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

### Fourth Year - Semester VII

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### 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
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.


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.


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:**
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.
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) 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. 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.

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,


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

Reference Books:

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. Content 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**

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**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:**

**Reference Books:**

**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:

3. Laboratory work (Experiments and Journal) ........................................... 15 Marks
4. 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
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.


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


**Text Book**


**References:**


**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:

5. Laboratory work (Experiments and Journal) 15 Marks
6. 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

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**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.


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).


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.


11. **Personal Area Networks (PANs)**: Introduction to PAN Technology and Applications, Commercial Alternatives: Bluetooth, Commercial Alternatives: HomeRF.


**Text Book:**

**References:**

**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:

7. Laboratory work (Experiments and Journal) 15 Marks
8. 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

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HOURS MARKS

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).

1. **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.

2. **Graphics and Image Data Representation:** Graphics/Image Data Types 60, Popular File Formats.


6. **Basic Video Compression Techniques:** Introduction to Video Compression, Video Compression Based on Motion Compensation, Search for Motion Vectors, H.261, H.263 303.


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.


15. **Multimedia Databases**: Design and Architecture of a Multimedia Database, Organizing Multimedia Data based on the Principal 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:**

**Reference Books:**

**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:

9. Laboratory work (Experiments and Journal) 15 Marks
10. 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 premiere.
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

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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.


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.


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.


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.


**Text Book:**

**Reference Books:**
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:

11. Laboratory work (Experiments and Journal) 15 Marks
12. 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.
- Russian Roulette
**Elective I - NANOTECHNOLOGY**

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**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 microscopics, scanning probe microscopics, optical microscopics 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.


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, Nanosytems 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:**
3. “Nano Essentials”, T. Pradeep, TMH.
6. “Nanotechnology – the fun and easy way to explore the science of mater’s smallest particles”, Richard Booker and Earl Boysen, Wiley.

**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:

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<tr>
<th>Description</th>
<th>Marks</th>
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<tr>
<td>13. Laboratory work (Experiments and Journal)</td>
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<tr>
<td>14. Test (at least one)</td>
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</table>

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) 

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<th>HOURS PER WEEK</th>
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<td>TUTORIALS</td>
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<tr>
<td>PRACTICALS</td>
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**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.


2. **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.


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.


**Reference Books:**

**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:

15. Laboratory work (Experiments and Journal) 15 Marks
16. 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

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<td>ORAL -- 25</td>
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<td>TERM WORK -- 25</td>
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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.


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.

9. **Uncertain Knowledge and Reasoning**: Uncertainty, Representing knowledge in an Uncertain Domain, Overview of Probability Concepts, Belief Networks, Simple Inference in Belief Networks


11. **Agent Communication**: Communication as action, Types of communicating agents, A formal grammar for a subset of English

**Text Book:**


**Reference Books:**

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.

**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:

- **17. Laboratory work (Experiments and Journal)**: 15 Marks
- **18. 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
CLASS B.E. ( INFORMATION TECHNOLOGY) SEMESTER VII

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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:
   - 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)
   - 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
   - Project can be undertaken on any subject taught through semester I to Semester VIII
   - Students can certainly take ideas from anywhere, but be sure that they should evolve them in the unique way to suit their project requirements.
   - 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
### Scheme of Instructions

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<tr>
<th>Sr. No</th>
<th>Subjects</th>
<th>Lect/ Week</th>
<th>Pract/ Week</th>
<th>Tuto/ Week</th>
<th>Theory Hours</th>
<th>T/W Marks</th>
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<td>Gaming Architecture and programming</td>
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### 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
INFORMATION STORAGE MANAGEMENT AND DISASTER RECOVERY

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: 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.


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.


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:**

**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:

19. Laboratory work (Experiments and Journal) 15 Marks
20. 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 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.
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


4. Building Bricks: Reusability in Software.


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:

21. Laboratory work (Experiments and Journal)  15 Marks
22. 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.
SOFTWARE PROJECT MANAGEMENT

CLASS B.E. (INFORMATION TECHNOLOGY) SEMESTER VIII

HOURS PER WEEK

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EVALUATION SYSTEM:

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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 leveling, 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:**

**Reference Books:**
**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:

23. Laboratory work (Experiments and Journal) 15 Marks
24. 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 used 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**

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**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.


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.


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 in Sample Solution.

9. **Authenticating Users with .NET Access Control Services:** Creating the .NET Services Solution, Installing the .NET Services SDK and other Tools, Creating 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 WSHttpRelayBinding.

11. **Exploring .NET Service Bus Queues and Routers:** Persisting Messages in Service Bus Queues, Delivering Message with Service Bus Routers.

**Text Book:**

**Reference Books:**

**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:

- **25. Laboratory work (Experiments and Journal)** 15 Marks
- **26. 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

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| EVALUATION SYSTEM:                  |               |
| THEORY :                            | 3             |
| PRACTICAL :                         | --            |
| ORAL :                              | --            |
| TERM WORK :                         | --            |

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.

1. **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.

2. **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.

3. **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.


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:

Reference:

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:

27. Laboratory work (Experiments and Journal) 15 Marks
28. 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

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**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.


5. **Designing Service Interfaces:** Services, Design Guidelines, Interface Design Illustrated, Solution Model.

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.


9. **Designing and Using Integration in SOA Solutions**: Challenges of Integration in SOA, Integration in SOA Defined, Special Considerations for Implementing of Integration.


**Text Book**
1. “Applied SOA”, Michael Rosen et al., Wiley India.

**Reference:**
1. “Service- Oriented Architecture for Enterprise Applications”, Shankar Kambhampaty, Wiley

**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:

29. Laboratory work (Experiments and Journal) 15 Marks
30. 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 |
| 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.


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.


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:**
4. “Public Information Technology and e-Governance: Managing the Virtual State”, Garson G. David, Jones and Bartlett”.
11. “Digital Divide or Digital Jumbo: Beyond the IT Revolution”, Mitshiro Kagami and Masatsugu Tsuji (ed.)

**Term Work:**
Term work shall consist of project report preparation. Distribution of marks for term work shall be as follows:

31. Laboratory work (Experiments and Journal) 15 Marks
32. 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

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**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 understanding 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, forgiving 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.


**Text Books:**

**Reference Books:**
3. Alexis Leon, “ERP Demystified”, TMH.

**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, Servelets / JSP) and or a CRM source code for a virtual enterprise using visual Basic and SQL server

33. Laboratory work (Experiments and Journal) 15 Marks
34. On line test of developed source code 10 Marks
**Elective – II: MOBILE AND E-COMMERCE**

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**EVALUATION SYSTEM: **

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**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.


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.


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 excelling 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, Revising 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 hand-held 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:**
Reference Books:

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:

35. Laboratory work (Experiments and Journal) .......... 15 Marks
36. 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.
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,

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
   Telematric 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 :
2. Fu, Gonzales and Lee, Robotics, McGraw Hill
3. J.J, Craig, Introduction to Robotics, Pearson Education
5. An Embedded Software Primer – David E. Simon – Pearson Education

Reference Books :
4. Staughard, Robotics and AI, Prentice Hall of India
6. Niku, Introduction to Robotics, Pearson Education
7. Klafter, Chmielewski, Negin, Robot Engineering, Prentice Hall of India
8. Mittal, Nagrath, Robotics and Control, Tata McGraw Hill publications
10. Embedded Linux – Hollabaugh, Pearson Education
12. Robotic Engineering / Richard D. Klafter, Prentice Ha
13. Robot Analysis and Intelligence / Asada and Slow time / Wiley Inter-Science.

Term Work:

Term work should consist of at least 8 Practicals 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:

3. Laboratory work (Experiment and Journal)        15  Marks
4. 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 Rhnio XR-3 robot.
2. Inverse Kinematics for Adept-1 SCARA Robot.
3. Work space analysis for Two-axis planer 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

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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:

2. 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.

3. 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.