enhance image using Contrast Stretching
3. To perform Colour Image Enhancement
4. To enhance image using Smoothing and Sharpening Filters

Topic-4 : Image Segmentation and Morphology [Any two Experiments]

1. To find edges using LOG and DOG
2. To find Edges using Prewit/ Sobel/ Fri-chen / Robert operators.
3. To find edges using canny Edge Detection.
4. To implement Image Border Tracing

Topic-5 : Application using OpenCV Library / Java [Any Two Experiments]

1. Digital Watermarking
 2. Biometric Authentication such as Face / Finger Print / Signature Recognition)
 3. Vehicle Number Plate Detection and Recognition,
 4. Object Detection using Correlation Principle,
 5. Person Tracking using DWT,
 6. Handwritten and Printed Character Recognition,
 7. Contend Based Image Retrieval,
 8. Text file Compression. .
 9. Morphological Toolkit Development
 10. Currency Recognition
 11. Human Expression Detection
 12. Image Enhancement using Adaptive Histogram Equalization(AHE), Modified AHE(MAHE), Technique.
 13. Image Compression using Vector Quantization
 14. Image Compression using DWT
-

SIMULATION AND MODELING				SEMESTER VII	
CLASS B.E. (INFORMATION TECHNOLOGY)					
HOURS PER WEEK	LECTURES	:	04		
	TUTORIALS	:	--		
	PRACTICALS	:	02		
			HOURS	MARKS	
EVALUATION SYSTEM:	THEORY		3	100	
	PRACTICAL		--	25	
	ORAL		--	--	
	TERM WORK		--	25	
Prerequisite: Probability and Statistics					
Objective: 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.					

- 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. Bödy, "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:

- | | |
|--|----------|
| 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 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

SOFTWARE TESTING & QUALITY ASSURANCE				
CLASS B.E. (INFORMATION TECHNOLOGY)			SEMESTER VII	
HOURS PER WEEK	LECTURES	:	04	
	TUTORIALS	:	--	
	PRACTICALS	:	02	
EVALUATION SYSTEM:			HOURS	MARKS
	THEORY		3	100
	PRACTICAL		--	
	ORAL		--	25
	TERM WORK		--	25
Prerequisite: Software Engineering				
Objective: This course equips the students with a solid understanding of: • Practices that support the production of quality software • Software testing techniques • Life-cycle models for requirements, defects, test cases, and test results • Process models for units, integration, system, and acceptance testing • Quality Models				

1. **Introduction:** Software Quality, Role of testing, verification and validation, objectives and issues of testing, Testing activities and levels, Sources of Information for Test Case Selection, White-Box and Black-Box Testing , Test Planning and Design, Monitoring and Measuring Test Execution, Test Tools and Automation, Test Team Organization and Management .
2. **Unit Testing:** Concept of Unit Testing , Static Unit Testing , Defect Prevention , 3.4 Dynamic Unit Testing , Mutation Testing , Debugging , Unit Testing in eXtreme Programming
3. **Control Flow Testing:** Outline of Control Flow Testing, Control Flow Graph, Paths in a Control Flow Graph, Path Selection Criteria, All-Path Coverage Criterion , Statement Coverage Criterion, Branch Coverage Criterion, Predicate Coverage Criterion, Generating Test Input, Examples of Test Data Selection.
4. **Data Flow Testing:** Data Flow Anomaly,. Overview of Dynamic Data Flow Testing, Data Flow Graph, Data Flow Terms, Data Flow Testing Criteria, Comparison of Data Flow Test Selection Criteria, Feasible Paths and Test Selection Criteria, Comparison of Testing Techniques.
5. **System Integration Testing:** Concept of Integration Testing, Different Types of Interfaces and Interface Errors, Granularity of System Integration Testing, System Integration Techniques, Software and Hardware Integration, Test Plan for System Integration, Off-the-Shelf Component Integration, Off-the-Shelf Component Testing, Built-in Testing

6. **System Test Categories:** Basic Tests, Functionality Tests, Robustness Tests, Interoperability Tests, Performance Tests, Scalability Tests, Stress Tests, Load and Stability Tests, Reliability Tests, Regression Tests, Documentation Tests.
7. **Functional Testing:** Equivalence Class Partitioning, Boundary Value Analysis, Decision Tables, Random Testing, Error Guessing, Category Partition.
8. **System Test Design:** Test Design Factors, Requirement Identification, Characteristics of Testable Requirements, Test Design Preparedness Metrics, Test Case Design Effectiveness.
9. **System Test Planning And Automation:** Structure of a System Test Plan, Introduction and Feature Description, Assumptions, Test Approach, Test Suite Structure, Test Environment, Test Execution Strategy, Test Effort Estimation, Scheduling and Test Milestones, System Test Automation, Evaluation and Selection of Test Automation Tools, Test Selection Guidelines for Automation, Characteristics of Automated Test Cases, Structure of an Automated Test Case, Test Automation Infrastructure
10. **System Test Execution:** Preparedness to Start System Testing, Metrics for Tracking System Test, Metrics for Monitoring Test Execution, Beta Testing, First Customer Shipment, System Test Report, Product Sustaining, Measuring Test Effectiveness.
11. **Acceptance Testing:** Types of Acceptance Testing, Acceptance Criteria, Selection of Acceptance Criteria, Acceptance Test Plan, Acceptance Test Execution, Acceptance Test Report, Acceptance Testing in eXtreme Programming.
12. **Software Quality:** Five Views of Software Quality, McCall's Quality Factors and Criteria, Quality Factors Quality Criteria, Relationship between Quality Factors and Criteria, Quality Metrics, ISO 9126 Quality Characteristics, ISO 9000:2000 Software Quality Standard ISO 9000:2000 Fundamentals, ISO 9001:2000 Requirements

Text Book

1. "Software Testing and Quality Assurance: Theory and Practice", Sagar Naik, University of Waterloo, Piyu Tripathy, Wiley, 2008

References:

1. "Effective methods for Software Testing" William Perry, Wiley.
2. "Software Testing - A Craftsman's Approach", Paul C. Jorgensen, CRC Press, 1995.
3. "The Art of Creative Destruction", Rajnikant Puranik, SPD.
4. "Software Testing", Srinivasan Desikan and Gopalaswamy Ramesh - Pearson Education 2006.
5. "Introducing to Software Testing", Louis Tamres, Addison Wesley Publications, First Edition.
6. "Software Testing", Ron Patton, SAMS Techmedia Indian Edition, Pearson Education 2001.
7. "The Art of Software Testing", Glenford J. Myers, John Wiley & Sons, 1979.
8. "Testing Object-Oriented Systems: Models Patterns and Tools", Robert V. Binder, Addison Wesley, 2000.
9. "Software Testing Techniques", Boris Beizer, 2nd Edition, Van Nostrand Reinhold, 1990.
10. "Software Quality Assurance", Daniel Galin, Pearson Education.

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:

- | | |
|--|----------|
| 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.

Elective - I : WIRELESS NETWORKS				
CLASS B.E. (INFORMATION TECHNOLOGY)			SEMESTER VII	
HOURS PER WEEK	LECTURES	:	04	
	TUTORIALS	:	--	
	PRACTICALS	:	02	
			HOURS	MARKS
EVALUATION SYSTEM:	THEORY	:	3	100
	PRACTICAL	:	--	--
	ORAL	:	--	25
	TERM WORK	:	--	25
Prerequisite: Networking Technology for Digital Devices, Convergence Technology for Networking in communication, C/C++/Java				
Objective: The main objective of this course is to get acquainted of Wireless Communication Systems and their Applications through today's technologies.				

1. **Introduction to Wireless Networks:** Evolution of Wireless Networks, Challenges, Overview of various Wireless Networks.
2. **Wireless Communications Principles and Fundamentals:** Introduction, The Electromagnetic Spectrum, The Cellular Concept, The Ad Hoc and Semi Ad Hoc Concepts, Wireless Services, Data Delivery Approaches, Overview of Basic Techniques and Interactions Between the Different Network Layers
3. **First Generation (1G) Cellular Systems:** Introduction, Advanced Mobile Phone System (AMPS), Nordic Mobile Telephony (NMT).
4. **Second Generation (2G) Cellular Systems:** Introduction, D-AMPS, cdmaOne (IS-95), GSM, IS-41, Data Operations, Cordless Telephony (CT).
5. **Third Generation (3G) Cellular Systems:** Introduction, 3G Spectrum Allocation, Third Generation Service Classes and Applications, Third Generation Standards.
6. **Fourth Generation (4G):** Introduction, Design Goals for 4G and Beyond and Related Research Issues, 4G Services and Applications, Challenges.
7. **Satellite Networks:** Introduction, Satellite Systems, VSAT Systems, Examples of Satellite-based Mobile Telephony Systems, Satellite based Internet Access.
8. **Fixed Wireless Access Systems:** Wireless Local Loop versus Wired Access, Wireless Local Loop, Wireless Local Loop Subscriber Terminals (WLL), Wireless Local Loop Interfaces to the PSTN, IEEE 802.16 Standards.
9. **Wireless Local Area Networks:** Introduction, Wireless LAN Topologies, Wireless LAN Requirements, The Physical Layer, The Medium Access Control (MAC) Layer, Latest Developments.

10. **Wireless ATM and Ad Hoc Routing:** Introduction, Wireless ATM Architecture, HIPERLAN 2: An ATM Compatible WLAN, Routing In Wireless Ad Hoc Networks.
11. **Personal Area Networks (PANs):** Introduction to PAN Technology and Applications, Commercial Alternatives: Bluetooth, Commercial Alternatives: HomeRF.
12. **Security Issues in Wireless Systems:** The Need for Wireless Network Security, Attacks on Wireless Networks, Security Services, Wired Equivalent Privacy (WEP) Protocol, Mobile IP, Weaknesses in the WEP Scheme, Virtual Private Network (VPN).
13. **Economics of Wireless Networks:** Introduction, Economic Benefits of Wireless Networks, The Changing Economics of the Wireless Industry, Wireless Data Forecast, Charging Issues.
14. **Case Studies on Simulation of Wireless Network Systems:** Performance Evaluation of IEEE 802.11 WLAN Configurations Using Simulation, Simulation Analysis of the QoS in IEEE 802.11 WLAN System, Simulation Comparison of the TRAP and RAP Wireless LANs Protocols, Simulation Modeling of Topology Broadcast Based on Reverse-Path Forwarding (TBRPF) Protocol Using an 802.11 WLAN-based MONET Model.

Text Book:

"Wireless Networks", P. Nicopolitidis, M. S. Obaldat, G. I. Papadimitriou, A. S. Pomportsis, John Wiley & Sons, Ltd.

References:

1. "Wireless Communications Principles and Practices", T. S. Rappaport, Pearson Education.
2. "Wireless Communications and Networks", William Stallings, Pearson Education.
3. "Wireless and Mobile Network Architectures", Yi-BaNG Lin and Imrich Chlamtac, Wiley.
4. "Wireless and Mobile Communication", Sanjeev Kumar, New Age International Publications.
5. "Wireless Network Evolving :2G to 3G", Garg, Pearson Education.
6. "Mobile Communication System", Y. C. Lee.
7. "Guide to Wireless Network Security", John R. Vacca, Springer.
8. "The Wireless Application Protocol", Steve Mann, Scott Sbihli, Wiley.
9. "Mobile Communications", Jochen Schiller, Pearson, Second Edition.
10. "Mobile Computing- Technology, Applications and Service Creation", A. K. Talukder, R.R. Yavagal, TMH.

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:

- | | |
|--|----------|
| 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 Experiment List

1. Study and analysis of wireless device and product specifications.
2. Implementation of spread spectrum techniques like DSSS and FHSS.
3. Use simulation tools like ANSim to study and simulate Ad-Hoc Network.
4. Implementation of MACA as RTS/CTS communication.
5. Study the wireless markup language and develop small application using it.
6. Study and implementation of wireless access and wireless application protocol.
7. Study and implementation of security issues in wireless network.
8. Case study implementation given in the syllabus.

Elective – I: MULTIMEDIA SYSTEMS				
CLASS B.E. (INFORMATION TECHNOLOGY)			SEMESTER VII	
HOURS PER WEEK	LECTURES	:	04	
	TUTORIALS	:	--	
	PRACTICALS	:	02	
EVALUATION SYSTEM:			HOURS	MARKS
	THEORY		3	100
	PRACTICAL		--	--
	ORAL		--	25
	TERM WORK		--	25
Prerequisite: Computer Graphics				
Objective: Students will be able to understand the relevance and underlining infrastructure of multimedia system. The purpose of the course for the students is to apply contemporary theories of multimedia learning to the development of multimedia products. Analyze instructional and informational media (audio/ visual materials, web based materials, games and simulations etc).				

- Multimedia Basics, Multimedia Authoring and Tools:** What is Multimedia?, Multimedia and Hypermedia, . World Wide Web, Overview of Multimedia Software Tools, Further Exploration, Multimedia Authoring, Some Useful Editing and Authoring Tools, VRML.
- Graphics and Image Data Representation:** Graphics/Image Data Types 60, Popular File Formats.
- Concepts in Video and Digital Audio:** Color Science, Color Models in Images, Color Models in Video. Types of Video Signals, Analog Video, Digital Video, Digitization of Sound, MIDI: Musical Instrument Digital Interface, Quantization and Transmission of Audio.
- Lossless & Lossy Compression Algorithms:** Introduction, Basics of Information Theory, Run-Length Coding, Variable-Length Coding, Dictionary-Based Coding, Arithmetic Coding, Lossless Image Compression. Distortion Measures, The Rate-Distortion Theory, Quantization, Transform Coding, Wavelet-Based Coding, Wavelet Packets, Embedded Zerotree of Wavelet Coefficients. Set Partitioning in Hierarchical Trees (SPIHT).
- Image Compression Standards:** The JPEG Standard, The JPEG2000 Standard, The JPEG-LS Standard, Bilevel Image Compression Standards.
- Basic Video Compression Techniques:** Introduction to Video Compression, Video Compression Based on Motion Compensation, Search for Motion Vectors, H.261, H.263 303.
- MPEG Video Coding:** Overview, MPEG-1, MPEG-2, Object-Based Visual Coding in MPEG-4, Synthetic Object Coding in MPEG, MPEG-4 Object types, Profiles and Levels, MPEG-4 Part10/H.264, MPEG-7.

8. **Basic Audio & MPEG Audio Compression Techniques:** ADPCM In Speech Coding, G.726 ADPCM, Vocoders, Psychoacoustics, MPEG Audio, Other Commercial Audio Codecs, future: MPEG-7 and MPEG-2.
9. **Computer and Multimedia Networks:** Basics of Computer and Multimedia Networks, Multiplexing Technologies, LAN and WAN, Access Networks, Common Peripheral Interfaces.
10. **Multimedia Network Communications and Applications:** Quality of Multimedia Data Transmission, Multimedia over IP, Multimedia over ATM Networks, Transport of MPEG-4, Media-on-Demand (MOD), Multimedia over Wireless Networks.
11. **Content-Based Retrieval in Digital Libraries:** How Should We Retrieve Images?, C. BIRD— A Case Study, Synopsis of Current Image Search Systems, Relevance Feedback, Quantifying Results, Querying on Videos, Querying on Other Formats, Outlook for Content-Based Retrieval.
12. **Image Databases:** Raw Images, Compress Image Presentations, Image Processing Segmentation, Similarity- Based Retrieval, Alternating Image DB Paradigms, Representing Image DBs with Relations and R Trees, Retrieving Images by Special Layout, Implementations, Selected Commercial Systems.
13. **Text/Document Databases:** Precision and Recall, Stop Lists, Word Stems and Frequency tables, Latent Semantic Indexing, TV-Trees, Other Retrieval Techniques, Selected Commercial Systems.
14. **Video & Audio Databases:** Organizing content of a Single video, Querying content of Video Libraries, Video Segmentation, Video Standard and Selected Commercial Systems. A general Model of Audio Data, Capturing Audio Content through Discrete Transformation, Indexing Audio Data and Selected Commercial Systems.
15. **Multimedia Databases:** Design and Architecture of a Multimedia Database, Organizing Multimedia Data based on the Principle of Uniformity, Media Abstractions, Query Languages for Retrieving Multimedia Data , Indexing SMDSS with Enhanced Inverted Indices, Query Relaxation/ Expansion, Conclusions and Selected Commercial Systems.

Text Books:

1. Ze-Nian Li and M. S. Drew, "Fundamental of Multimedia", Pearson Education.
2. V. S. Subrahmanian, "Principles of Multimedia Database Systems", Morgan Kaufmann Publication.

Reference Books:

1. K. R. Rao, Zoran S. Bojkovic, D. A. Milovanovic, "Introduction to Multimedia Communications", Wiley.
2. R. Steinmetz and K. Nahrstedt "Multimedia: Computing, Communication & Applications, Pearson Education.
3. Buford, "Multimedia Systems", Pearson Education.

4. C. T. Bhunia, "Multimedia and multimedia Communications", New Age International Publishers.
5. Prabhat K. Andheigh, Kiran Thakrar, "Multimedia Systems design", PHI.
6. Koegel Buford, "Multimedia Systems", Pearson Eduaction.
7. J. D. Gibson, 'Multimedia Communications: Directions and Innovations', Academic Press, Hard-court India.
8. Free Halshal, 'Multimedia Communications', PEA.

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:

- | | |
|--|----------|
| 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 Experiment List

1. Study of multimedia I/O devices.
2. Calculator for blind
3. Media player application
4. Design advertisement using flash/macromedia
5. Design a web application using dream viewer and fireworks
6. Create multimedia database for student ID card preparation
7. Study and use of different MPEG file formats.
8. Construction of website using pictures, videos, audio etc with proper layout.
9. Implementation Huffman algorithm for six character long string.
10. Edit the movie clip using adobe premlere.
11. Record a speech and perform compression and decompression.
12. Design a game/application in flash.
13. Convert BMP file to JPG file using any programming language.

Elective – I : EVOLUTIONARY ALGORITHMS				
CLASS B.E. (INFORMATION TECHNOLOGY)			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 and Algorithms, Knowledge of Programming Language / Tool (c / c++ / Java).				
Objective: The objective of the course is to understand the working of Evolutionary algorithms such as Genetic Algorithm, Genetic Programming, Evolutionary Algorithms and Evolutionary Programming with their application is the various aspects of Computer engineering.				

- 1. Evolutionary Computation (EC):** The Historical Development of EC, Principles of Darwinian natural selection, Overview of Genetic Algorithms (GA), Genetic Programming (GP), Evolutionary Strategies (ES), Evolutionary Programming (EP), Features of Evolutionary Computation, Genes and Population Genetics, The Genotype/Phenotype Dichotomy, Broad Applicability, Hybridization with Other Methods, Parallelism, Applications of Evolutionary Computation.
- 2. Genetic Algorithms (GA):** Overview of Conventional Optimization and Search Techniques, Simple Genetic Algorithm, Comparison with Other Optimization Techniques, Application of GA (Data analysis and prediction, Genetic algorithms in financial markets, GA in search, optimization, and machine learning), GA Terminologies: Individual, Genes, Fitness, Population, Encoding, Breeding, Termination Implicit Parallelism, Case Study of Traveling Salesman Problem.
- 3. Advanced Operators in GA:** Diploidy, Dominance and Abeyance, Multiploid, Inversion and Reordering, Niche and Speciation, Micro-operators, Non-binary Representation, Multi-objective Optimization, Combinatorial Optimization, GA classifications: SGA, Parallel GA, Hybrid GA.
- 4. Genetic Programming (GP):** Introduction, Comparison with GA, Primitives of GP, Attributes, Terminals, Function set, Operators in GP, Steps in GP, Improving genetic programming with statistics, Genetic programming with tree genomes, linear genomes, and graph genomes, Implementation of genetic programming, GP Applications. Case study of Santa-Fe-trail, Case study of John Muir Trail.
- 5. Foundations of Evolutionary Algorithms:** Schemas and the two-armed bandit problem, Mathematical models for simple genetic algorithms, Where to use evolutionary algorithms? Theoretical advantages and disadvantages of evolutionary algorithms over alternative methods (hill-climbing, simulated annealing, etc.), Co-evolutionary

Algorithms: Cooperative co-evolution, Competitive co-evolution, Swarm Intelligence and ant colony optimization.

6. **Evolutionary Strategies (ES):** Introduction, Comparison with GA & GP, Operators, Gaussian Mutation Operator, Intermediate Recombination Operator, Application of ES for Image Enhancement.
7. **Evolutionary Programming (EP):** Introduction. Comparison with GA, GP & ES. Selection mechanism, Applications of ES.
8. **Multi-Objective Evolutionary Optimization:** Pareto optimality. Multi-objective evolutionary algorithms. Learning Classifier Systems: Basic ideas and motivations, Main components and the main cycle. Theoretical Analysis of Evolutionary Algorithms: Schema theorems, Convergence of EAs, Computational time complexity of EAs, No free lunch theorem.
9. **Application of Genetic Algorithm to Image Processing:** Designing Texture Filters with Genetic Algorithms, Genetic Algorithm Based Knowledge Acquisition on Image Processing, Object Localization in Images Using Genetic Algorithm, Problem Description, Image Preprocessing, The Proposed Genetic Algorithm Approach.

Text Book:

1. Sivanandam, Deepa "Introduction to Genetic Algorithm", Springer.
2. Melanie Mitchell: "An Introduction to Genetic Algorithm", PHI.

Reference Books:

1. D. E. Goldberg, "Genetic Algorithms in Search, Optimisation and Machine Learning", Addison-Wesley.
2. Zbigniew Michalewics, "Genetic Algorithms + Data Structures = Evolution Programs", Springer Verlag, 1997.
3. Goldberg, "Genetic Algorithms", Pearson Education.
4. T. Back, D. B. Fogel and Michalewicz, "Evolutionary Computation1: Basic Algorithms and Operators", 2000.
5. A. E. Eiben and J.E. Smith, "Introduction to Evolutionary Computing", Springer, 2003.
6. W. Banzhaf et al. Morgan Kaufmann, "Genetic Programming: An Introduction", 1999.
7. J. R. Koza, "Genetic Programming: On the Programming of Computers by Means of Natural Selection", 1992
8. Vose Michael D, "The Simple Genetic Algorithm --- Foundations And Theory", Phi.
9. Rajasekaran S., Pai G.A. Vijayalakshmi, "Neural Networks, Fuzzy Logic, and Genetic Algorithms: Synthesis and Applications", Phi.
10. Reeves, C. R. and Rowe, J. E., "Genetic Algorithms - Principles and Perspectives: A Guide to GA Theory", 2003.
11. Falkenauer. E., "Genetic Algorithms and Grouping Problems", 1998.

Term Work:

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| 1. Laboratory work (Experiments and Journal) | 15 Marks |
| 2. Test (at least one) | 10 Marks |

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Suggested Experiment list

A mini-project based on the following (not Restricted to) topic:

- Flow Shop Scheduling Problem.
- Traveling Sales-person Problem.
- Santa-Fe-trial.
- John Muir Trail.
- Designing Texture Filters with Genetic Algorithm.
- Knowledge Acquisition on Image Processing.
- Object Localization in Images Using Genetic Algorithm.
- Finite Automata Construction Using Genetic Algorithm.
- Russian Roulette

Elective – I: IT APPLICATIONS IN CIVIL ENGINEERING				
CLASS B.E. (INFORMATION TECHNOLOGY)			SEMESTER VII	
HOURS PER WEEK	LECTURES	:	04	
	TUTORIALS	:	--	
	PRACTICALS	:	02	
			HOURS	MARKS
EVALUATION SYSTEM:	THEORY		3	100
	PRACTICAL		--	--
	ORAL		--	25
	TERM WORK		--	25

Unit 1: Introduction to construction Industry

Introduction to various aspects of Civil Engineering; Overview of present practices in Structural, Hydraulics, Geotechnical, Surveying, Environmental & construction Management and their field applications. Perspectives and definition of the construction firms for the future; New trends in organization for the construction firm.

Unit 2: Software Applications in construction Projects

Use of advanced spread sheet and advanced autocad in civil engineering projects; Understanding the basics of developing software for the purpose of structural analysis, Geotechnical analysis, surveying, water resource management and Project Management. Overview of GIS & GPS.

Unit 3: IT applications in construction project management.

Overview of Construction equipments; Developing simple programs for calculating equipment output, cycle time, strength of concrete using any of the procedural languages.(BASIC, COBOL or FORTRAN). Developing applications with file and database software; Developing simulations for various civil engineering operations. Management of information; Web based material procurement, e-auctions and e-tendering.

Unit 4: Intelligent Buildings & Building Automation

Concept of Intelligent Building. Building Automation, Controls and Protocols IT tools for Illumination, HVAC load calculation, Acoustics, Fire etc. Energy Efficiency in Buildings. Passive Architecture. Green Building concepts. Overview of Building Management System Software

Unit 5: IT applications in Construction quality & safety.

Use of sensors and wireless communication technologies on construction sites for safe operations. Use of lasers and sensors in defect detections and construction quality improvement.

Recommended Text Book:

1. **Boyd C Paulson, JR "Computer applications in construction"**, Mc Graw Hill International Editions, Civil Engineering Series.

Students should be demonstrated capabilities of present software in structural and Construction Management areas (Minimum one source code from each) Students shall also be encouraged to write programs for simple problems of construction field applications

Term Work:

Term work shall consist of at least 10 experiments/ presentations/ assignments covering all topics and one written test.

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.