SCHEME AND SYLLABI FOR

EIGHTH SEMESTER

OF

BACHELOR OF

TECHNOLOGY IN
COMPUTER SCIENCE AND ENGINEERING

FROM 2009 ADMISSION ONWARDS

CALICUT UNIVERSITY (P.O), THENHIPALAM

Semester VIII		Hours / Week			Marks		Semester-end duration-hours	Credits
Code	Subject	L	T	D/P	Inte-rnal	S emes ter-end		
CS09 801	Computer Architecture and Parallel Processing	4	1		30	70	3	5
CS09 802	Data mining and Warehousing	2	1		30	70	3	3
CS09 803	Elective IV	3	1		30	70	3	4
CS09 804	Elective V	3	1		30	70	3	4
CS09 805(P)	***Project***			11				7
CS09 806(P)	***Seminar***			3				2
CS09 807(P)	***Viva – Voce***							3
Total		**12**	**4**	**14**				**28**
Total Marks								

Code	Elective I
CS09 L01	Information Security
CS09 L02	Computational Intelligence
CS09 L03	Queuing Theory
CS09 L04	Object Oriented Modeling and Design
CS09 L05	Management Information Systems
Electives for 7th and 8th semester	
CS09 L06	Artificial Neural Networks
CS09 L07	Distributed Systems
CS09 L08	Fuzzy Logic and Applications
CS09 L09	Speech and Language Processing
CS09 L10	Advanced Topics in Operating Systems
CS09 L11	Advanced Database Design
CS09 L12	Digital Image Processing
CS09 L13	VLSI Design
CS09 L14	Information Theory and Coding
CS09 L15	Multimedia
CS09 L16	Web Programming
CS09 L17	Graph Theory and Combinatorics
CS09 L18	Machine Learning
CS09 L19	Soft Computing

CS09 L20	Information Retrieval
CS09 L21	Digital Design Using VHDL
CS09 L22	Computational Geometry
CS09 L23	Simulation and Modeling **(Global Elective 1 from CSE)**
CS09 L24	Computer Based Numerical Methods **(Global Elective 2 from CSE)**
CS09 L25	Pattern Recognition **(Global Elective 3 from CSE)**
	Global Electives from other departments
EE09 L23	Process Control and Instrumentation
EE09 L25	Robotics & Automation
ME09 L24	Marketing Management
AN09 L24	Project Management
EC09 L25	Biomedical Instrumentation
IC09 L23	Bio-Informatics
PE09 L23	Total Quality Management
CE09 L24	Remote Sensing and GIS
CE09 L25	Finite Element Methods
BT09 L24	Bio-ethics and Intellectual Property Rights

CS09 801 : Computer Architecture and Parallel Processing

Teaching scheme **Credits:** 5
4 hours lecture and 1 hour tutorial per week

Objectives

- *To teach ideas on parallel computing based computer architectures with a quantitative approach.*
- *To impart concepts in new design paradigms to achieve parallelism, memory hierarchy design and inter-connection networks.*

Module I (16 hours)
Fundamentals - task of a computer designer - trends in technology usage and cost - performance measurement - quantitative principles of computer design - instruction set architectures - classification - addressing and operations - encoding an instruction set - role of compilers - case study - the DLX architecture - pipelining - pipeline for DLX - pipeline hazards - data and control hazards - implementation difficulties - pipelining with multicycle operations.

Module II (15 hours)
Instruction level parallelism - concepts and challenges - dynamic scheduling -dynamic hardware prediction - multiple issue of instructions - compiler and hardware support for ILP - vector processing - vector architecture – vector length and stride - compiler vectorization - enhancing vector performance

Module III (17 hours)
Memory hierarchy design - reducing cache misses and miss penalty, reducing hit time - main memory - virtual memory and its protection - case study - protection in the Intel Pentium - crosscutting issues - I/O systems - performance measures - reliability and availability - designing an I/O system - case study - performance of Unix file system.

Module IV (17 hours)
Interconnection networks - simple networks - connecting more than two computers - practical issues - multiprocessors - introduction – application domains - centralised-shared memory and distributed-shared memory architectures - synchronisation - models of memory consistency

Text Books

1. Hennesy J.L. & Pattersen D.A., *Computer Architecture: A Quantitative approach*, Harcourt Asia Pte Ltd. (Morgan Kaufman).

Reference Books

1. C. Pattersen D.A. & Hennesy J.L., *Computer Organisation and Design: The Hardware/Software Interface*, Harcourt Asia Pvt. Ltd. (Morgan Kaufman)
2. Hwang K., *Advanced Computer Architecture: Parallelism, Scalability and Programmability*, McGraw Hill

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

CS09 802: Data Mining and Warehousing

Teaching scheme **Credits:** 3
2 hours lecture and 1 hour tutorial per week

Objectives

- *To give only a broad, yet in-depth overview of the field of data mining and warehousing, a multi-disciplinary field of study.*

Module I (10 hours)
Introduction: what is Data Mining, which data, what kinds of patterns can be mined-Data Warehouse and OLAP technology for Data Mining,Data Warehouse Architecture.
Data preprocessing: data cleaning, data integration and transformation, data reduction, discretization and concept - hierarchy generation.

Module II (10 hours)
Data Mining Primitives, Languages and System Architectures. - Concept Descriptions: Characteristic and Discriminant rules.
Data Generalization. - Mining Association Rules in Large Databases - Transactional databases.

Module III (10 hours)
Concept Descriptions: Characteristic and Discriminant rules, Data Generalization, Example of decision tables and Rough Sets.
Classification and prediction, Decision Tree Induction (ID3, C4.5), Bayesian Classification.
Cluster Analysis. A Categorization of major Clustering methods
Module IV (9 hours)
Introduction to Data warehousing: Need for warehousing, Data warehouse Architecture and design, Hardware and operational design, Tuning and testing.
Trends , Developments and Applications.

Text Books

1. J. Han and M. Kamber, *Data mining: Concepts and Techniques*, Elsevier Science, 2007.

Reference Books

1. K.P.Soman, Shyam Diwakar, and V. Ajay, *Insight into Data Mining: Theory and Practice*, Prentice Hall of India, 2006.
2. S. Sumathi, S. N. Sivanandam, *Introduction to data mining and its applications,(Illustrated Edn)*, Springer Publishers, 2006
3. P.M.Tan, N.Stenbach and V.Kumar, *Introduction to Data Mining*, Pearson Education, London, 2007
4. K.Mehmed, *Data Mining: Concepts,Models, Methods, and Algorithms*, John Wiley and Sons, 2003.
5. Paulraj Ponniah, *Data Warehousing Fundamentals: A Comprehensive Guide for IT Professional*, Wiley Student Edition, 2007
6. S. Anahary and D. Murray, *Data Warehousing in the Real World,:A Practical Guide for Building Decision Support Systems*, Pearson Education, 2000.
7. M.H. Dunham, *Data mining: Introductory and Advanced Topics*, Pearson Education, 2004.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

Note: One of the assignments shall be simulation of continuous systems using any technical computing software

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

CS09 805 (P) : Project

Teaching scheme **Credits:** 2
3 hours practical per week

Objectives

This project work is the continuation of the project initiated in seventh semester. The performance of the students in the project work shall be assessed on a continuous basis by the project evaluation committee through progress seminars and demonstrations conducted during the semester. Each project group should maintain a log book of activities of the project. It should have entries related to the work done, problems faced, solution evolved etc.

There shall be at least an Interim Evaluation and a final evaluation of the project in the 8th semester. Each project group has to submit an interim report in the prescribed format for the interim evaluation.

Each project group should complete the project work in the 8th semester. Each student is expected to prepare a report in the prescribed format, based on the project work. Members of the group will present the relevance, design, implementation, and results of the project before the project evaluation committee comprising of the guide, and three/four faculty members specialised in computer science and engineering.

50% of the marks is to be awarded by the guide and 50% by the evaluation committee.

Internal Continuous Assessment
40% - Design and development/Simulation and analysis
30% - Presentation & demonstration of results
20% - Report
10% - Regularity in the class

CS09 806 (P) : Seminar

Teaching scheme **Credits:** 2
3 hours practical per week

Objectives

- *To assess the ability of the student to study and present a seminar on a topic of current relevance in computer science engineering or allied areas*

It enables the students to gain knowledge in any of the technically relevant current topics and acquire the confidence in presenting the topic. The student will undertake a detailed study on the chosen topic under the supervision of a faculty member, by referring papers published in reputed journals and conferences. Each student has to submit a seminar report, based on these papers; the report must not be reproduction of any original paper. A committee consisting of three/four faculty members will evaluate the seminar.

Internal Continuous Assessment
20% - Relevance of the topic and literature survey
50% - Presentation and discussion
20% - Report
10% - Regularity in the class and Participation in the seminar

CS09 807 (P) : Viva Voce

Credits: 3

Objectives

- *To examine the knowledge acquired by the student during the B.Tech. course, through an oral examination*

The students shall prepare for the oral examination based on the theory and laboratory subjects studied in the B.Tech. Course, mini project, seminar, and project. There is only university examination for viva-voce. University will appoint two external examiners and an internal examiner for viva-voce. These examiners shall be senior faculty members having minimum five years teaching experience at engineering degree level. For final viva-voce, candidates should produce certified reports of mini project, seminar, and project (two interim reports and main report). If he/she has undergone industrial training/industrial visit/educational tour or presented a paper in any conference, the certified report/technical paper shall also be brought for the viva-voce.

Allotment of marks for viva-voce shall be as given below.

Assessment in Viva-voce

40% - Subjects
30% - Project and Mini Project
20% - Seminar
10% - Industrial training/industrial visit/educational tour or Paper presented at National-level

CS09 L01 : Information Security

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To teach the fundamentals of information security which deals with protecting information and information systems from unauthorized access, use, disclosure, disruption, modification or destruction.*
- *To teach the various threats to storage of secure information.*

Module I (15 hours)
Introduction – basics of cryptography – review of cryptography – symmetric cryptography, stream ciphers, block ciphers, integrity – public key cryptography, knapsack, RSA, Diffie-Helman – hash functions – Linear and differential cryptoanalysis.

Module II (12 hours)
Authentication – Methods of authentication – Passwords – Biometrics – Two-factor authentication – Single sign-in – web cookies – Authorization – Access control matrix – Multilevel security models – Multilateral security – covert channel – inference control – CAPTCHA – Firewalls – Intrusion detection.

Module III (11 hours)
Simple security protocols – authentication protocols – Authentication and TCP – Zero knowledge protocols – secure socket layer – IPSec – Kerberos – GSM.

Module IV (14 hours)
Software Flaws – Malware – software based attacks – software recovery engineering – software tamper resistance – digital rights management – software development – operating system security functions – trusted operating systems – next generation secure computing base.

Text Books

1. Mark Stamp, *Information Security : Principles and Practice*, Wiley India Pvt. Ltd, 2006.

Reference Books

1. Gurpreet Dhillon, *Principles of Information Systems Security: text and cases*. NY: John Wiley & Sons, 2007.
2. Chris McNab. *Network Security Assessment*. Sebastopol, CA: O'Reilly, 2004.
3. Bruice Schneier, Applied Cryptography, Wiley India Pvt. Ltd, 2006.
4. Timothy Layton P, *Information Security: Design, Implementation, Measurement, and Compliance*. Boca Raton, FL: Auerbach publications, 2007.
5. Thomas R Peltier., *Information Security Policies, Procedures, and Standards: guidelines for effective information security management*. Boca Raton, FL: Auerbach publications, 2002.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

CS09 L02 : Computational Intelligence

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To teach how to create cognitive systems that could compete with humans in large number of areas.*
- *To teach fundamental heuristic algorithms such as those found in fuzzy systems, neural networks and evolutionary computation*

Module I (13 hours)
Recursion and Mathematical Induction - Verification and Limitations - Verification of Logic Programs - Limitations - Applications in Natural Language Processing - Using Definite Clauses for Context-Free Grammars - Augmenting the Grammar - Building Structures for Nonterminals - Canned Text Output - Enforcing Constraints - Building a Natural Language Interface to a Database

Module II (14 hours)
Searching - Graph Searching - Blind Search Strategies - Heuristic Search - Refinements to Search Strategies, Cycle Checking - Multiple-Path Pruning, Iterative Deepening, Direction of Search, Bidirectional Search, Island-Driven Search, Searching in a Hierarchy of Abstractions - Dynamic Programming - Constraint Satisfaction Problems - Representing Knowledge - Choosing a Representation Language - Mapping from Problem to Representation - Inference Procedure - Knowledge Engineering , Introduction - Knowledge-Based System Architecture - Meta-Interpreters - Querying the User - Debugging Knowledge Bases - Meta-Interpreter with Search – Unification

Module III (12 hours)
Equality - Integrity Constraints - Complete Knowledge Assumption - Disjunctive Knowledge - Explicit Quantification - First-Order Predicate Calculus - Modal Logic - Actions and Planning - Representing Time, Relations, Actions, Change - Reasoning with World Representations - Assumption-Based Reasoning Framework - Default Reasoning - Default Prediction - Abduction - Evidential and Causal Reasoning - Algorithms for Assumption-Based Reasoning

Module IV (13 hours)
Using Uncertain Knowledge - Random Variables - Probability - Information Theory - Independence Assumptions - Belief Networks - Reasoning in a Belief Network - Implementing Belief Networks - Making Decisions Under Uncertainty - Decision Variables - Decision Networks - The Value of Information - Learning - Issues - Learning Decision Trees - Searching for a Good Decision Tree - Neural Networks - Case-Based Reasoning - Learning as Refining the Hypothesis Space - Learning Under Uncertainty - Explanation-Based Learning - Building Situated Robots - The Agent Function - Robot Architectures - Implementing a Controller - Reasoning in Situated Robots

Text Books

1. Russel Ebenhart, Yuhui Shi, *Computational Intelligence – Concepts to Implementations*, Morgran Kaufmann Publishers, 2009.

Reference Books

1. A.P. Engelbrecht, *Computational Intelligence : An Introduction*, John Wiley, 2003
2. A. Konar, *Computational Intelligence : Principles, Techniques and Applications*, Springer 2005.
3. A. Kusiak, Computational Intelligence *in Design and Manufacturing*, Wiley-Interscience, 2000.
4. D. Lind, B. Marcus, *Symbolic Dynamics and Coding*, Cambridge University Press, 1995.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

CS09 L03: Queuing Theory

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To teach the fundamental queueing models and the various parameters involved with performance of the individual disciplines.*

Module I (14 hours)
Description of the Queueing problem - Characteristics of Queueing processes - Notation - Measuring System
Performance - Some General Results - Simple Bookkeeping for Queues - Poisson process and the Exponential Distribution - Markovian property of the Exponential Distribution - Stochastic Processes and Markov Chains - Steady-state Birth-Death Processes - Simple Markovian Birth-Death Queueing Models -

Module II (15 hours)
Steady-state solution for the M/M/1 Model - Methods of Solving Steady-state Difference Equations - Queues with parallel channels (M/M/c) - Queues with Parallel Channels and Truncation (M/M/c/K) - Erlang's Formula (M/M/c/c) - Queues with Unlimited Service - Queues with Impatience - Transient Behaviour - Busy-Period analyses for M/M/1 and M/M/c - Bulk input (M[x]/M/1) - Bulk Service (M/M[Y]/1) - Erlang's Models (M/Ek/1, Ek/M/1, Ej/Ek/1) - Priority Queue disciplines

Module III (12 hours)
Series Queues - Open Jackson Networks - Closed Jackson Networks - Cyclic Queues - Extensions of Jackson Networks - Non-Jackson Networks - Single-server Queues with Poisson Input and General Service (M/G/1) - Multi server Queues with Poisson input and General Service - General Input and Exponential service

Module IV (13 hours)
G/Ek/1, G(k)/M/1 and G/PHk/1 - General Input, General Service (G/G/1) - Multichannel Queues with Poisson input and Constant Service (M/D/c) - Semi-Markov and Markov Renewal Processes in Queueing - Other Queueing Disciplines - Design and Control of Queues - Statistical Inference in Queueing - Bounds, Approximations, Numerical Techniques and Simulation. - Bounds and Inequalitites - Approximations - Numerical Techniques - Discrete-Event Stochastic Simulation Problems.

Text Books

1. Donald Gross & Carl M Harris, *Fundamentals of Queuing Theory, 3rd edition*, Wiley India, 1997.

Reference Books

1. Trivedi K S, *Probability and Statistics with Reliability, Queueing and Computer Science Applications*, Prentice Hall of India, 1984.
2. Allen A O, Probability, *Statistics and Queueing Theory*, Academic Press, 1981.
3. Balaguruswamy E, *Reliability Engineering* , Tata McGraw Hill Publishers, New Delhi, 1984.
4. Sanjay K Bose, *An Introduction to Queueing Systems*, Kulwer Academic Plenum Publishers.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

CS09 L04 : Object Oriented Modelling and Design

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To impart ideas on building systems through the object oriented modelling approach using the Unified Modelling Language.*

Module I (14 hours)
Introduction to UML and Unified Process - Use case modeling: Actors and Use cases, Use case specification, Actor generalization, Use case generalization - Objects and classes, Relationships, Inheritance and Polymorphism, Packages.

Module II (14 hours)
Use case realization: Interactions, Sequence diagrams, Communication diagrams, Interaction occurrences. Activity diagrams: Activity semantics, activity partitions, Sending signals and accepting events, Interaction overview diagrams.

Module III (13 hours)
Design: Design workflow, well-formed design classes, Refining analysis relationships. Interfaces and components - State machine diagrams, Composite states, submachine states

Module IV (13 hours)
Implementation workflow, Deployment, Introduction to OCL: Why OCL? OCL expression syntax, Types of OCL expressions. Introduction to Software Architecture, Architecture description language (ADL)

Text Books

1. Jim Arlow and Ila Neustadt, *UML 2 and the Unified Process: Practical Object oriented Analysis and Design, Second Edition*, Pearson Education.

Reference Books

1. Craig Larman, *Applying UML and Patterns, 3rd Edition*, Pearson Education.
2. Grady Booch, JamesRambaugh,Ivar Jacobson .A.W , *The Unified Modeling Language User Guide*
3. Bruegge, *Object Oriented Software Engineering using UML patterns and Java*, Pearson Education
4. James Rambaugh et. al., *Object Oriented Modelling and Design*, Prentice Hall India
5. Ivar Jacobson, Grady Booch, James Rambaugh A.W, *The Unified Software Development Process*.
6. DeLillo. *Object Oriented Design in C++*. Thomson Learning

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A:	*Short answer questions (one/two sentences)* All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.	*5 x 2 marks=10 marks*
PART B:	*Analytical/Problem solving questions* Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.	*4 x 5 marks=20 marks*
PART C:	*Descriptive/Analytical/Problem solving questions* Two questions from each module with choice to answer one question.	*4 x 10 marks=40 marks*

Maximum Total Marks: 70

CS09 L05 : Management Information Systems

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To introduce the methods and the influence of the information systems in management milieu*
- *To enable the students to use MIS as an effective tool in management and decision making*

Module I (14 hours)

Information Systems-functions of management-levels of management-framework for information systems-systems approach-systems concepts-systems and their environment-effects of systems approach in information systems design-using systems approach in problem solving - strategic uses of information technology.

Module II (14 hours)

Computer Fundamentals, Telecommunication and Networks - Communication, Media, Modems & Channels - LAN, MAN & WAN - Network Topologies, Internet, Intranet and Extranet. Wireless technologies like Wi-Fi, Bluetooth and Wi-Max.

Module III (10 hours)

Kinds of Information Systems - Transaction Processing System (TPS) - Office Automation System (OAS) - Management Information System (MIS) - Decision Support System (DSS) and Group Decision Support System (GDSS) - Expert System (ES) - Executive Support System (EIS or ESS).

Module IV (14 hours)

Information systems planning - critical success factor - business system planning - ends/means analysis - organizing the information systems plan - system analysis and design - alternative application development approaches - organization of data processing - security and ethical issues of information systems.

Reference Books

1. Schultheis R. & Mary Summer, *Management Information Systems-The Manager's View*, Tata McGraw Hill.
2. Kenneth J Laudon, Jane P.Laudon, *Management Information Systems-Organization and Technology*, Pearson/PHI,10/e, 2007
3. W. S. Jawadekar, *Management Information Systems,* Tata McGraw Hill Edition, 3/e, 2004.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

CS09 L06 : Artificial Neural Networks

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To teach the fundamental building blocks of Neural networks and to promote their widespread use in the current day scientific research environment.*

Module I (14 hours)
Introduction – Historical development – Biological networks – Comparison – Network architecture – Activation function – Learning methods – McCullogh Pitts Neuron Model – architecture – Learning rules – Hebbian learning rules – Perceptron Learning rule – Delta learning rule – Competitive – Out star rule – Boltsman learning – Memory based learning.

Module II (14 hours)
Feedforward networks – Introduction – Single layer perceptron architecture – Perceptron algorithm for several input classes – Perceptron convergence theorem – Multilayer perceptron networks – Backpropagation networks – Generalised delta learning rule – backpropagation rule – Architecture and training – Learning in backpropogation – Local minima and global minima – merits and demerits of back propogation networks – Radial Basis Function (RBF) Networks – Algorithm for an RBFN with fixed centres – Adaline and Madaline networks

Module III (13 hours)
Counter propagation networks – Winner take-all learning – out star learning – Kohonen self organizing network – Full counter propagation networks – Training phases – Forward only counter propagation network – Learning Vector Quantizer

Module IV (13 hours)
Associative memory – Continuous and Discrete Hopfield networks – Energy analysis – Storage and retrieval algorithm – Boltzman machine – Bidirectional Associative memory – Adaptive Resonance Theory networks – Applications of Neural networks – Solving optimization problems – Solving Linear Equations – Solving Travelling Salesman Problem – Applications in Pattern Recognition, Image Processing.

Text Books

1. S N Shivanandam, S Sumati, S N Deepa, *Introduction to Neural Networks using MATLAB,* Tata McGraw Hill.
2. J.M. Zurada, *Introduction to Artificial Neural Networks, 3rd edition,* Jaico Publishers.

Reference Books

1. Kishan Mehrotra, Chelkuri K Mohan, Sanjay Ranka, *Elements of Artificial Neural Networks,* Penram International.
2. Simon Haykin, *Artificial Neural Network,* Pearson Education.
3. Laurene Fausett, Fundamentals of Neural Networks, 2nd edition, Pearson Education.
4. B. Yenganarayana, *Artificial Neural Networks,* Prentice Hall India.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A:	*Short answer questions (one/two sentences)* All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.	*5 x 2 marks=10 marks*
PART B:	*Analytical/Problem solving questions* Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.	*4 x 5 marks=20 marks*
PART C:	*Descriptive/Analytical/Problem solving questions* Two questions from each module with choice to answer one question.	*4 x 10 marks=40 marks*

Maximum Total Marks: 70

CS09 L07 : Distributed Systems

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To impart basic knowledge of the issues concerning distributed systems, from both software and hardware viewpoints.*

Module I (10 hours)
Operating system fundamentals - distributed system concepts and architectures - major design issues - distributed computing environments (DCE).

Module II (13 hours)
Concurrent processes and programming - threads and processes - client server model - time services language mechanisms for synchronization - concurrent programming languages.

Module III (13 hours)
Inter-process communication and coordination - message passing communication - request/reply communication - transaction communication -name and directory services - distributed mutual exclusion - leader election.

Module IV (13 hours)
Distributed process scheduling - static process scheduling, dynamic load sharing and balancing - distributed process implementation - real-time scheduling - concepts of distributed file systems - distributed shared memory - distributed computer security.

Text Books

1. Chow R. & Johnson T, *Distributed Operating Systems and Algorithms*, Addison Wesley.

Reference Books

1. Sinha P.K., *Distributed Operating Systems Concepts and Design*, PHI
2. Tanenbaum S., *Distributed Operating Systems*, Pearson Education.
3. Coulouris G, Dollimore J. & Kindberg T., *DistributedSystems Concepts and Design*, Addison Wesley
4. Singhal M. & Shivaratri, *Advanced Concepts in Operating Systems, Distributed Databases And Multiprocessor Operating Systems*, McGraw Hill.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A:	*Short answer questions (one/two sentences)* All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.	*5 x 2 marks=10 marks*
PART B:	*Analytical/Problem solving questions* Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.	*4 x 5 marks=20 marks*
PART C:	*Descriptive/Analytical/Problem solving questions* Two questions from each module with choice to answer one question.	*4 x 10 marks=40 marks*

Maximum Total Marks: 70

CS09 L08 : Fuzzy Logic and Applications

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To impart the basic concepts of fuzzy set theory.*
- *To understand the applications of fuzzy logic in various fields.*

Module I (14 hours)
Crisp sets and fuzzy sets – introduction – crisp sets an overview – the notion of fuzzy sets – basic concepts of fuzzy sets – classical logic an overview – fuzzy logic. Operations on fuzzy sets – fuzzy complement – fuzzy union – fuzzy intersection – combinations of operations – general aggregation operations.

Module II (14 hours)
Fuzzy relations – crisp and fuzzy relations – binary relations – binary relations on a single set– equivalence and similarity relations – compatibility or tolerance relations – orderings – membership functions – methods of generation – defuzzification methods.

Module III (13 hours)
Fuzzy measures – general discussion – belief and plausibility measures – probability measures – possibility and necessity measures – relationships among classes of fuzzy measures.

Module IV (13 hours)
Fuzzy Logic and Applications – applications of fuzzy logic – Fuzzy Controllers (overview & an example) – fuzzy systems and neural networks – fuzzy Neural networks. Fuzzy Clustering – fuzzy pattern recognition – fuzzy Image Processing – fuzzy databases – fuzzy information retrieval.

Text Books

1. G.J. Klir and T.A. Folger, *Fuzzy sets, Uncertainty and Information*, Prentice Hall of India, 1998.
2. T.J. Ross, *Fuzzy Logic with Engineering applications*, McGraw Hill Int. Ed

Reference Books

1. H.J. Zimmerman, *Fuzzy set theory and its Applications, 4th Ed.*, Kluwer Academic Publishers, 2001.
2. G.J. Klir and B.Yuan, *Fuzzy sets and fuzzy logic: Theory and Applications*, Prentice Hall of India, 1997.
3. H.Nguyen and E.Walker, *A first course in Fuzzy logic, 2nd Ed.*, Chapman and Hall/CRC, 1999.
4. J. Yen and R. Lengari, *Fuzzy Logic: Intelligence, Control and Information*, Pearson Education, 1999

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A:	*Short answer questions (one/two sentences)* All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.	*5 x 2 marks=10 marks*
PART B:	*Analytical/Problem solving questions* Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.	*4 x 5 marks=20 marks*
PART C:	*Descriptive/Analytical/Problem solving questions* Two questions from each module with choice to answer one question.	*4 x 10 marks=40 marks*

Maximum Total Marks: 70

CS09 L09 : Speech and Language Processing

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To teach the fundamental concepts in speech processing and natural language processing through which human-computer dialog systems may be developed.*

Module I (13 hours)
Introduction: Words, Regular Expressions and Automata, Words and Transducers, N-grams, Part-of-Speech Tagging, Hidden Markov and maximum Entropy Models

Module II (13 hours)
Speech: Phonetics, Speech Synthesis, Automatic Speech, Recognition, Speech Recognition : Advanced Topics, Computational Phonology

Module III (13 hours)
Syntax: Formal Grammars of English, Syntactic Parsing, Statistical Parsing, Features and Unification, Language and Complexity

Module IV (13 hours)
Semantics and Pragmatics: The Representation of Meaning, Computational Semantics, Lexical Semantics, Computational Lexical Semantics, Computational Discourse Applications : Information Extraction, Question Answering and Summarization, Dialog and Conversational Agents, Machine Translation

Text Books

1. Daniel Jurafsky and James H. Martin, *Speech and Language Processing : An Introduction to Natural Language Processing*, Computational Linguistics, and Speech Recognition (Second Edition), Prentice Hall, 2009

Reference Books

1. C.D.Manning and H. Schutze, *Foundations of Statistical Natural Language Processing*, MIT Press, London, 2001.
2. James Allen, *Natural Language Understanding*, 2nd Edn, Benjamin/Cummings Pub. Co., 1994.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A:	*Short answer questions (one/two sentences)* All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.	*5 x 2 marks=10 marks*
PART B:	*Analytical/Problem solving questions* Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.	*4 x 5 marks=20 marks*
PART C:	*Descriptive/Analytical/Problem solving questions* Two questions from each module with choice to answer one question.	*4 x 10 marks=40 marks*

Maximum Total Marks: 70

CS09 L10 : Advanced Topics in Operating Systems

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To teach advanced concepts related to operating systems including various categories and the complex algorithms in their management functions.*

Module I (14 hours)
Introduction – Functions – Design approaches – Types of advanced operating systems – Synchronization mechanisms – concept of a process – threads – critical section problems – synchronization problems.

Module II (14 hours)
Architecture – mutual execlusion – deadlock detection – resource management – file systems – shared memory – scheduling – failure recovery – fault tolerance.

Module III (13 hours)
Multiprocessor system architecture – intercommunication networks – caching – hypercube architectures – structure of multiprocessor operating system – design issues – threads – process synchronization – processor scheduling – memory management – reliability – fault tolerance

Module IV (13 hours)
Introduction to database operating sytesms and realtime operating systems – concurrency control – distribted database systems – concurrency control – distributed database systems – concurrency control algorithms – basic synchronization primitives – lock based – time stamp based.

Text Books

1. Mukesh Singal, *Advanced Topics in Operating Systems*, Tata McGraw Hill.

Reference Books

1. Nutt G.J, *Operating Systems – A Modern Perspective*, Addison Wesley.
2. Schilberschatz & Galvin, *Operating System Concepts*, Addison Wesley.
3. Tanenbaum A.S., *Modern Operating Systems*, Pearson Education.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

CS09 L11 : Advanced Database Design

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To impart knowledge on the advancements in database management systems. This covers ideas on the latest methodologies such as object oriented, distributed and deductive database systems along with comparisons and some case studies.*
- *to enable the student to analyze, design and implement modern database systems, especially for a distributed environment..*

Module I (11 hours)
Overview of relational database concept - object oriented database - overview of object oriented concepts - object definition language - object query languages - object database conceptional design – Object relational and extended relational systems.

Module II (13 hours)
Distributed database concepts - data fragmentation replication and allocation - types of distributed database system - query process - concurrency control for distributed database - overview of client - server architecture and its relationship to distributed database

Module III (13 hours)
Deductive database - introduction to deduction database prolog/datalog notation - interpretation of rules - basic inference mechanism for logic programs - datalog programs and their evaluation - deduction database systems - data Warehousing and data mining - database on World Wide Web - multimedia database - mobile database - geographic information system - digital libraries

Module IV (15 hours)
Oracle and microsoft access - basic structure of the oracle system - database structures and its manipulation in oracle - storage organization programming oracle applications - oracle tools - an overview of Microsoft access features and functionality of access - distributed databases in oracle

Text Books

1. Elmasri & Navathe, *Fundamentals of Database Systems*, Pearson Education, fourth edition.

Reference Books

1. Ramakrishnan R. & Gehrke J., *Database Management Systems*, McGraw Hill
2. O'neil P. & O'neil E., *Database Principles, Programming, And Performance*, Harcourt Asia (Morgan Kaufman)
3. Silberschatz, Korth H.F. & Sudarshan S., *Database System Concepts*, Tata McGraw Hill
4. Theory T.J., *Database Modelling And Design*, Harcourt Asia (Morgan Kaufman)

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A:	*Short answer questions (one/two sentences)* All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.	*5 x 2 marks=10 marks*
PART B:	*Analytical/Problem solving questions* Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.	*4 x 5 marks=20 marks*
PART C:	*Descriptive/Analytical/Problem solving questions* Two questions from each module with choice to answer one question.	*4 x 10 marks=40 marks*

Maximum Total Marks: 70

CS09 L12 : Digital Image Processing

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To impart the introductory concepts of image processing*
- *To understand all the elements of image processing beginning from formation and digitization to enhancement, restoration, edge detection, segmentation, and compression .*

Module I (15 hours)
Introduction - digital image representation - fundamental steps in image processing - elements of digital image processing systems - digital image fundamentals - elements of visual perception - a simple image model - sampling and quantization - basic relationship between pixels - image geometry - image transforms - introduction to Fourier transform - discrete Fourier transform (DFT) - properties DFT- other separable image transforms - Walsh, Hadamard and Discrete Cosine transforms. Hotelling transform.

Module II (12 hours)
Image enhancement - basic grey level transformation - histogram equalization - image subtraction - Image averaging - spatial filtering - smoothing, sharpening filters - Laplacian filters. Enhancement in the frequency domain - frequency domain filters - smoothing, sharpening filters - homomorphic filtering.

Module III (12 hours)
Image restoration - model of Image degradation/restoration process - noise models - inverse filtering - least mean square filtering - constrained least mean square filtering. Edge detection - thresholding - region based segmentation - Boundary representation

Module IV (13 hours)
Image compression - fundamental concepts of image compression - compression models - information theoretic perspective. Lossless compression - Huffman coding - arithmetic coding - bit plane coding - run length coding. Lossy compression - transform coding - Image compression standards.

Text Books

1. R.C. Gonzalez and R.E. Woods, *Digital Image Processing - 2nd ed.*, Prentice Hall of India, New Delhi.

Reference Books

1. B. Chanda and D.D. Majumder, *Digital Image Processing and Analysis*, PHI
2. A.K. Jain, *Fundamentals of Digital Image Processing*, PHI
3. W.K. Pratt, *Digital Image Processing*, John Wiley, 2006
4. M. Sonka, V. Hlavac and R. Boyle, *Image Processing Analysis and Machine Vision*, Brooks/colic, Thompson Learning, 1999.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A:	*Short answer questions (one/two sentences)* All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.	*5 x 2 marks=10 marks*
PART B:	*Analytical/Problem solving questions* Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.	*4 x 5 marks=20 marks*
PART C:	*Descriptive/Analytical/Problem solving questions* Two questions from each module with choice to answer one question.	*4 x 10 marks=40 marks*

Maximum Total Marks: 70

CS09 L13 : VLSI Design

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To impart the required skills to the students in design of VLSI components.*

Module I (14 hours)
Introduction to MOS technology - IC technology - MOS and VLSI - NMOS and "CMOS fabrication - thermal aspects - MOS circuits tub ties and latch up - wire parasitic - design rules and layouts - multilayer CMOS process - layout diagrams - stick diagrams - hierarchical stick diagrams - layout design analysis tools.

Module II (14 hours)
Logic gates - review of combinational logic circuits - basic gate layouts – delay - power Consumption - speed power product - wires and delay – combinational logic networks - layout design methods -network delay - cross talk – power optimization - switch logic networks.

Module III (12 hours)
Sequential machines - latches and flip flops - sequential system design -subsystem design - pipelining - data paths - adders - ALU - ROM - RAM -FPGA - PLA – multipliers.

Module IV (12 hours)
Floor planning - methods - floor plan of a 4 bit processor - off chip connections –architecture design - register transfer design - architecture for low power - architecture testing - cad systems and algorithms - simulation - layout synthesis.

Text Books

1. Neil H. E. Weste, Kamran Eshraghian, *Principles of CMOS VLSI Design,* Addison Wesley.

Reference Books

1. C. Puck Nell D. A. & Eshraghian K., *Basic VLSI Design - Systems and Circuits*
2. Mead C, Conway L., *Introduction to VLSI System*, Addison Wesley
3. Wayne Wolf, *Modern VLSI Design*, Phipe.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A:	*Short answer questions (one/two sentences)* All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.	*5 x 2 marks=10 marks*
PART B:	*Analytical/Problem solving questions* Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.	*4 x 5 marks=20 marks*
PART C:	*Descriptive/Analytical/Problem solving questions* Two questions from each module with choice to answer one question.	*4 x 10 marks=40 marks*

Maximum Total Marks: 70

CS09 L14 : Information Theory and Coding

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To teach the fundamentals of information quality, error control in communication process and various systems of coding information for reliable communications.*

Module I (14 hours)
Information theory - information and entropy - properties of entropy of a binary memory less source - extension of a discrete memory less source -source coding theorem - Shannon-Fano coding - Huffman coding - Lempel Ziv coding - discrete memory less source - binary symmetric channel - mutual information - properties - channel capacity - channel coding theorem -information capacity theorem.

Module II (14 hours)
Coding - linear block codes - generator matrices - parity check matrices - encoder-syndrome and error detection - minimum distance - error correction and error detection capabilities - cyclic codes - coding and decoding.

Module III (13 hours)
Introduction to algebra - groups - fields - binary field arithmetic - construction of galois field - basic properties - computations - vector spaces - matrices - BCH codes - description - decoding - reed 55eneral codes

Module IV (13 hours)
Coding - convolutional codes - encoder - generator matrix - transform domain representation - state diagram - distance properties - maximum likelihood decoding - Viterbi decoding - sequential decoding - interleaved convolutional codes.

Text Books

1. Simon Haykin, *Communication Systems*, John Wiley
2. Shu Lin & Costello D.J., *Error Control Coding - Fundamentals and Applications*, Prentice Hall Inc. Englewood Cliffs.

Reference Books

1. C. Das J., Malik S.K. & Chatterje P.K., *Principles of Digital Communication*, New Age International Limited
2. Sam Shanmugham, *Digital and Analog Communications*, John Wiley
3. Simon Haykin, *Digital Communications*, John Wiley
4. Taub & Shilling, *Principles of Communication Systems*, Tata McGraw Hill

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

CS09 L15 : Multimedia

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To impart the fundamental concepts of multimedia.*

Module I (13 hours)
Multimedia system organization and architecture - QOS architecture - multimedia distributed processing models - multimedia conferencing model - storage organization.

Module II (13 hours)
Psychoacoustics - digital audio and computer - digital representation of sound - audio signal processing (editing and sampling) - audio production - digital music - musical instrument synthesizer - MIDI protocol

Module III (13 hours)
Raster scanning principle - color fundamental - color video performance measurement - analog audio - stereo effect - MPEG and DVI technology - multimedia applications - toolkit and hyper application.

Module IV (13 hours)
Multimedia information system - operating system support middleware system service architecture - presentation services - user interface - file system and information and information model - presentation and anchoring file - Multimedia standards - role of standards - standardization issues - distributed multimedia systems.

Text Books

1. P. K. Buford, *Multimedia Systems*, AWL.

Reference Books

1. W.I. Grosky, R. Jain and R. Mehrotra, *The Handbook of Multimedia Information System*, Prentice Hall India.
2. P. K. Andleigh and K. Thakrar, *Multimedia Systems Design*, Prentice Hall India.
3. M. J. Bunzal and S. K. Morriec, *Multimedia Application Development*, Tata McGraw Hill
4. Rao, Bojkovic and Milovanovic, *Multimedia Communication Systems*,
5. R. Steinmetz and K. Nahrstedt, *Multimedia Computing Communication and Application*, Pearson Education

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A:	*Short answer questions (one/two sentences)* All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.	*5 x 2 marks=10 marks*
PART B:	*Analytical/Problem solving questions* Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.	*4 x 5 marks=20 marks*
PART C:	*Descriptive/Analytical/Problem solving questions* Two questions from each module with choice to answer one question.	*4 x 10 marks=40 marks*

Maximum Total Marks: 70

CS09 L16 : Web Programming

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To teach the various technologies available for programming the web applications.*

Module I (14 hours)
Introduction to Web programming – Introduction to SGML features – HTML, XHTML, DHTML, XML – HTML Vs XML – Creating XML documents – Parsing an XML document – Writing well formed documents – Organizing elements with namespaces – Defining elements in a DTD – Declaring elements and attributes in a DTD.

Module II (14 hours)
CGI/Perl: Creating link to a CGI Script – Using a link to send data to a CGI Script – parsing data sent to a Perl CGI script – Using CGI script to process form data – Using scalar variables in Perl – Using variables in Perl – Using arithmetic operators in Perl – Associating a form with a script.

Module III (13 hours)
Event driven programming using Java applets – Java Server Pages – JSP scripting elements – Linking to external files – JSP declarations – JSP Expressions – JSP Scriplets – Processing client requests – Java Beans : features – designing Java Beans – Properties of beans – creation of events – EJB basics – types of beans – development of session beans – steps in creation and implementing interfaces – Accessing a database from JSP.

Module IV (13 hours)
PHP : Defining PHP variables – variable types – operators – control flow constructs in PHP – Establishing connection with MySQL database – managing system data – parsing data between pages – Introduction to AJAX programming.

Text Books

1. Robert W. Sebesta, *Programming with World Wide Web*, 4th edition, Pearson Education, 2009.

Reference Books

1. Xue Bal et. al, *The Web Warrior Guide to Web programming*, Thomson Learning.
2. Chris Bates, *Web Programming : Building Internet Applications, 3rd ed*, Wiley Academic Catalog.
3. H.M. Deitel, P.J. Deitel, A.B. Goldberg, *Internet and World Wide Web : How to Program, 3rd edition*, Pearson Education.
4. Kalata, *Internet Programming with VBScript and JavaScript*, Thomson Learning.
5. Joseph L Weber, *Using JAVA 2 Platform – Special Edition*, Prentice Hall India.
6. Larne Pekowsky, *Java Server Pages*, Pearson Asia.
7. Barry Burd, *JSP*, IDG Books India.
8. Ed Roman, *Mastering Enterprise Java Beans and the Java 2 platform Enterprise Edition*, Wiley Computer Publishing.
9. Floyd Marinescu, *EJB Design Patterns*,
10. Steven Holzner, *Ajax Bible*, Wiley Student Edition.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

CS09 L17 : Graph Theory and Combinatorics

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To introduce the basics of graph theory as a modelling and analysis tool in computer science and engineering.*
- *To introduce the structures such as graphs and trees and several combinatorial techniques which are needed in number theory based computing and network security studies in Computer Science.*

Module I (13 hours)
Introduction to graphs - definitions - subgraphs - paths and cycles - matrix representation of graphs - Euler tours - Chinese postman problem - planar graphs -Euler's formula - platonic bodies - applications of Kuratowski's theorem - Hamiltonian graphs - graph colouring and chromatic polynomials - map colouring.

Module II (14 hours)
Trees - definitions and properties - rooted trees - trees and sorting - weighted trees and prefix codes - biconnected components and articulation points - the max-flow min-cut theorem - maximum bipartite matching - Matchings -matchings and augmenting paths -the personal assignment problem – Networks - flows and cuts - ford and Fulkerson algorithm - separating sets.

Module III (11 hours)
Fundamental principles of counting - permutations and combinations - binomial theorem - combinations with repetition - combinatorial numbers - principle of inclusion and exclusion - derangements - arrangements with forbidden positions

Module IV (14 hours)
Generating functions - partitions of integers - the exponential generating function - the summation operator - recurrence relations - first order and second order - non-homogeneous recurrence relations - method of generating functions

Text Books

1. Grimaldi R.P., *Discrete and Combinatorial Mathematics: An Applied Introduction*, Addison Wesley.
2. Clark J. & Holton D. A., *A First Look at Graph Theory*, Allied Publishers (World Scientific).

Reference Books

1. Corman T.H., Leiserson C.E. & Rivest R.L., *Introduction to Algorithms*, Prentice Hall India.
2. Mott J.L., Kandel A. & Baker T.P, *Discrete Mathematics for Computer Scientists And Mathematicians*, Prentice Hall of India.
3. Liu C.L., *Elements of Discrete Mathematics*, McGraw Hill.
4. Rosen K.H., *Discrete Mathematics and Its Applications*, McGraw Hill.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

CS09 L18 : Machine Learning

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To teach the fundamental concepts of Machine Learning,*
- *To equip the learners with techniques and methods using which machines mimic the human learning process.*

Module I (10 hours)
Preliminaries - Introduction - Learning Input-Output Functions - Learning and Bias - Sample applications - Boolean Functions - Representation - Classes of Boolean Functions - Introduction to Neural Networks

Module II (14 hours)
Using Version Spaces for Learning - Version Spaces and Mistake Bounds - Version Graphs - Learning as Search of a Version Space - The Candidate Elimination Method - Neural Networks - Threshold Logic Units - Linear Machines - Networks of TLUs - Training Feedforward Networks by Backpropogation - Synergies Between Neural Network and Knowledge-Based Methods - Statistical Learning - Using Statistical Decision Theory - Learning Belief Networks - Neighest-Neighbor Methods

Module III (14 hours)
Decision Trees - Definitions - Supervised Learning of Univariate Decision Trees - Networks Equivalent to Decision Trees - Overfitting and Evaluation - The Problem of Replicated Subtrees - The problem of Missing Attributes - Comparisions - Inductive Logic Programming - Notations and Definitions - A Generic ILP Algorithm - Inducing Recursive Programs - Choosing Literals to Add - Relationship Between ILP and Decision Tree Induction - Computational Learning Theory - Notation and Assumptions for PAC Learning Theory - PAC Learning - The Vapnik-Chervonenkis Dimension - VC Dimension and PAC Learning

Module IV (14 hours)
Unsupervised Learning - Clustering Methods - Hierarchical Clustering Methods - Temporal-Difference Learning - Temporal Patterns and Prediction Problems - Supervised and Temporal-Difference Methods - Incremental computation of the (delta w)i - An experiment with TD Methods - Theoretical Results - Intra-Sequence Weight Updating - Delayed-Reinforcement Learning - The General Problem - Temporal Discounting and Optimal Policies - Q-Learning - Discussion, Limitations, and Extensions of Q-Learning - Explanation-Based Learning - Deductive Learning - Domain Theories - Evaluable Predicates - More General Proofs - Utility of EBL - Applications

Text Books

1. Ethem Alpaydın, *Introduction to Machine Learning (Adaptive Computation and Machine Learning)*, MIT Press, 2004.

Reference Books

1. Mitchell. T, *Machine Learning*, McGraw Hill, 1997.
2. Christopher M. Bishop, *Pattern Recognition and Machine Learning*, Springer, 2006.
3. Ryszard S. Michalski, Jaime G. Carbonell, Tom M. Mitchell, *Machine*

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

CS09 L19 : Soft Computing

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

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

Module I (14 hours)
Introduction to Genetic Algorithm, Genetic Operators and Parameters, Genetic Algorithms in Problem Solving, Theoretical Foundations of Genetic Algorithms, Implementation Issues - systems

Module II (14 hours)
Neural Model and Network Architectures, Perceptron Learning, Supervised Hebbian Learning, Backpropagation, Associative Learning, Competitive Networks, Hopfield Network, Computing with Neural Nets and applications of Neural Network.

Module III (13 hours)
Introduction to Fuzzy Sets, Operations on Fuzzy sets, Fuzzy Relations, Fuzzy Measures, Applications of Fuzzy Set Theory to different branches of Science and Engineering.

Module IV (13 hours)
Advanced Topics: Support Vector Machines, Evolutionary computation (EC)- Evolutionary algorithms, Harmony search, Swarm intelligence

Text Books

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

Reference Books

1. M. Mitchell, *An Introduction to Genetic Algorithms*, Prentice-Hall, 1998.
2. D. E. Goldberg, *Genetic Algorithms in Search, Optimization, and Machine Learning*, Addison-Wesley, 1989.
3. S. V. Kartalopoulos, *Understanding Neural Networks and Fuzzy Logic: Basic Concepts and Applications*, IEEE Press - PHI, 2004.
4. S. Rajasekaran & G. A. Vijayalakshmi Pai, *Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications*, PHI, 2003.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

CS09 L20 : Information Retreival

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To familiarize the students with tools and techniques for deriving the right information at the right time, in the current scenario of information explosion*
- *To present the techniques for storage of many forms of information, such as text, image, audio and video formats, and to present several issues related to different IR tasks.*

Module I (10 hours)
Introduction: Information versus Data Retrieval, IR: Past, present, and future. Basic concepts: The retrieval process, logical view of documents. Modeling: A Taxonomy of IR models, ad-hoc retrieval and filtering. Classic IR models: Set theoretic, algebraic, probabilistic IR models, models for browsing.

Module II (12 hours)
Retrieval evaluation: Performance evaluation of IR: Recall and Precision, other measures, Reference Collections, such as TREC, CACM, and ISI data sets. Query Languages: Keyword based queries, single word queries, context queries, Boolean Queries, Query protocols, query operations.

Module III (12 hours)
Text and Multimedia Languages and properties, Metadata, Text formats, Markup languages, Multimedia data formats, Text Operations. Indexing and searching: Inverted files, Suffix trees, Suffix arrays, signature files, sequential searching, Pattern matching.

Module IV (16 hours)
Multimedia IR: Spatial access methods, Generic multimedia Indexing approach, Distance functions, feature extraction, Image features and distance functions. Searching the Web: Characterizing and measuring the Web. Search Engines: Centralized and Distributed architectures, user Interfaces, Ranking, Crawling the Web, Web directories, Dynamic search and Software Agents.

Text Book

1. R. Baeza-Yates and B. R. Neto, *Modern Information Retrieval*, Pearson Education, 2004.

Reference Books

1. C.J. van Rijsbergen, *Information Retrieval*, Butterworths, 1979.
2. R.R.Korfhage, Information Storage and Retrieval, Wiley Student Edn, 2006.
3. C.D. Manning and H. Schutze, *Foundations of Statistical natural Language Processing* (Chapters 13, 14, and 15 only), The MIT Press, Cambridge, London.2001.
4. D. Hand, H. Mannila, P. Smyth, *Data Mining*, Prentice Hall of India, 2004.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

CS09 L21 : Digital Design using VHDL

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To teach the various aspects in the design of digital circuits using VHDL, including the language elements.*

Module I (13 hours)
VHDL Design methodology - Requirements analysis and specification - VHDL Design Description - Verification using simulation – Test benches – Functional (Behavioral) Simulation - Logic synthesis for the Target - Place-and-Route and Timing simulation - VHDL Design Methodology advantages - VHDL for synthesis versus VHDL for simulation - Design Units, Library units and Design entities - Entity declaration - VHDL Syntax definitions - Architecture body - Coding styles - Object classes and object types - Signal objects - Scalar types - Type Std_logic - Scalar literals and Scalar constants - Composite types - Arrays - Types unsigned and signed - Composite literals and Composite constants - Integer types - Port Types for Synthesis - Operators and expressions

Module II (13 hours)
Logical operators - Signal assignments in dataflow style architectures - Selected signal assignment - Type Boolean and the Relational operators - Conditional signal assignment - priority encoders - Don't care inputs and outputs - Decoders - Table lookup - Three state buffers - Avoiding conditional loops - Behavioral style architecture - process statement - Sequential statements - Case statement - If statement - Loop statement – Variables - Simulator Approaches - Elaboration - Signal Drivers - Simulator Kernel Process - Simulation Initialization - Simulation Cycles - Signals Versus Variables - Delta Delays - Delta Delays and combinational feedback - Multiple Drivers - Signal Attributes - Design Verification - Single process testbench - Wait statements - Assertion and Report statements - Records and Table lookup test benches - Predefined shift operators - Stimulus order based on UUT functionality

Module III (13 hours)
Latches and Flipflops - D Latch - Detecting clock edges - D Flip-flops - Enabled (Gated) Flip-flop - Other Flip-flop types - PLD Primitive memory elements - Timing requirements and Synchronous input data - Multibit latches and registers - shift registers - Shift register counters - Counters - Detecting non-clock signal edges – Memories - Finite state machines - FSM state diagrams - Three process FSM VHDL template - State diagram development - State encoding and state assignment - supposedly state FSMs - Counters as Moore FSMs - Algorithmic State Machine charts ASM charts to VHDL - System architecture - Successive approximation register design example - Sequential Multiplier Design - Subprograms - Functions - Procedures - Array attributes and unconstrained arrays – Overloading Subprograms and operators – Type conversions

Module IV (13 hours)
Packages and package bodies - Standard and De factor standard packages - Packages for VHDL text output- Simple sequential test benches - Systems clock - System reset - Synchronizing stimulus generation and monitoring – Test bench for successive approximation register - Output verification in stimulus procedures - Bus functional models – Response monitors - Modular design, partitioning and hierarchy - Design units and library units - Design libraries - Direct design entity instantiation - Configuration declarations - Component connections - Parameterized design entities - Library of parameterized modules (LPM) - Generate statement

Text Books

1. Peter J Ashenden, *The Designer's Guide to VHDL, 3rd edition*, Morgan Kauffman Publishers, 2008.

Reference Books

1. Kenneth L Short, *VHDL for Engineers*, Prentice Hall.
2. S.S. Limaye, *Digital design with VHDL*, CMR Design Automation (P) Ltd, 1999.
3. Ian Grout, *Digital Systems Design with FPGAs and CPLDs*, Newness/Elsevier, 2009.
4. Peter J Ashenden, *Digital Design: An Embedded Systems Approach using VHDL*, Morgan Kauffman Publishers, 2008.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

CS09 L22 : Computational Geometry

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- To teach the algorithms concerned with geometric shapes and figures, particularly related to space manipulation.

Module I (13 hours)
Introduction - An example : convex hull - degeneracies and robustness - application domains - line segment intersection - the doubly-connected edge list - computing the overlay of two subdivisions - boolean operations - guarding and polygon triangulations - partitioning a polygon into monotone pieces - triangulating a monotone polygon - Linear programming - the geometry of casting - half-plane intersection - incremental linear programming - randomized linear programming - unbounded linear programs - linear programming in higher dimensions - smallest enclosing discs

Module II (13 hours)
orthogonal range searching - 1-dimensional range searching - Kd-Trees - range trees - higher dimensional range trees - general sets of points - fractional cascading - point location and trapezoidal maps - a randomized incremental algorithm - dealing with degenerate cases - a tail estimate - voronoi diagrams - computing the voronoi diagram - voronoi diagrams of line segments - farthese-point voronoi diagrams arrangements and duality - computing the discrepancy - duality - arrangements of lines - levels and discrepancy

Module III (13 hours)
Delaunay triangulations - triangulations of planar point sets - computing the delaunay triangulation - the analysis - a framework of randomized algorithms - geometric data structures - interval trees - priority search trees - segment trees - convex hulls - complexity in 3-space - computing convex hulls in 3-space - analysis - convex hulls and half-space intersection - binary space partitions - determination of BSP trees - BSP trees and the painter's algorithm - construction of BSP tree - the size of BSP tree in 3-space - BSP trees for low-density scenes

Module IV (13 hours)
robot motion planning - work space and configuration space - a point robot - minkowski sums - translational motion planning - motion planning with rotations - quadtrees (non-uniform mesh generation) - uniform and non-uniform meshes - quadtrees for point sets - from quadtrees to meshes - visibility graphs - shortest paths for a point robot - computing the visibility graph - shortest paths for a translating polygonal robot - simplex range searching - partition trees - multi-level partition trees - cutting trees

Text Books

1. Mark de Berg, Mark van Kreveld, Mark Overmars, Otfried Schwartzkopf, *Computational Geometry : Algorithms and Applications*, Springer, New York, 1997.

Reference Books

1. Franco Preparata and Michael I. Shamos, *Computational Geometry : an Introduction*, Springer, New York, 1985.
2. Jean-Daniel Boissonnat and Mariette Yvinec, *Algorithmic Geometry*, Cambridge University Press, 1998.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

CS09 L23 : Simulation and Modelling

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To teach the students how to reproduce real-world events or process under controlled laboratory conditions, using mainly mathematical models.*

Module I (10 hours)
Introduction - systems and models - computer simulation and its applications -continuous system simulation - modeling continuous systems - simulation of continuous systems - discrete system simulation - methodology – event scheduling and process interaction approaches - random number generation -testing of randomness - generation of stochastic variates - random samples from continuous distributions - uniform distribution - exponential distribution m-Erlang distribution - gamma distribution - normal distribution - beta distribution - random samples from discrete distributions - Bernoulli - discrete uniform -binomial - geometric and poisson

Module II (12 hours)
Evaluation of simulation experiments - verification and validation of simulation experiments - statistical reliability in evaluating simulation experiments -confidence intervals for terminating simulation runs - simulation languages -programming considerations - general features of GPSS - SIM SCRIPT and SIMULA.

Module III (15 hours)
Simulation of queueing systems - parameters of queue - formulation of queueing problems - generation of arrival pattern - generation of service patterns -Simulation of single server queues - simulation of multi-server queues -simulation of tandom queues.

Module IV (15 hours)
Simulation of stochastic network - simulation of PERT network - definition of network diagrams - forward pass computation - simulation of forward pass -backward pass computations - simulation of backward pass - determination of float and slack times determination of critical path - simulation of complete network - merits of simulation of stochastic networks.

Reference Books

1. C. Deo N., *System Simulation And Digital Computer*, Prentice Hall of India.
2. Gordan G., *System Simulation*, Prentice Hall of India.
3. Law A.M. & Ketton W.D., *Simulation Modelling and Analysis*, McGraw Hill.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

Note: One of the assignments shall be computer based simulation of continuous systems using any technical computing software
One of the tests must be computer based (practical).

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

CS09 L24 : Computer Based Numerical Methods

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To impart the basic concepts of mathematical modelling of problems in science and engineering and to know procedures for solving different kinds of problems.*
- *To understand the various numerical techniques which provide solutions to non linear equations, partial differential equations etc that describe the mathematical models of problems.*

Module I (13 hours)
Errors in numerical computation - mathematical preliminaries - errors and their analysis - machine computations - computer software. Algebraic and Transcendental Equations - bisection method - iteration method - method of false position - rate of convergence - method for complex root - Muller's method - quotient difference method - Newton-Raphson method.

Module II (13 hours)
Interpolation – introduction - errors in polynomial interpolation - finite differences - decision of errors - Newton's formula for interpolation. Gauss, Sterling, Bessel's, Everett's Formula - interpolation by unevenly spaced points - Lagrange interpolation formula - divided difference - Newton's general interpolation formula.

Module III (13 hours)
Numerical Integration and Differentiation – introduction - numerical differentiation - numerical integration - trapezoidal rule - Simpson 1/3 rule - Simpson 3/8 rule - Boole's and Weddle's rules - Euler-Maclariaun formula - Gaussian formula - numerical evaluation of singular integrals.

Module IV (13 hours)
Statistical Computations - frequency Chart - method of least square curve fitting procedures - fitting a straight line - curve fitting by sum of exponential - data fitting with cubic splines - approximation of functions. Regression Analysis - linear and nonlinear regression - multiple regression - statistical quality control methods.

Text Books

1. E. Balagurusamy, *Numerical Methods*, Tata McGraw-Hill Pub.Co.Ltd, New Delhi, 1999.
2. C.F. Gerald and P.O. Wheatley, *Applied Numerical Analysis, 6th Ed.*, Pearson Education Asia, New Delhi, 2002.

Reference Books

1. P. Kandasamy, K. Thilagavathy and K. Gunavathy, *Numerical Methods*, S.Chand Co. Ltd., New Delhi, 2003.
2. R.L. Burden and T.D. Faires, *Numerical Analysis, 7th Ed.*, Thomson Asia Pvt. Ltd., Singapore, 2002.
3. Shastri, *Introductory methods of numerical analysis*, Prentice Hall International.
4. V. Rajaraman, *Introduction to Numerical Methods*, Tata McGraw Hill.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A:	*Short answer questions (one/two sentences)* All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.	*5 x 2 marks=10 marks*
PART B:	*Analytical/Problem solving questions* Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.	*4 x 5 marks=20 marks*
PART C:	*Descriptive/Analytical/Problem solving questions* Two questions from each module with choice to answer one question.	*4 x 10 marks=40 marks*

Maximum Total Marks: 70

CS09 L25 : Pattern Recognition

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To impart a basic knowledge on pattern recognition and to give a sound idea on the topics of parameter estimation and supervised learning, linear discriminant functions and syntactic approach to PR.*
- *To provide a strong foundation to students to understand and design pattern recognition systems.*

Module I (12 hours)
Introduction - introduction to statistical - syntactic and descriptive approaches - features and feature extraction - learning - Bayes Decision theory - introduction - continuous case - 2-category classification - minimum error rate classification - classifiers - discriminant functions - and decision surfaces - error probabilities and integrals - normal density - discriminant functions for normal density

Module II (12 hours)
Parameter estimation and supervised learning - maximum likelihood estimation - the Bayes classifier - learning the mean of a normal density - general Bayesian learning - nonparametric technic - density estimation - parzen windows - k-nearest neighbour estimation - estimation of posterior probabilities - nearest-neighbour rule - k-nearest neighbour rule

Module III (12 hours)
Linear discriminant functions - linear discriminant functions and decision surfaces - generalised linear discriminant functions - 2-category linearly separable case - non-separable behaviour - linear programming procedures - clustering - data description and clustering - similarity measures - criterion functions for clustering

Module IV (16 hours)
Syntactic approach to PR - introduction to pattern grammars and languages - higher dimensional grammars - tree, graph, web, plex, and shape grammars - stochastic grammars - attribute grammars - parsing techniques - grammatical inference

Text Books

1. Duda & Hart P.E, *Pattern Classification And Scene Analysis*, John Wiley
2. Gonzalez R.C. & Thomson M.G., *Syntactic Pattern Recognition - An Introduction*, Addison Wesley.

Reference Books

1. Fu K.S., *Syntactic Pattern Recognition And Applications*, Prentice Hall, Eaglewood cliffs
2. Rajjan Shinghal, *Pattern Recognition: Techniques and Applications*, Oxford University Press, 2008.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

EE09 L23 PROCESS CONTROL AND INSTRUMENTATION

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To create an awareness of the different transducers used in industry and signal conditioning*
- *To familiarize the process control elements and their control characteristics*

Module I (8 hours)
Signal Conditioning – Analog – Digital - Signal conversions - Process Control Principles - Identification of elements, block diagram, the loop, control system evaluation stability, regulation, evaluation criteria, and cyclic response.

Module II (10 hours)
Final Control Element: Final control operation, signal conversions, analog electrical signal, digital electrical signals, Direct action – pneumatic signals, Actuators – electrical actuators, pneumatic actuators, control elements – fluid valves. Signal Conditioning of Transducers- Temperature Transducers - flow transducers

Module III (12hours)
Controller Principles - Process characteristics, control system parameters, controller modes, discontinuous controller modes, continuous controller modes, composite controller modes.
Analog Controllers - Electronic controller – Direct action, reverse action, proportional mode, integral mode, derivative mode, composite controller modes. Pneumatic controllers – implementation of PI, PID, PD. Design consideration.

Module IV (14hours)
Control Loop Characteristics: Control system configurations, cascade control, multivariable control, feed forward control, Split range control, inferential control, Adaptive control, control system quality – loop disturbance, optimum control, measure of quality, Stability, process loop tuning

Text Books
1. Curtis D. Johnson, *Process Control Instrumentation Technology*, Pearson Education.

Reference Books
1. Curtis D. Johnson, *Microprocessors in Process Control*, PHI
2. George Stephanopoulis, *Chemical Process Control*
3. Caughner, *Process Analysis and Control*
4. Deshpande and Ash, *Elements of computer process control of Industrial processes*, ISA
5. Jayantha K. Paul, *Real- Time microcomputer control of Industrial processes*, Kluwer Publications, Netherlands.
6. S. K. Singh, *Computer Aided Process Control*, PHI2
7. Dale E. Seborg, Thomas F. Edgar, Duncan A. Mekkichamp, *Process Dynamics and Control*, Wiley India

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: Short answer questions (one/two sentences) *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each Module and not more than two questions from any Module.

PART B: Analytical/Problem solving questions *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each Module and not more than two questions from any Module.

PART C: Descriptive/Analytical/Problem solving questions *4 x 10 marks=40 marks*

Two questions from each Module with choice to answer one question.

Maximum Total Marks: 70

EE09 L 25 ROBOTICS AND AUTOMATION

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To give an introduction of industrial robotics and automation*

Module I (14 Hours)
Automation and Robotics - Robotics in Science Fiction - A Brief History of Robotics - The Robot and Its Peripherals-Robot Activation and Feedback Components - Position Sensors - Velocity Sensors - Actuators - Power Transmissions Systems - Robot Joint Control Design- Introduction to Manipulator Kinematics - Homogeneous Transformations and Robot Kinematics -Manipulator Path Control - Robot Dynamics - Configuration of a Robot Controller.

Module II (13 Hours)
Types of End Effectors - Mechanical Grippers - Other Types of Grippers - Tools as End Effectors - The Robot/End Effector Interface - Considerations in Gripper Selection and Design - Sensors in Robotics - Tactile Sensors - Proximity and Range Sensors - Miscellaneous Sensors and Sensor-Based Systems - Uses of Sensors in Robotics - Introduction to Machine Vision - The Sensing and Digitizing Function in Machine Vision - Image Processing and Analysis - Training and Vision System - Robotic Applications.

Module III (14 Hours)
Methods of Robot Programming – Lead through Programming Methods - A Robot Program as a Path in Space - Motion Interpolation - WAIT, SIGNAL, and DELAY Commands - Branching - capabilities and Limitations of Lead through Methods - The Textual Robot Languages - Generations of Robot Programming Languages - Robot Language Structure - Constants, Variables, and Other Data Objects - Motion Commands - End Effector and Sensor Commands - Computations and operations - Program Control and Subroutines - Communications and Data Processing - Monitor Mode Commands.

Module IV (13 Hours)
Introduction to robot intelligence and task planning- state space search-problem reduction-use of predicate logic-means –end analysis-problem-solving –robot learning-robot task planning-expert systems and knowledge learning.

Text Books

1. Mikell P. Groover- et. Al, *Industrial robotics, Technology, programming and Applications*, McGraw Hill
2. K. S. Fu, R. C. Gonzalez, C. S. G. Lee, *Robotics, Control, Sensing and Intelligence*, McGraw Hill

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each Module and not more than two questions from any Module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each Module and not more than two questions from any Module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each Module with choice to answer one question.

Maximum Total Marks: 70

ME09 L24: Marketing Management

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives

- *To impart knowledge on fundamentals of marketing, marketing environment market oriented strategic planning, marketing research and marketing communications.*

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Pre-requisites: *Basic knowledge of principles of management*

Module I (13 hours)

Introduction to marketing : Defining marketing for the twenty first century, marketing – scope, tasks, concept of market and marketing, company orientations towards the market place – production , product, selling, marketing, customer and societal marketing concepts.

Marketing environment : Controllable factors, identifying and responding to the major macro environment – uncontrollable factors – demographic, economic, natural technological, political-legal and social – cultural environment.

Module II (13 hours)

Market Oriented strategic planning – key areas, organizational levels, corporate and division strategic planning – corporate mission, strategic business units, The Boston consulting group approach, The general electric model, Planning new businesses – Growth – Intensive, integrative, diversification, Marketing mix – variables, marketing-mix strategy. Market-segmentation – levels, patterns, procedure, effectiveness. Market targeting – Evaluation, target market selection.

Module III (13 hours)

Marketing research – Need, scope – Marketing research process. Consumer behaviour – factors influencing buyer behaviour – Cultural, social personal, psychological factors. Defining customer value and satisfaction. Product life cycles – marketing strategies for different stages of product life cycle.

Module IV (15 hours)

Marketing communications – process – developing effective communications – Identification of the target audience, determination of communication objectives, Designing the message, select the communication channels, establishing the total marketing communications budget – Deciding on the marketing communications mix – promotional tools an over view – advertising, sales promotion, public relations and publicity, sales force and direct marketing- developing and managing an advertising program – setting objectives, deciding budget, choosing message – an overview on measuring effectiveness of a media – sales promotion – purpose, major decisions.

Text Books

1. P. Kotler, *Marketing Management,* 11th Edition – Pearson Eductation (Singapore) Pvt Ltd, New Delhi (2004)

Reference Books

1. V. S. Ramaswamy, S. Namkumari, *Marketing Management*, Mc Millan India Ltd, New Delhi (1997).
2. Saxena, *Marketing Management*, 2nd Edition, Tata Mc Graw Hill (2002).

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, Literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

AN09 L24 PROJECT MANAGEMENT

Teaching scheme
3 hours lecture and 1 hour tutorial per week **credits 4**

Objectives:

- *To give an exposure to the major aspects of project viz. Project Planning, Analysis, Selection, Implementation and review.*

Module I (13 hours)

Planning -Capital Expenditures -Phases of Capital Budgeting -Levels of decision Making -Facets of Project analysis-Feasibility Study -Objectives of Capital Budgeting -Resource Allocation framework Key Criteria-Elementary Investment strategies -Portfolio planning tools -Generation of ['project Ideas Monitoring the environment -Corporate appraisal -Scouting for project ideas -Preliminary Screening Project rating index -Sources of Positive net present value

Module II (14hours)

Analysis -Market and demand analysis -Situational analysis and specification of objectives -Collection of secondary information -Conduct of market survey -Characterization of Market -demand Forecasting -Market planning -Technical analysis-Material inputs and utilities -Manufacturing process/technology -Product Mix -Plant capacity -Location and site -machineries and equipments -Structures and civil works -Project charts and layouts -Work schedule -Financial Analysis -Cost of project -means of finance -Estimates of sales and Production -Cost of production -Working capital requirements and its financing -Profitability projections -Break even point -projected cash flow statements and balance sheets

Module III (13hours)

Project Cash flows -Basic I single amount -Future value of an annuity -Present value of a single amount -Present Value of an annuity-Cost of capital -Cost of debt capital -cost of preference capital -Rate of return -Cost of external equity and retained earnings -Determination of weights -Appraisal criterion -Net present value Cost benefit ratio-Internal rate of return-Urgency -payback period

Module IV (14hours)

Implementation-Forms of Project organization -Project planning -Project control -Human Aspects of Project management -Network Techniques -Development of Network -Time estimation -Critical path determination -Scheduling under limited resources -PERT Model-CPM Model -Network Cost System -Project review-Initial; review -Performance evaluation-Abandonment **analysis**

Text Book:

Prasanna Chandra, *Projects Planning, Analysis, Selection, Implementation and Review·. Fourth Edition,* Tata McGraw-Hill.

Reference books

I. Dennis Lock, *Project Management,* Grower Publications

2. Prasanna Chandra, *Financial Management Theory and Practice,* Tata McGraw Hill Publishers

3. Parameswar P Iyer, *Engineering Project management,* Vikas publishers

4. Gido & Clements, *Success/iii Project Management,* Vikas Publishers

5. Harold.T..Amrine John.A.Ritchey, *Manufacturing Organisation and Management,* Pearson Education

Internal Continuous Assessment *(Maximum Marks-30)*

6 60% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.

10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

EC09 L25: Biomedical Instrumentation

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- To impart knowledge about the principle and working of different types of bio-medical electronic equipments/devices

Module I (14 hours)

Electrical activity of excitable cells-SD curve-functional organization of the peripheral nervous system-electrocardiogram (in detail with all lead systems)-electroencephalogram-electromyogram –electroneurogram- electrode –electrolyte interface-polarisation-polarisable and non polarisable electrodes- surface electrodes –needle electrodes-micro electrodes- practical hints for using electrodes-'skin- electrodes' equivalent circuit-characteristics of 'bio-amplifiers'

Module II (14 hours)

Blood pressure-direct measurements-harmonic analysis of blood pressure waveform-system for measuring venous pressure-heart sounds- phonocardiography-cardiac catheterization-indirect blood pressure measurement –electromagnetic blood flow meters-ultrasonic blood flow meters-impedance plethysmography –photo plethysmography-'indicator- dilution'method for blood flow determination –spirometry-measurement of various respiratory parameters- respiratory plethysmography-chamber plethysmography

Module III (13 hours)

Measurement of gas flow rate cardiac pacemakers and other electric stimulators-defbrillators and cardio converters –blood plumps –hemodialysis-ventilators –infant incubators-drug delivery devices-lithotripsy-therapeutic applications of laser

Module IV (13 hours)

Physiological effects of electricity-important susceptibility parameters-macro shock hazards-micro shock hazards-protection against shock-electrical isolation- electrical safety analyzers-measurements of pH,pC2, and PO2

Text Books

1. Webster J,' Medical Instrumentation-Application and Design', John Wiley
2. Handbook of Biomedical Instrumentation, Tata-Migraw Hill, New Delhi

Reference Books

1. Geddes& Baker,'Principles of Applied Biomedical Instrumentation', Wiley
2. Encyclopedia of Medical Devices and Instumentation Wiley
3. Bronzino,Hand book of Biomedical Engineering,IEEE press book

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

IC09 L23 Bioinformatics

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives:

- *To get the students acquainted with the interdisciplinary field of bioinformatics*
- *To expose the students to the biological database resources and tools*
- *To provide an introduction to the important problems and algorithms in bioinformatics.*

Prerequisites

Familiarity with internet resources and an aptitude for learning algorithms along with high school level knowledge in biology.

Module I (14hours)
The biological backdrop:

Cells-Prokaryotes and Eukaryotes-DNA double helix- central dogma – DNA, RNA, aminoacids, Proteins -string representations- different levels of protein structures-DNA cloning- RFLP-SNP-Polymerase chain reaction (PCR)-gel electrophoresis-hybridization-A brief introduction to different mappings techniques of genomes- genome sequencing methods-DNA micro arrays –Human Genome Project-A glossary of biological terms.

Module II (14hours)
Bioinformatics-the big picture and the biological database resources:

Scope of bioinformatics-Genomics and Proteomics- A very brief introduction to major problems in bioinformatics like sequence alignment, phylogeny, gene finding, microarray analysis, secondary structure prediction, protein structure prediction, comparative genomics and drug design.
An introduction to the major re
sources at NCBI, EBI and ExPASy- Nucleic acid sequence databases: GenBank, EMBL, DDBJ -Protein sequence databases: SWISS-PROT, TrEMBL, PIR_PSD - Genome Databases at NCBI, EBI, TIGR, SANGER – How to access these databases and to make use of the tools available. Various file formats for bio-molecular sequences like genbank and fasta.
The concept of profiles- The derived databases- Prosite, Pfam, PRINTS, CATH, SCOP

Module III (13 hours)
Sequence alignment algorithms and Tools:

Basic concepts of sequence similarity, identity and homology, definitions of homologues, orthologues, paralogues.
Scoring matrices: basic concept of a scoring matrix, PAM and BLOSUM matrices, differences between distance & similarity matrix.
Pairwise sequence alignments: basic concepts of sequence alignment, Needleman & Wuncsh, Smith & Waterman algorithms for pairwise alignments. BLAST and FASTA and their versions.
Multiple sequence alignments (MSA): the need for MSA, basic concepts of various approaches for MSA (e.g. progressive, hierarchical etc.). Algorithm of CLUSTALW.

Module IV (13 hours)
Phylogeny, gene finding and molecular visualization:
Phylogeny: Basic concepts of phylogeny; molecular evolution; Definition and description of phylogenetic trees. Phylogenetic analysis algorithms - Maximum Parsimony, UPGMA and Neighbour-Joining.
Gene Finding: The six reading frames-Computational gene finding in prokaryotes and eukaryotes Basic signals –start and stop codons, promoters etc- important coding measures- Regular expressions- Introduction to Hidden Markov models- Introduction to genomic signal processing
Molecular visualization: Visualization of protein structures using Rasmol or Rastop

Text Books

1. Dan E. Krane and Michael L. Raymer, *Fundamental concepts of Bioinformatics*, Pearson Education
2. T. K. Attwood and D. J. Parry-Smith, *Introduction to Bioinformatics*, Pearson Education, 2003.
3. Claverie & Notredame, *Bioinformatics - A Beginners Guide*, Wiley-Dreamtech India Pvt
4. Neil C. Jones and PavelA. Pevzner, *An introductin to bioinformatics algorithms*, Ane Books
5. Gary Benson and Roderic Page, *Alogorithms in Bioinformatics*, Springer.
6. R. Durbin et.al., *Biological Sequence Analysis*, Cambridge University Press.
7. Gauthm, *Bioinformatics databases and algorithms*, Narosa Publishers

References

1. Dan Gusfield, *Algorithms On Strings, Trees And Sequences*, Cambridge University Press
2. Resources at web sites of NCBI, EBI, SANGER, PDB etc

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.

10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

PE09 L23: Total Quality Management

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To impart knowledge on the concept of quality tools for analysing quality statistical tools in quality acceptance sampling life tests*

Module I (14 hours)
Definition of quality-internal and external customers- vision statement – mission statements – objectives – goals – targets- evolution of TQM – Defining TQM – stages in TQ M implementation-TQM models

Module II (14 hours)
SWOT analysis-strategic planning-customer focus-quality function deployment-customer satisfaction measurement-seven new management tools-Deming wheel-zero defect concept-bench marking-six sigma concepts-failure mode and effect analysis-poke yoke

Module III (13 hours)
Five S for quality assurance-quality circle philosophy-failure rate analysis-mean failure rate-mean time to failure (MTTF)-Mean time between failure (MTBF)-hazard models-system reliability-availability- maintenance

Module IV (13 hours)
Quality and cost-characteristics of quality cost-micro analysis of quality cost-measurement of quality-TQM road map- ISO 9000 series certification-ISO 9001:2000 certification-ISO 14000 certification-QS 9000 auditing-Quality auditing- quality awards

Text Books

1. L Suganthi, Anand A Samuel, *Total Quality Management*, PHI
2. Lt.Gen. Lal H, *Total Quality Management*, Wiley Eastern Limited

Reference Books

1. Greg Bounds, *Beyond Total Quality Management*, McGraw Hill Publishers
2. Menon H G, *TQM in New Product Manufacturing*, McGraw Hill Publishers

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A:	*Short answer questions (one/two sentences)* All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.	*5 x 2 marks=10 marks*
PART B:	*Analytical/Problem solving questions* Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.	*4 x 5 marks=20 marks*
PART C:	*Descriptive/Analytical/Problem solving questions* Two questions from each module with choice to answer one question.	*4 x 10 marks=40 marks*

Maximum Total Marks: 70

CE09 L24: REMOTE SENSING AND GIS

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives

- *To make the students aware of the technological developments in the geographical database management and its advantages*

Module I (14 Hours)

Remote sensing: definition – components of remote sensing- energy sensor, interacting body – active and passive remote sensing – platforms – arial and space platforms – balloons ,helicopters, aircrafts and satellites – synoptivity and repeativity – electromagnetic radiation (EMR) – EMR spectrum – visible, infrared (IR) near IR, middle IR, thermal IR and microwave – black body radiation – Plancks Law – Stefan –Boltzman law.

Atmospheric characteristics – scattering of EMR – Raliegh, Mie, Non-selective and Raman scattering – EMR interaction with water vapur and ozone – atmospheric windows – significance of atmospheric windows – EMR interaction with earth surface material, radiance, irradiance, incident, reflected, absorbed and transmitted energy – reflectance – specular and diffused reflection surfaces – spectral signature – spectral signature curves – EMR interaction with water, soil and earth surface.

Module II (14 Hours)

Opticaa and Microwave Remote sensing:

Satellites – classification – based on orbits – sun synchronous and geo synchronous – based on purpose – earth resources satellites , communication satellites, weather satellites, spy satellites – satellite sensors – resolution – spectral, spatial, radiometric and temporal resolution – description of multi-spectral scanning – along and across track scanners- description of sensors in IRS series – current satellites – radar – speckle – back scattering- side looking air borne radar – synthetic aperture radar – radiometer radar – geometrical characteristics. Principles of thermal remote sensing. Principles of microwave remote sensing.

Module III (13 Hours)

Geographic information system – components of GIS – hardware, software and organisational context – data – spatial and non spatial maps – types of maps – projection- types of projection – data input- digitiser, scanner, editing – raster and vector data structures – comparison of raster and vector data structure – analysis using raster and vector data – retrieval, reclassification, overlaying, buffering - data output – printers and plotters.

Module IV (13 Hours)

Miscellaneous topics: interpretation of satellite images- elements of interpretation – visual interpretation – digital image processing techniques – image enhancement – filtering – image classification – FCC composites - supervised and unsupervised integration of GIS and remote sensing –application of remote sensing and GIS – urban applications – water resources – urban analysis – watershed management – resources information system – hazard mitigation.

Text books:

1. Anji Reddy, Remote sensing and Geographical systems, BS Publications
2. M G Srinivas (Edited by), remote sensing applications, Nerusa publishing house
3. Lillesand T M and Kuefer R W., Remote sensing and image interpretation, John Wiley and sons
4. Jensan J R, Introductory digital image processing, Prentice Hall of India
5. Sabins, Flyod, F., Remote sensing principles and Interpretation, W H Freman and Co., NewYork

References:

1. Janza F J, Blue H M and Johnston, J E., Manual of remote sensing vol. I., American Society of Photogrammetry, 1975
2. Burrough P A., Principles of GIS for land resource assessment, Oxford
3. Star Jeffrey L (Ed), Ests Joh E and McGwire Kenneth, Integration of geographical systems and remote sensing, Cambridge university.
4. De Merse, Michael N., Fundamentals of geographic information system, 2nd edn., John Wiley and sons.

CE09 L25 FINITE ELEMENT METHODS

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objective:

- *To make the back ground, basic concepts and basic formulation of finite element method clear to the students*

Module I (14 hours)

Introduction to Finite Element Methods: Physical problems, mathematical models and finite element solutions – Mathematical model of Discrete systems – elements and assemblage - matrix formulation – Equations of equilibrium - element assembly and solution for unknowns –Gauss elimination method, LDL^{-T} Method - Basic equations of elasticity – stress–strain and strain-displacement relations - theory of stress and deformation - stress-strain-temperature relations

Review of direct stiffness method: Descretization – element and structure stiffness matrices DOF relationship- assembly of global stiffness matrix and load vector - solution of equations for unknowns - displacement boundary conditions - computation of stress - support reactions.

Module II (13 hours)

Continuous systems: Practical Examples –mathematical models- differential formulation – limitations – Variational formulation – Total potential energy - principle of stationary potential energy - problems having many d.o.f - potential energy of an elastic body - the Rayleigh-Ritz method - piecewise polynomial field - finite element form of Rayleigh-Ritz method - finite element formulations derived from a functional - interpolation - shape functions for C^0 and C^1 elements - Lagrangian interpolation functions for two and three dimensional elements

Module III (13 hours)

Displacement based elements for structural mechanics: formulas for element stiffness matrix and load vector - overview of element stiffness matrices - consistent element nodal vector - equilibrium and compatibility in the solution - convergence requirements - patch test - stress calculation - other formulation methods

Straight sided triangles and tetrahedral: natural coordinates for lines - triangles and tetrahedral - interpolation fields for plane triangles - linear and quadratic triangle - quadratic tetrahedron

Module IV (14 hours)

The isoparametric formulation: introduction - an isoparametric bar element - plane bilinear element - summary of gauss quadrature - quadratic plane elements - direct construction of shape functions for transition elements - triangular isoparametric elements - consistent element nodal loads - validity of isoparametric elements - appropriate order of quadrature - element and mesh instabilities - remarks on stress computation

Coordinate transformation: transformation of vectors - transformation of stress, strain and material properties - transformation of stiffness matrices - transformation of flexibility to stiffness - inclined support - joining dissimilar elements to one another- rigid links - rigid elements

Text books:

1. Bathe K.J., Finite Element Procedures in Engineering Analysis, Prentice Hall of India
2. Cook R.D., Malkus D.S. & Plesha M.F., Concepts & Applications of Finite Element Analysis, John Wiley
3. Reddy, J.N., An Introduction to the Finite Element Method, McGraw Hill, 2006.

Reference books:

1. Desai C.S., Elementary Finite Element Method, Prentice Hall of India
2. Chandrupatla T.R. & Belegundu A.D., Introduction to Finite Elements in Engineering, Prentice Hall of India
3. Cook, R.D., Finite Element Modelling for Structural Analysis, John Wiley and sons.
4. Gallaghar R.H., Finite Element Analysis: Fundamentals, Prentice Hall Inc.
5. Rajasekaran S., Finite Element Analysis in Engineering Design, Wheeler Pub.
6. Krishnamoorthy C. S., Finite Element Analysis - Theory and Programming, Tata McGraw Hill
7. Zienkiewics O.C. & Taylor R.L., The Finite Element Method, Vol I & II, McGraw Hill
8. Segrelind., The Finite Element Method.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.

10% - Regularity in the class

University Examination pattern

PART A: *Short answer questions 5×2 marks=10 Marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical / Problem solving questions 4×5 marks=20 Marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Problem solving questions.4×10 marks= 40 Marks*

Two questions from each module with choice to answer one question.

Maximum Total marks: 70

BT09 L24 BIOETHICS & INTELLECTUAL PROPERTY RIGHTS

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives:

- ***To impart knowledge on bioethics and intellectual property rights***
- ***To study the various ethical issues in biotechnology***

Module I

Biotechnology and Bioethics. what is Ethical Biotechnology? (Rights, Confidentiality, Animal Rights, Environmental Ethics, Decision Making) – Ethical Aspects of Designer Babies, genetic screening and prenatal testing – issues of ethics in biomedicine. Transgenic plants. The debates of GM foods. Terminator technology, Ethical, issues of the Human Genome Project. Ethical issues in pharmaceutical drug research. Orphan drugs.

Module II

Intellectual Property Rights – Development and need for IPR in knowledge based industries. Various types of intellectual Property Rights with examples (Trademarks, copyrights, Industrial Designs, Patents, Geographical Indicators etc) – Objectives of the patent system – Basic Principles and General Requirements of Patents (Novelty, Utility Non obviousness. Etc) and tenets of patent law – Product and process Patents)

Module III

The patenting process in India – Exercising and Enforcing of intellectual Property Rights. Rights of IPR owner Brief overview of Patent filing in India. Criteria for Patent infringement – Various Amendments to Patent Law in India. Comparison of Patent Law in India and the US.
International Conventions and treaties: TRIPS. Evolution and present status. WIPO and its functioning. CBD Treaty. Paris and Berne Conventions Enforcement and Dispute Settlement in WTO – Patent Cooperation Treaty IPR and WTO regime.

Module IV

Biotechnological inventions and patent law – patentable subjects and protection in biotechnology. The patentability of microorganisms – Diamond vs Chakrabarty Case – Bioprospecting & Biopiracy (Case studies of Neem / Turmeric / Arogyapacha of Kani Tribals in Kerala/Rosy Periwinkle of Madagascar)- Traditional knowledge Systems (TKS) – Options for protection of Traditional knowledge Systems. Need for Sui Generics Systems. TKS and the National and International Arena. Biodiversity and Farmers rights – IPR and Plant Genetic Resources – Plant Breeder Rights .UPOV Treaty.

Text Books

1. Ethical Issues in Biotechnology. Edited by Richard Sherlock and John D.Morrey. 2002 Publishers Lanham, Md: Rowman and Littlefield.
2. J.Rehm and G.Reed, Biotechnology, Second Edition, Multi Volume Treatise, Volume 12 Legal Economic and Ethical Dimensions, VCHPublishers.
3. Prabuddha Ganguli Intellectual Property Rights - Unleashing the Knowledge Economy. Tata Mc.Graw Hill Publishing Company Limited, New Delhi.
4. Beier, F.K, Crespi,R.S and Straus, T.Biotechnology and Patent protection – Oxford and IBH Publishing Co.New Delhi.
5. Sasson A, Biotechnologies and Development, UNESCO Publications.
6. Jeffrey M.Gimble, Academia to Biotechnology, Elsevier, Academic Press.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination pattern

PART A: *Short answer questions 5×2 marks=10 Marks*
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.
PART B: *Analytical / Problem solving questions 4×5 marks=20 Marks*
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.
PART C: *Problem solving questions.4×10 marks= 40 Marks*
Two questions from each module with choice to answer one question.

Maximum Total marks: 70