SCHEME AND SYLLABI

FOR

THIRD TO EIGHTH SEMESTERS

OF

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND ENGINEERING

FROM 2009 ADMISSION ONWARDS

CALICUT UNIVERSITY (P.O), THENHIPALAM

SCHEME OF STUDIES AND EXAMINATION FOR B. TECH DEGREE COURSE
2009 ADMISSION

COMPUTER SCIENCE AND ENGINEERING

Combined I & II Semesters (Common for all branches)		Hours / Week			Marks		Semester-end duration-hours	Credits
Code	Subject	L	T	D/P	Inte-rnal	S emes ter-end		
EN09 101	Engineering Mathematics I	2	1		30	70	3	4
EN09 102	Engineering Mathematics II	2	1		30	70	3	4
EN09 103	Engineering Physics	2			30	70	3	3
EN09 103(P)	***Physics Lab***			1	50	50	3	1
EN09 104	Engineering Chemistry	2			30	70	3	3
EN09 104(P)	***Chemistry lab***			1	50	50	3	1
EN09 105	Engineering Mechanics	2	1		30	70	3	4
EN09 106	Basics of Civil and Mechanical Engineering	2	1		30	70	3	4
EN09 107	Basics of Electrical, Electronics and CommunicationEngineering	2	1		30	70	3	4
EN09 108	Engineering Graphics			3	30	70	3	3
EN09 109(P)	***ComputerProgramming in C***	1		1	50	50	3	3
EN09 110A(P)	***Mechanical Workshop***			2	50	50	3	2
EN09 110B(P)	***Electrical and Civil Workshops***			2	50	50	3	2
	Total	**15**	**5**	**10**				**38**
	Total Marks							

Semester III		Hours / Week			Marks		Semester-end duration-hours	Credits
Code	Subject	L	T	D/P	Inte-rnal	S emes ter-end		
EN09 301	Engineering Mathematics III	3	1		30	70	3	4
CS09 302	Data structures	4	1		30	70	3	5
CS09 303	Discrete Computational Structures	3	1		30	70	3	4
EN09 304	Humanities and Communication Skills	2	1		30	70	3	3
CS09 305	Electronic Circuits	3	1		30	70	3	4
CS09 306	Switching Theory and Logic Design	3	1		30	70	3	4
CS09 307(P)	***Electronic Circuits Lab***			3	50	50	3	2
CS09 308(P)	***Programming Lab***			3	50	50	3	2
	Total	**18**	**6**	**6**				**28**
	Total Marks							

Semester IV		Hours / Week			Marks		Semester-end duration-hours	Credits
Code	Subject	L	T	D/P	Inte-rnal	S emes ter-end		
EN09 401B	Engineering Mathematics IV	3	1		30	70	3	4
EN09 402	Environmental Studies	2	1		30	70	3	3
CS09 403	Computer Organization and Design	4	1		30	70	3	5
CS09 404	Programming paradigms	3	1		30	70	3	4
CS09 405	Systems Programming	3	1		30	70	3	4
CS09 406	Microprocessor Based design	3	1		30	70	3	4
CS09 407(P)	***Data Structures Lab***			3	50	50	3	2
CS09 408(P)	***Digital Systems Lab***			3	50	50	3	2
Total		**18**	**6**	**6**				**28**
Total Marks								

Semester V		Hours / Week			Marks		Semester-end duration-hours	Credits
Code	Subject	L	T	D/P	Inte-rnal	S emes ter-end		
CS09 501	Software Architecture and Project Management	3	1		30	70	3	4
CS09 502	Industrial Economics and Principles of Management	2	1		30	70	3	3
CS09 503	Signal Processing	3	1		30	70	3	4
CS09 504	Operating Systems	4	1		30	70	3	5
CS09 505	Digital Data Communication	3	1		30	70	3	4
CS09 506	Theory of Computation	3	1		30	70	3	4
CS09 507(P)	***Programming Paradigm Lab***			3	50	50	3	2
CS09 508(P)	***Hardware Lab***			3	50	50	3	2
Total		**18**	**6**	**6**				**28**
Total Marks								

Semester VI		Hours / Week			Marks		Semester-end duration-hours	Credits
Code	Subject	L	T	D/P	Inte-rnal	S emes ter-end		
CS09 601	Embedded Systems	3	1		30	70	3	4
CS09 602	Compiler Design	4	1		30	70	3	5
CS09 603	Computer Networks	3	1		30	70	3	4
CS09 604	Database Management Systems	3	1		30	70	3	4
CS09 605	Computer Graphics	2	1		30	70	3	3
CS09 606	Elective I	3	1		30	70	3	4
CS09 607(P)	***Systems Lab***			3	50	50	3	2
CS09 608(P)	***Mini Project***			3				2
Total		**18**	**6**	**6**				**28**
Total Marks								

Semester VII		Hours / Week			Marks		Semester-end duration-hours	Credits
Code	Subject	L	T	D/P	Inte-rnal	S emes ter-end		
CS09 701	Wireless Networks and Mobile Communication Systems	2	1		30	70	3	3
CS09 702	Design and Analysis of Algorithms	4	1		30	70	3	5
CS09 703	Internet Technology	2	1		30	70	3	3
CS09 704	Cryptography and Network Security	3	1		30	70	3	4
CS09 705	Elective II	3	1		30	70	3	4
CS09 706	Elective III	3	1		30	70	3	4
CS09 707(P)	***Compiler Lab***			3	50	50	3	2
CS09 708(P)	***Network Programming Lab***			3	50	50	3	2
CS09 709(P)	***Project***			1				1
Total		**17**	**6**	**7**				**28**
Total Marks								

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

EN09 301: Engineering Mathematics III

(Common for all branches)

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives

- *This course provides a quick overview of the concepts and results in complex analysis that may be useful in engineering.*
- *Also it gives an introduction to linear algebra and Fourier transform which has good wealth of ideas and results with wide area of application*

Module I: Functions of a Complex Variable (13 hours)

Functions of a Complex Variable – Limit – Continuity – Derivative of a Complex function – Analytic functions – Cauchy-Riemann Equations – Laplace equation – Harmonic Functions – Conformal Mapping – Examples: Z^n, sinz, cosz, sinhz, coshz, $(z+{}^1/_z)$ – Mobius Transformation.

Module II: Functions of a Complex Variable (14 hours)

Definition of Line integral in the complex plane – Cauchy's integral theorem (Proof of existence of indefinite integral to be omitted) – Independence of path – Cauchy's integral formula – Derivatives of analytic functions (Proof not required) – Taylor series – Laurent series – Singularities and Zeros – Residues – Residue Integration method – Residues and Residue theorem – Evaluation of real integrals.

Module III: Linear Algebra (13 hours) - Proofs not required

Vector spaces – Definition, Examples – Subspaces – Linear Span – Linear Independence – Linear Dependence – Basis – Dimension – Ordered Basis – Coordinate Vectors – Transition Matrix – Orthogonal and Orthonormal Sets – Orthogonal and Orthonormal Basis – Gram-Schmidt orthogonolisation process – Inner product spaces –Examples.

Module IV: Fourier Transforms (14 hours)

Fourier Integral theorem (Proof not required) – Fourier Sine and Cosine integral representations – Fourier Transforms – Fourier Sine and Cosine Transforms – Properties of Fourier Transforms.

Text Books

Module I:
Erwin Kreysig, *Advanced Engineering Mathematics, 8e*, John Wiley and Sons, Inc.
Sections: 12.3, 12.4, 12.5, 12.6, 12.7, 12.9

Module II:
Erwin Kreysig, *Advanced Engineering Mathematics, 8e*, John Wiley and Sons, Inc.
Sections: 13.1, 13.2, 13.3, 13.4, 14.4, 15.1, 15.2, 15.3, 15.4

Module III:
Bernaed Kolman, David R Hill, *Introductory Linear Algebra, An Applied First Course,* Pearson Education.
Sections: 6.1, 6.2, 6.3, 6.4, 6.7, 6.8, Appendix.B.1

Module IV:
Wylie C.R and L.C. Barrett, *Advanced Engineering Mathematics*, McGraw Hill.
Sections: 9.1, 9.3, 9.5

Reference books

1. H S Kasana, *Complex Variables, Theory and Applications*, 2e, Prentice Hall of India.
2. John M Howie, *Complex Analysis*, Springer International Edition.
3. Shahnaz bathul, *Text book of Engineering Mathematics*, *Special functions and Complex Variables*, Prentice Hall of India.
4. Gerald Dennis Mahan, *Applied mathematics*, Springer International Edition.
5. David Towers, *Guide to Linear Algebra*, MacMillan Mathematical Guides.
6. Howard Anton, Chris Rorres, *Elementary Linear Algebra, Applications Version, 9e*, John Wiley and Sons.
7. Anthony Croft, Robert Davison, Martin Hargreaves, *Engineering Mathematics*, 3e, Pearson Education.
8. H Parthasarathy, *Engineering Mathematics, A Project & Problem based approach*, Ane Books India.
9. B V Ramana, *Higher Engineering Mathematics*, McGrawHill.
10. Sarveswara Rao Koneru, *Engineering Mathematics*, Universities Press.
11. J K Sharma, *Business Mathematics, Theory and Applications*, Ane Books India.
12. John bird, *Higher Engineering Mathematics*, Elsevier, Newnes.
13. M Chandra Mohan, Varghese Philip, *Engineering Mathematics-Vol. I, II, III & IV.*, Sanguine Technical Publishers.
14. N Bali, M Goyal, C Watkins, *Advanced Engineering Mathematics, A Computer Approach, 7e*, Infinity Science Press, Fire Wall Media.
15. V R Lakshmy Gorty, *Advanced Engineering Mathematics-Vol. I, II.*, Ane Books India.
16. Sastry S.S., *Advanced Engineering Mathematics-Vol. I and II.*, Prentice Hall of India.
17. Lary C Andrews, Bhimsen K Shivamoggi, *Integral Transforms for Engineers*, Prentice Hall of 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

CS09 302 : Data Structures

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

Objectives

- *To impart the basic concepts of continuous data structures*
- *To develop understanding about fundamental searching and sorting techniques..*

Module I (11 hours)
Review of Data Types - Scalar Types - Primitive types - Enumerated types - Subranges - Arrays- sparse matrices - representation - Records - Complexity of Algorithms - Time & Space Complexity of Algorithms -Recursion: Recursive algorithms - Analysis of Recursive algorithms

Module II (18 hours)
Linear Data Structures - Stacks – Queues -Lists - Dequeus - Linked List - singly, doubly linked and circular lists - Application of linked lists - Polynomial Manipulation - Stack & Queue implementation using Array & Linked List - Typical problems - Conversion of infix to postfix - Evaluation of postfix expression - priority queues

Module III (18 hours)
Non Linear Structures - Graphs - Trees - Graph and Tree implementation using array and Linked List - Binary trees - Binary tree traversals - pre-order, in-order and postorder - Threaded binary trees - Binary Search trees - AVL trees - B trees and B+ trees - Graph traversals - DFS, BFS - shortest path - Dijkstra's algorithm, Minimum spanning tree - Kruskal Algorithm, Prims algorithm

Module IV (18 hours)
Searching - Sequential Search - Searching Arrays and Linked Lists - Binary Searching - Searching arrays and Binary Search Trees - Hashing - Open & Closed Hashing - Hash functions - Resolution of Collision -Sorting- n^2 Sorts - Bubble Sort - Insertion Sort - Selection Sort - n log n Sorts - Quick Sort - Heap Sort - Merge Sort - External Sort - Merge Files

Text Books

1. Aho A.V, Hopcroft J.E. & Ullman J.D, *Data Structures and Algorithms,* Addison Wesley

Reference Books

1. Sahni S, *Data Structures, Algorithms and Applications in C++,* McGrawHill
2. Wirth N, *Algorithms + Data Structures = Programs,* Prentice Hall.
3. Cormen T.H, Leiserson C.E & Rivest R.L, *Introduction to Algorithms in C++*, Thomson Books.
4. Deshpande P.S, Kakde O.G, *C and Data Structures*, Dream- tech India Pvt. Ltd.

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 303 : Discrete Computational Structures

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

Objectives

- *This course provides the mathematical foundations required in any stream of study in Computing. The material covered is essential for most of the subsequent semesters for a sound understanding of the various algorithms and methods. At the end of the course, the student is expected to be familiar with the essential proof techniques, logic and useful mathematical objects.*

Module I (13 hours)
Logic - Logical connectives and Truth tables – Logical equivalence and laws of logic – Logical implication and rules of inference- Quantifiers – Proofs of theorems using rules of universal specification and universal generalization.

Module II (13 hours)
Relational Structures - Cartesian products – Relations – Relation matrices – Properties of relations – Composition of relations - Equivalence relations and partitions - Functions – One-to-one, onto functions – Composition of functions and inverse functions - Partial orders - Hasse diagrams.

Module III (13 hours)
Group Theory - Definition and elementary properties - Cyclic groups - Homomorphisms and Isomorphisms – Subgroups - Cosets and Lagrange's theorem - Elements of coding theory- Hamming metric - Generator matrices - Group codes - Hamming matrices.

Module IV (13 hours)
Recurrence Relations - Introduction, Linear recurrence relations with constant coefficients - Homogeneous solutions - Particular solutions - Total solutions Generating Function - solutions of recurrence relations by the method of generating functions.

Text Books

1. Ralph P Grimaldi, *Discrete and Combinatorial Mathematics: An applied introduction (Fourth Edition)*, Pearson Education, 2004.

Reference Books

1. Thomas Koshy, Discrete Mathematics with Applications, Academic Press/Elsevier, 2005
2. Tremblay, J P & Manohar,R, *Discrete and Mathematical Structures with Applications to Computer Science*, McGraw Hill Book Company.
3. Kolman B & Busby R C, *Discrete and Mathematical Structures for Computer Science*, Prentice Hall of India.
4. C.L. Liu, *Elements of Discrete Mathematics*, Tata McGraw Hill, 2002
5. Donald F Stanat & David F McAllister, *Discrete and Mathematical Structures in Computer Science*, Prentice Hall.
6. Truss J K, *Discrete Mathematics for Computer Scientists*, Pearson Education, 2001.

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

EN09 304: Humanities and Communication Skills

(Common for all branches)

Teaching scheme **Credits:** 3

2 hours lecture and 1 hour tutorial per week

Objectives

- *To identify the most critical issues that confronted particular periods and locations in history*
- *To identify stages in the development of science and technology*
- *To understand the purpose and process of communication*
- *To produce documents reflecting different types of communication such as technical descriptions, proposals , and reports*
- *To develop a positive attitude and self-confidence in the workplace and*
- *To develop appropriate social and business ethics*

Module I (14 hours)

Humanities, Science and Technology: Importance of humanities to technology, education and society- Impact of science and technology on the development of modern civilization.- Contributions of ancient civilization: Chinese, Indian, Egyptian and Greek. -Cultural, Industrial, Transportation and Communication revolutions.

Advances in modern India: Achievements in information, communication and space technologies.

Module II (16 hours)

Concept of communication: The speaker/writer and the listener/reader, medium of communication, barriers to communication, accuracy, brevity, clarity and appropriateness

Reading comprehension: Reading at various speeds, different kinds of text for different purposes, reading between lines.

Listening comprehension: Comprehending material delivered at fast speed and spoken material, intelligent listening in interviews

Speaking: Achieving desired clarity and fluency, manipulating paralinguistic features of speaking, task oriented, interpersonal, informal and semi formal speaking, making a short classroom presentation.

Group discussion: Use of persuasive strategies, being polite and firm, handling questions and taking in criticisms on self, turn-taking strategies and effective intervention, use of body language.

Module III (16 hours)

Written Communication : Note making and taking, summarizing, notes and memos, developing notes into text, organization of ideas, cohesion and coherence, paragraph writing, ordering information in space and time, description and argument, comparison and contrast, narrating events chronologically. Writing a rough draft, editing, proof reading, final draft and styling text.

Technical report writing: Synopsis writing, formats for reports. Introductory report, Progress report, Incident report, Feasibility report, Marketing report, Field report and Laboratory test report

Project report: Reference work, General objective, specific objective, introduction, body, illustrations using graphs, tables, charts, diagrams and flow charts. Conclusion and references

Preparation of leaflets, brochure and C.V.

Module IV (14 hours)

Human relations and Professional ethics: Art of dealing with people, empathy and sympathy, hearing and listening. Tension and stress, Methods to handle stress

Responsibilities and rights of engineers- collegiality and loyalty – Respect for authority – Confidentiality – conflicts of interest – Professional rights, Rights of information, Social responsibility.

Senses of ethics – variety of moral issues – Moral dilemma – Moral autonomy – Attributes of an ethical personality – right action – self interest

Reference Books

1. Meenakshi Raman and Sangeeta Sharma, *Technical Communication - Principles and Practice* Oxford University press, 2006
2. Jayashree Suresh and B S Raghavan, *Professional Ethics*, S Chand and Company Ltd, 2005
3. Subrayappa, *History of Science in India*, National Academy of Science, India
4. R C Bhatia, *Business Communication*, Ane Books Pvt. Ltd, 2009
5. Sunita Mishra and C Muralikrishna, *Communicatin Skils for Engineers*, Pearson Education, 2007.
6. Jovan van Emden and Lucinda Becker, *Effective Communication for Arts and Humanities Students*, Palgrave macmillam, 2009
7. W C Dampier, *History of Science*, Cambridge University Press
8. Vesilind, *Engineering, Ethics and the Environment*, Cambridge University Press
9. Larson E, *History of Inventions*, Thompson Press India Ltd.
10. Bernal J.D, *Science in History*, Penguin Books Ltd
11. Encyclopedia Britannica, *History of Science, History of Technology*
12. Brownoski J, *Science and Human Values*, Harper and Row

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 305: Electronic Circuits

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

Objectives

- *To introduce the concepts and working principles of electronic circuits essential for the computing field.*

Module I (14 hours)
Diode switch, clipping and clamping circuits – Types of Diodes - light emitting diodes - photo diode - opto coupler - laser diode - the schottky diode - varactor diodes - varistors - current-regulator diodes - step recovery diodes - back diodes - tunnel diodes - pin diodes – Transistors - Transistor switch and amplifier circuits – Bistable multivibrator - Schmitt trigger - Monostable and astable multivibrator

Module II (15 hours)
MOSFETs - Depletion mode MOSFET - Depletion mode MOSFET Amplifiers - Dual Gate D-MOSFETs - Enhancement-mode MOSFET - Drain characteristics of E-MOSFET - Digital switching - CMOS circuits – Non-linear Op-amp circuits - Comparators with Zero Reference Voltage - Comparators with Non-zero references - Comparator with hysterisis - Window comparator - Integrator - Waveform conversion with op-amp - waveform generation using op-amp

Module III (10 hours)
Logic levels - Concepts of SSI, MSI, LSI and VLSI - Logic families: NOT gate, TTL, ECL, CMOS logic - Interfacing - Comparison of logic families - TTL and, MOS flip-flops.

Module IV (13 hours)
Memories: Basic concepts - Read only memories - Programmable ROMs - Static and dynamic random access memories - Memory expansion - Magnetic bubble memories - Magnetic surface storage devices - CD-ROMs - Special memories -1 Sample and hold circuit - D/A converters - A/D converters - Timing circuits.

Text Books

1. Mahadevaswamy U.B & V. Nattarasu, *Electronic Circuits : Computer Engineer's Perspective*, Sanguine Technical Publishers, 2008 (Module I & II)
2. Taub H. & Schilling D., *Digital Integrated Electronics*, McGraw Hill (Modules III & IV)

Reference Books

1. Nagarath I. J., *Electronics Analog & Digital*, Prentice Hall India
2. Floyd T.L., *Digital Fundamentals*, Universal Book Stall
3. Schilling D.L. & Belove C, *Electronic Circuits: Discrete & Integrated*, 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 306 : Switching Theory and Logic Design

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

Objectives

- *To introduce the principles, features and properties of digital devices and circuits. This provides the basic concepts of computations and logic designs of Arithmetic Logic Unit (ALU) of a Computer.*

Module I (13 hours)
Number Systems and codes - Boolean algebra - Postulates and theorems -Constants, variables and functions - Switching algebra - Electronic gates and mechanical contacts Boolean functions and logical operations - Normal and canonical forms - Self-dual functions - Logical operations - Karnaugh map - prime cubes - Minimum sum of products and product of sums - Quine-McClusky algorithm.

Module II (13 hours)
Combinational Logic - Analysis and design of combinational logic circuits - Universal property of the NAND and NOR gates - Adders - Parallel adders and look-ahead adders - Comparators - Decoders and encoders - Code conversion - Multiplexers and demultiplexers - Parity generators and checkers - ROMs, PLAs.

Module III (13 hours)
Fault diagnosis and tolerance - Fault classes and models - Fault diagnosis and testing - Test generation - Fault table method - Path sensitization method -Boolean difference method - Fault-tolerance techniques. Programmable logic arrays - PLA minimization - Essential prime cube theorem - PLA folding – Design for testability.

Module IV (13 hours)
Counters and shift registers - SR, JK, D and T flip-flops - Excitation tables -Triggering of flipflops - Flip-flop applications - Latches - Ripple counters - Synchronous counters - Up-down counters - Design of sequential circuits - Counter decoding - Counter applications - Shift registers and their applications - Clock mode sequential machine - State tables and diagrams.

Text Books

1. Biswas N. N., *Logic Design Theory*, Prentice Hall of India (Modules I, II & III)
2. Floyd T.L., *Digital Fundamentals*, Universal Book Stall (module IV).

Reference Books

1. Kohavi Z., *Switching & Finite Automata Theory*, Tata McGraw Hill
2. Millman J. & Halkias C.C., *Integrated Electronics: Analog & Digital Circuits & Systems*, Tata McGraw Hill.
3. M.Morris Mano, Charles R. Kime, Logic *and Computer Design Fundamentals*, 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 307(P) : Electronics Circuits Lab

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

Objective

- *To give a hands on experience to students in the static and dynamic characteristics of the electronics components and systems.*

1. Silicon, germanium and zener diode characteristics
2. Characteristics of UJT and UJT relaxation oscillator
3. Static transistor characteristics in CE and CB configurations
4. Clipping, clamping, differentiating and integrating circuits
5. Series voltage regulator
6. Frequency response of CE amplifier with and without feedback
7. Emitter follower: measurement of input and output impedance
8. RC phase shift oscillator
9. Op amp: inverting and non-inverting amplifier, voltage follower
10. Op amp: differential amplifier.

Reference Books

1. Millman & Halkias, *Integrated Electronics*, Tata McGraw Hill.
2. Bhargava etal., Basic *Electronic Circuits and Linear Circuits*, Tata McGraw Hill

Internal Continuous Assessment *(Maximum Marks-50)*

60%-Laboratory practical and record
30%- Test/s
10%- Regularity in the class

Semester End Examination *(Maximum Marks-50)*

70% - Procedure, conducting experiment, results, tabulation, and inference
20% - Viva voce
10% - Fair record

CS09 308(P) : Programming Lab

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

Objectives

- *To give a strong foundation for developing the art of programming to the students of computing streams. For adequacy this has to be complemented by exercises appearing in the references.*

Set 1 (3 lab sessions)
HCF (Euclid's algorithm) and LCM of given numbers - Find mean, median and mode of a given set of numbers - Conversion of numbers from binary to decimal, hexadecimal, octal and back - Evaluation of functions like e^x, sin(x) and cos(x) for a given numerical precision using Taylor's series - Testing whether a given number is prime.

Set 2 (2 lab sessions)
String manipulation programs: sub-string search, deletion - Lexicographic sorting of a given set of strings - Generation of all permutations of the letters of a given string using recursion.

Set 3 (2 lab sessions)
Matrix operations: Programs to find the product of two matrices - Inverse and determinant (using recursion) of a given matrix - Solution to simultaneous linear equations using Jordan elimination

Set 4 (3 lab sessions)
Files: Use of files for storing records with provision for insertion - Deletion, search, sort and update of a record

Reference Books

1. Schildt H., *C The Complete Reference*, Tata McGraw Hill
2. TanH.H. &D'OrazioT.B., *C Programming for Engineering & Computer Science*, McGraw Hill
3. Cormen T.H. et al, *Introduction to Algorithms*, Prentice Hall of India

Internal Continuous Assessment *(Maximum Marks-50)*

60%-Laboratory practical and record
30%- Test/s
10%- Regularity in the class

Semester End Examination *(Maximum Marks-50)*

70% - Procedure, conducting experiment, results, tabulation, and inference
20% - Viva voce
10% - Fair record

EN09 401B: Engineering Mathematics IV

(Common for IC, EC, EE, AI, BM, CS, and IT)

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives

- *To inculcate the students an adequate understanding of the basic concepts of probability theory to make them develop an interest in the area which may find useful to pursue their studies.*
- *To stimulate the students understanding of the Z-transform. A study of some important partial differetial equations is also included to make the student get acquainted with the basics of PDE.*

Module I – Probability Distributions - (13 hours)

Random variables – Mean and Variance of probability distributions – Binomial Distribution – Poisson Distribution – Poisson approximation to Binomial distribution – Hyper Geometric Distribution – Geometric Distribution – Probability densities – Normal Distribution – Uniform Distribution – Gamma Distribution.

Module II – Z transforms - (14 hours)

Introduction – The Z transform – Z transform and Region of Convergence (ROC) of finite duration sequences – Properties of ROC – Properties of Z-Transforms: Linearity, Time Shifting, Multiplication by exponential sequence, Time reversal, Multiplication by *n*, Convolution, Time Expansion, Conjugation, Initial Value Theorem, Final Value Theorem – Methods to find inverse transforms – long division method – partial fraction method – residue method – Solutions of difference equations using Z Transforms.

Module III - Series solutions of differential equations - (14 hours)

Power series method for solving ordinary differential equations – Legendre's equation – Legendre polynomials – Rodrigue's formula – Generating functions – Relation between Legendre polynomials – Orthogonality property of Legendre polynomials (Proof not required) – Frobenius method for solving ordinary differential equations – Bessel's equation – Bessel functions – Generating functions – Relation between Bessel functions – Orthogonality property of Bessels functions (Proof not required).

Module IV - Partial Differential Equations - (13 hours)

Introduction – Solutions of equations of the form $F(p,q) = 0$; $F(x,p,q) = 0$; $F(y,p,q) = 0$; $F(z,p,q) = 0$; $F_1(x,q) = F_2(y,q)$; Clairaut's form, $z = px + qv + F(p,q)$; Legrange's form, $Pp + Qq = R$ – Classification of Linear PDE's – Derivation of one dimensional wave equation and one dimensional heat equation – Solution of these equation by the method of separation of variables – D'Alembert's solution of one dimensional wave equation.

Text Books

Text Books

Module I:
Richard A Johnson, CB Gupta, *Miller and Freund's Probability and statistics for Engineers, 7e*, Pearson Education - Sections: 4.1, 4.2, 4.3, 4.4, 4.6, 4.8, 5.1, 5.2, 5.5, 5.7

Module II:
P Ramesh Babu, R Ananda Natarajan, *Signals and* Systems, 2e, Scitech Publications.
Sections: 10.1, 10.2, 10.3, 10.4, 10.5.1, 10.5.2, 10.5.3, 10.5.4, 10.5.5, 10.5.6, 10.5.7, 10.5.8, 10.5.12, 10.5.13, 10.6, 10.10

Module III:
Erwin Kreysig, *Advanced Engineering Mathematics, 8e*, John Wiley and Sons, Inc.
Sections: 4.1, 4.3, 4.4, 4.5

Module IV:
N Bali, M Goyal, C Watkins, *Advanced Engineering Mathematics, A Computer Approach, 7e*, Infinity Science Press, Fire Wall Media.
Sections: 16.1, 16.2, 16.3, 16.4, 16.5, 16.6, 16.7, 16.8, 16.9
Erwin Kreysig, *Advanced Engineering Mathematics, 8e*, John Wiley and Sons, Inc.
1. Sections: 11.2, 11.3, 11.4, 9.8 Ex.3, 11.5

Reference books

1. William Hines, Douglas Montgomery, avid Goldman, Connie Borror, *Probability and Statistics in Engineering*, 4e, John Wiley and Sons, Inc.
2. Sheldon M Ross, *Introduction to Probability and Statistics for Engineers and Scientists*, 3e, Elsevier, Academic Press.
3. Anthony Croft, Robert Davison, Martin Hargreaves, *Engineering Mathematics*, 3e, Pearson Education.
4. H Parthasarathy, *Engineering Mathematics, A Project & Problem based approach*, Ane Books India.
5. B V Ramana, *Higher Engineering Mathematics*, McGrawHill.
6. Sarveswara Rao Koneru, *Engineering Mathematics*, Universities Press.
7. J K Sharma, *Business Mathematics, Theory and Applications*, Ane Books India.
8. John bird, *Higher Engineering Mathematics*, Elsevier, Newnes.
9. M Chandra Mohan, Vargheese Philip, *Engineering Mathematics-Vol. I, II, III & IV.*, Sanguine Technical Publishers.
10. Wylie C.R and L.C. Barret, *Advanced Engineering Mathematics*, McGraw Hill.
11. V R Lakshmy Gorty, *Advanced Engineering Mathematics-Vol. I, II.*, Ane Books India.
12. Sastry S.S., *Advanced Engineering Mathematics-Vol. I and II.*, Prentice Hall of India.
13. Michael D Greenberg, *Advanced Engineering Mathematics*, Pearson Education.
14. Lary C Andrews, Bhimsen K Shivamoggi, *Integral Transforms for Engineers*, Prentice Hall of 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

EN09 402 : Environmental Studies

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

Objectives

- *To understand the problems of pollution, loss of forest, solid waste disposal, degradation of environment, loss of biodiversity and other environmental issues and create awareness among the students to address these issues and conserve the environment in a better way.*

Module I (8 hours)
The Multidisciplinary nature of environmental science, Definition-scope and importance-need for public awareness. Natural resources, Renewable and non-renewable resources:
Natural resources and associated problems-forest resources: Use and over exploitation, deforestation, case studies. Timber extraction, mining, dams and their defects on forests and tribal people.- water resources : Use and over utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems - Mineral resources: Use and exploitation,environmental effects of extracting and using mineral resources, case studies - Food resources: World food problems, changes caused by agriculture over grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging,salinity,case studies -Energy resources: Growing energy needs, renewable and non-renewable energy resources, use of alternate energy resources, Land resources: Land as a resource, land degradation, man induced land slides, soil erosion and desertification.

Module II (8 hours)
Ecosystems-Concept of an ecosystem-structure and function of an ecosystem – producers, consumers, decomposers-energy flow in the ecosystem-Ecological succession- Food chains, food webs and Ecological pyramids-Introduction, types, characteristics features, structure and function of the following ecosystem-Forest ecosystem- Grassland ecosystem –Desert ecosystem-Aquatic ecosystem(ponds, streams, lakes, rivers, oceans , estuaries)
Biodiversity and its consideration
Introduction- Definition: genetic , species and ecosystem diversity-Biogeographical; classification of India – value of biodiversity: consumptive use, productive use, social ethical , aesthetic and option values Biodiversity at Global, national , and local level-India at mega –diversity nation- Hot spot of biodiversity-Threats to biodiversity: habitat loss, poaching of wild life, man , wild life conflicts –Endangered and endemic species of India-Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

Module III (10 hours)
Environmental pollution
Definition-Causes, effects and control measures of Air pollution-m Water pollution –soil pollution-Marine pollution-Noise pollution-Thermal pollution-Nuclear hazards-Solid waste management: Causes, effects and control measures of urban and industrial wastes-Role of an individual in prevention of pollution-pollution case studies-Disaster management: floods, earth quake, cyclone and landslides-Environmental impact assessment

Module IV (10 hours)
Environment and sustainable development-Sustainable use of natural resources-Conversion of renewable energy resources into other forms-case studies-Problems related to energy and Energy auditing-Water conservation, rain water harvesting, water shed management-case studies-Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust-Waste land reclamation-Consumerism and waste products-Reduce, reuse and recycling of products-Value education.

Text Books

1. Clark,R.S., *Marine pollution*, Clanderson Press Oxford.
2. Mhaskar A. K., *Matter Hazrdous*, Techno-science Publications.
3. Miller T. G. Jr., *Environmental Science*, Wadsworth Publishing Co.
4. Townsend C., Harper J, Michael Begon, *Essential of Ecology*, Blackwell Science
5. Trivedi R. K., Goel P. K., *Introduction to Air Pollution*, Techno-Science Publications.

Reference Books

1. Raghavan Nambiar, K., Course *book on Environmental Studies*, Nalpat Publishers, Kochi.
2. Bharucha Erach, *Biodiversity of India*, Mapin Publishing Pvt. Ltd., Ahmedabad.
3. Cunningham, W.P., Cooper, T.H., Gorhani, E & Hepworth, M.T. 2001, *Environmental encyclopedia*, Jaico publishing House Mumbai 1196p
4. *Down to Earth*, Centre for Science and Environment
5. Hawkins, R.E. *Encyclopedia of Indian Natural History*, Bombay Natural History Society, Bombay
6. Mckinney, M.L. & School, R.M. 1996. *Environmental Science system & Solutions*, Web enhanced edition, 639p.
7. Odum, E.P. 1971. *Fundamentals of Ecology*. W.B.Saunders Co. USA, 574p
8. Rao, M.N. & Datta, A.K 1987, *Waste Water treatment*, Oxford & IBH Publ. Co. Pvt. Ltd.,
9. *Survey of the Environment*, The Hindu Magazine
10. Wagner.K.D. 1998, *Environmental Management*, W.B. Saunders Co. Philadelphia, USA.

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 403: Computer Organization and Design

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

Objectives

- *To lay the foundation for the study of hardware organization of digital computers. It brings out the interplay between various building blocks of computers, without being specific to any particular computer. At the end of the course, the student is expected to gain a fair idea about the functional aspects of each building block in computer design, in the general sense.*

Module I (17 hours)
Computer abstraction and technology: Below your program - Under the covers - Historical perspective - Measuring performance - Relating the metrics - evaluating, comparing and summarizing performance - Case study: SPEC95 bench mark - Instructions - Operations and operands of the computer hardware - Representing instructions - Making decision - Supporting procedures - Beyond numbers - Other styles of addressing - Starting a program - Case study: 80x86 instructions.

Module II (15 hours)
Computer arithmetic - Signed and unsigned numbers - Addition and subtraction - Logical operations - Constructing an ALU - Multiplication and division - Floating point - Case study: floating point in 80x86

Module III (16 hours)
The processor: Building a data path - Simple and multi-cycle implementations - Microprogramming - Exceptions - Case study: Pentium Pro implementation.

Module IV (17 hours)
Memory hierarchy - Caches - Cache performance - Virtual memory - Common framework for memory hierarchies - Case study - Pentium Pro memory hierarchy . input/output - I/O performance measures - Types and characteristics of I/O devices - Buses - Interfaces in I/O devices - Design of an I/O system

Text Books

1. Pattersen D.A. & Hennesy J.L., *Computer Organisation & Design: The Hardware/Software Interface*, Harcourt Asia.

Reference Books

1. Heuring V.P. & Jordan H.F., *Computer System Design & Architecture*, Addison Wesley
2. Hamacher, Vranesic & Zaky, *Computer Organisation*, 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 404: Programming Paradigms

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

Objectives

- *To introduce the different models of programming and the various constructs and their implementation to support on a bare machine.*

Module I (15 hours)
Role of programming languages - high level languages - programming paradigms - language implementation on a machine - language Syntax description - notation for expressions, abstract syntax trees, lexical syntax, context free grammars, variants of grammars - Language Semantic description - introduction to synthesized attributes, attributed grammar, natural semantics, de-notational semantics Imperative programming: Introduction - structured programming - constructs for structured control flow - syntactic concerns - handling special cases in loops - discussion based on C. Role of types: Basic types - compound types like arrays, records, union and variant records, sets - pointers and dynamic allocation - Types and error checking - discussion based on C. Introduction to procedures: parameter passing methods - scope rules - nested scopes - implementation - discussion based on C.

Module II (14 hours)
Object oriented programming: Introduction - grouping of data and operations - constructs for program structuring - information hiding - program design with modules - modules and defined types - illustration based on C++ on class declaration, dynamic allocation, templates, objects. Definition of object - object oriented thinking - Inheritance - derived classes and information hiding- illustration based on C++.

Module III (12 hours)
Functional Programming: Elements of Functional programming - Types: values and operations - Functional declaration- approaches to expression evaluation- lexical scopes - type checking. Functional programming with lists - introduction to scheme - structures of lists - list manipulation - simplification of expressions - storage allocation for lists.

Module IV (11 hours)
Logic Programming: Introduction - computing with relations - introduction to PROLOG - data structures - programming techniques - control in PROLOG - cuts. Concurrent programming: parallelism in hardware-implicit synchronization-interleaving - liveness properties - safe access to shared data - synchronized access to shared variables.

Text Books

1. Sethi R., *Programming Languages: Concepts and Constructs*, Addison Wesley

Reference Books

1. Tennent R.D., *Principles of Programming Languages*, Prentice Hall International.
2. Sayed. H, Roosta; *Foundation of programming languages Design and Implementations*; Vikas Publising House, New Delhi.
3. Pratt T.W, and Zelkowitz M.V, *Programming Languages: Design and Implementation*, Prentice Hall International.
4. Appleby. D and VandeKopple J.J; *Programming Languages: Paradigm and Practice*, Tata McGraw Hill.
5. Scott M.L; *Programming Language Pragmatics*; Harcourt Asia(Morgan Kaufman).
6. Clocksin W F, Mellish C S; *Programming in PROLOG*.

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 405: Systems Programming

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

Objectives

- *To familiarize the students with the essentials of system software design. System software consists of programs necessary to make the hardware function properly.*
- *To equip the student with the right kind of tools for computer systems design and development.*

Module I (15 hours)
Background - system software machine architecture - the simplified instructional computer - traditional machines - RISC machines - assemblers - basic assembler functions - machine dependent and machine independent - assembler features - assembler design - assembler design options - implementation examples - AIX Assembler.

Module II (13 hours)
Loaders and linkers - basic loader functions - machine dependent and machine independent loader features - loader design options and implementation examples - macro processors - basic macro processor functions - machine-independent macro processor features - macro processor design options and implementation examples.

Module III (14 hours)
Introduction to operating systems - basic principles - batch processing - multiprogramming - timesharing systems and real-time systems - parallel and distributed systems - computer system structure - computer system operation - I/O structure - structure - storage hierarchy - hardware protection - general system architecture - operating system structure - system components - OS services -system calls - system structure - virtual machines.

Module IV (10 hours)
General overview of the UNIX operating system - history of UNIX - system structure - user perspective - services - hardware assumptions - unix architecture - system concepts - kernel data structures - system administration process (concepts only)

Text Books

1. Beck L.L., *System Software - An introduction to Systems Programming*, Addison Wesley
2. Bach M. J., *The Design of the Unix Operating System*, Prentice Hall India

Reference Books

1. Dhamdhere D.M., *Systems Programming and Operating Systems*, Tata McGraw Hill
2. Godbole S., *Operating 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 406: Microprocessor Based Design

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

Objectives

- *To familiarize the student with the internals of a microprocessor with a wide range of processing capabilities.*
- *Also to give a fair idea of various interfacing methods and devices, along with a detailed treatment of important design issues.*

Module I (12 hours)
Historical background of microprocessors - Inside the PC: Motherboard - Graphic adapters and monitors - Drive controllers - Floppy and hard disk drives - Streamers and other drives - Parallel interfaces and printers - Serial interfaces and modems - Network adapters and LANs - CMOS RAM and real clock - Keyboard, mouse and other rodents - The power supply - Operating system - BIOS and memory organization - 8086/8088 Hardware specification: Clock generator - Bus. buffering and latching - bus timing - Ready and wait states - Minimum and maximum modes - Advanced processors - Features of 80386, 80486 and Pentium processors.

Module II (13 hours)
Microprocessor architecture: Real mode and protected mode memory addressing - Memory paging - Addressing modes - Data addressing - Program memory addressing - Stack memory addressing - Data movement instructions - Arithmetic and logic instructions - Program control instructions - Programming the microprocessor: modular programming - Using keyboard and display - Data conversions - disk files - interrupt hooks.

Module III (12 hours)
Memory interface: Memory devices - Address decoding, 8 bit (8088), 16 bit (8086), 32 bit (80486) and 64 bit (Pentium) memory interfaces - Dynamic RAM. I/O interface - Port address decoding - PPI, 8279 interface - 8254 timer interface - 16550 UART interface - ADC/DAC interfaces.

Module IV (15 hours)
Interrupts: Interrupt processing - Hardware interrupts - Expanding the interrupt - 8259A programmable interrupt controller - DMA: DMA operation - 8237 DMA controller - Shared bus operation - Disk memory systems - Video displays - Bus interface: ISA bus - EISA and VESA buses - PCI bus.

Text Books

1. Brey B.B., *The Intel Microprocessors 8086 to Pentium: Architecture, Programming and Interface*, Prentice Hall of India
2. Messmer H.P., The *Indispensable PC Hardware Book*, Addison Wesley.

Reference Books

1. Ray K. & Bhurchandi K.M., *Advanced Microprocessors & Peripherals*, Tata McGraw Hill.
2. Hall D.V., *Microprocessors & Interfacing: Programming & Hardware*, Tata McGraw Hill.
3. Miller K., *An Assembly Language Introduction to Computer Architecture using the Intel Pentium*, Oxford University Press.
4. Bigelow SJ., *Troubleshooting, Maintaining & Repairing PCs*, 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 407(P) : Data Structure Lab

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

Objectives

- *To give hands on experience in viewing data as the central resource in computing process and to visualize the importance of structuring data.*
- *To demonstrate the impact of organizing data on the efficiency of algorithms that process the data, including static and dynamic data structures as well as linear and nonlinear data structures.*

1. Stack and Queue: Implementation using arrays and Linked lists
2. Searching Methods: Binary search and Hashing
3. Sorting: Recursive implementation of Quick Sort and Merge Sort
4. Binary Search Tree. Implementation with insertion, deletion and traversal
5. Infix Expression Evaluation: Using expression tree
6. Graph Search Algorithms: DFS and BFS on A connected directed graph
7. Minimal Spanning Tree. Implementation of Kruskal's and Prim's Algorithms
8. Shortest Path Algorithm. Dijkstra and Floyd Warshall Algorithsm
9. Disjoint Set operations: Union and Find using rank and path compression
10. Applications of Heap: Priority Queue and Heap Sort.

Reference Books

1. Cormen T.H., Lieserson C.E. & Rivest R.L., *Introduction to Algorithms,* Prentice Hall of India.
2. Sahni S., *Data structures, Algorithms & Applications in C++*, McGraw Hill.

Internal Continuous Assessment *(Maximum Marks-50)*

60%-Laboratory practical and record
30%- Test/s
10%- Regularity in the class

Semester End Examination *(Maximum Marks-50)*

70% - Procedure, conducting experiment, results, tabulation, and inference
20% - Viva voce
10% - Fair record

CS09 408(P) : Digital Systems Lab

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

Objectives

- *To give a hands on experience on digital electronics components and systems; which are fundamental building blocks of the Computer systems.*
- *To deal extensively with the characteristic and features of indispensable digital electronic circuits and systems through structured experiments.*

1. Verification of truth tables of AND, OR, NOT, NAND, NOR and XOR gates, used for gating digital signals.
2. TIL characteristics
3. Verification of the postulates of Boolean algebra and DeMorgan's theorem using logic gates.
4. Half and full adders, half and full subtractors.
5. Digital comparator, parity gererator and checker, and code converter
6. Characteristics and operations of RS, gated RS, D, T, and JK master slave flipflops
7. Multiplexer and demultiplexer using gates
8. Shift register, ring counter, and twisted ring counter.
9. Decade counter and variable modulo asynchronous counter
10. Astable multivibrator and schmitt trigger using gates, astable and monostable rnultivibrator and frequency divider using 555.

Reference Books

1. C Nagarath J., *Electronics Analog & Digital*, Prentice Hall India
2. Millman & Halkias, *Integrated Electronics*, Tata McGraw Hill.

Internal Continuous Assessment *(Maximum Marks-50)*

60%-Laboratory practical and record
30%- Test/s
10%- Regularity in the class

Semester End Examination *(Maximum Marks-50)*

70% - Procedure, conducting experiment, results, tabulation, and inference
20% - Viva voce
10% - Fair record

CS09 501: Software Architecture and Project Management

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

Objectives

- *To impart the basic concepts of software architecture and design patterns.*
- *To develop an understanding about development of complex software systems in a methodical manner.*

Module I (13 hours)
Software Architecture - Foundations - Software architecture in the context of the overall software life cycle - Architectural Styles - CASE study of Architectures Designing, Describing, and Using Software Architecture - IS2000: The Advanced Imaging Solution - Global Analysis - Conceptual Architecture View - Module Architecture View - Styles of the Module Viewtype - Execution Architecture View, Code Architecture - View. Component-and-Connector Viewtype - Styles of Component-and-Connector Viewtype - Allocation Viewtype and Styles - Documenting Software Interfaces, Documenting Behavior - Building the Documentation Package.

Module II (11 hours)
Archetypes and Archetype Patterns, Model Driven Architecture with Archetype Patterns. Literate Modeling, Archetype Pattern. , Customer Relationship Management (CRM) Archetype Pattern, Product Archetype Pattern, Quantity Archetype Pattern, Rule Archetype Pattern. Design Patterns, Creational Patterns, Patterns for Organization of Work, Access Control Patterns, Service Variation Patterns, Service Extension Patterns

Module III (13 hours)
Object Management Patterns Adaptation Patterns, Communication Patterns, Architectural Patterns, Structural Patterns, Patterns for Distribution, Patterns for Interactive Systems Adaptable Systems, Frameworks and Patterns, Analysis Patterns Patterns for Concurrent and Networked Objects, Patterns for Resource Management, Pattern Languages, Patterns for Distributed Computing.

Module IV (15 hours)
Defining EAI, Data-Level EAI, Application Interface-Level EAI., Method- Level EAI., User Interface-Level EAI, The EAI Process - An Introduction to EAI and Middleware, Transactional Middleware and EAI, RPCs, Messaging, and EAI, Distributed Objects and EAI, Database- Oriented Middleware and EAI, Java Middleware and EAI, Implementing and Integrating Packaged Applications—The General Idea, XML and EAI, Message Brokers—The Preferred EAI Engine, Process Automation and EAI. Layering, Organizing Domain Logic, Mapping to Relational Databases, Web Presentation, Domain Logic Patterns, Data Source Architectural Patterns, Object-Relational Behavioral Patterns, Object-Relational Structural Patterns, Object-Relational Metadata Mapping Patterns, Web Presentation Patterns, Distribution Patterns, Offline Concurrency Patterns.

Reference Books

1. Ian Gorton Springer, *Essential Software Architecture*, 1st edition, 2006.
2. Bob Hughes, Mike Cotterell, *Software Project Management, 4th edition,* Tata McGraw Hill, 2006.
3. Christine Hofmeister, Robert Nord, Deli Soni , *Applied Software Architecture*, Addison-Wesley Professional; 1st edition, 1999.
4. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, *Design Patterns: Elements of Reusable Object-Oriented Software*, Addison-Wesley Professional; 1st edition.
5. Martin Fowler, *Patterns of Enterprise Application Architecture*, Addison- Wesley Professional, 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 502: Industrial Economics and Principles of management

(Comman for CS and IT)

Teaching scheme **Credits:** 3

2 hours lecture and 1 hour tutorial per week

Section A : Industrial Economics

Objectives

- *To provide knowledge on fundamentals of economics, forms of business organisations, trade and taxation.*

Module I (14 hours)

Nature and scope of economics – definitions of macro and micro economics – basic terminologies – goods – utility – value – wealth – factors of production – land – labour – division of labour – capital and capital formation – consumption – wants – characteristics and classification – law of diminishing marginal utility – demand – law of demand – elasticity of demand – types of elasticity – factors determining elasticity – measurement – its significance – supply – law of supply – market price – perfect competition – monopoly – monopolistic competition.

Module II (13 hours)

Forms of business – proprietorship – partnership – joint stock company – cooperative sector – state enterprises. National income – concepts – GNP – theory of money – nature and functions of money – inflation and deflation – taxation – theory of international trade – free trade v/s protection – balance of trade and balance of payments – trade of policy of the Government of India.

Text Books

1. K.K. Dewtt, J.D. Varma, *Elementary Economic Theory*, S. Chand Publishers
2. Barthwal R.R., *Industrial Economics – An Introductory Text Book*, New Age publishers

Reference Books

1. G. Narendrababu, *Elements of Economic Analysis*
2. K. P. M. Sundaran, *Money, Banking, Trade & Finance*
3. M.L. Jhingan, *Micro Economic Theory*, Konark.

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.	*2 x 2 marks= 4 marks* *1 x 1mark = 1 mark*
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.	*2 x 5 marks=10 marks*
PART C:	*Descriptive/Analytical/Problem solving questions* Two questions from each module with choice to answer one question.	*2 x 10 marks=20 marks*

Maximum Total Marks: 35

Note : Section A (Engineering Economics) and Section B (Principles of Management) should be written in separate answer sheets.

Section B : Principles of Management

Objectives

- *To provide knowledge on principles of management, decision making techniques, accounting principles and basic management streams.*

Module III (13 hours)

Principles of Management – Evolution of management theory and functions of management Organizational structure – Principles and types.

Decision making – Strategic, tactical and operational decisions, decision making under certainty, risk and uncertainty and multistage decisions and decision tree. Human resource management – Basic concepts of job analysis, job evaluation, merit rating, wages, incentives, recruitment, training and industrial relations.

Module IV (14 hours)

Financial management – Time value of money and comparison of alternative methods.

Costing – Elements and components of cost, allocation of overheads, preparation of cost sheet – break even analysis

Basics of accounting – Principles of accounting, basic concepts of journal, ledger, trade, profit and loss and balance sheet.

Marketing management – Basic concepts of marketing environment, marketing mix, advertising and sales promotion.

Project management – Phases, organization, planning, estimating, planning using PERT & CPM.

Reference Books

1. F. Mazda, *Engineering Management*, Addison Wesley Longman Ltd., 1998.
2. Lucy C Morse and Daniel L Bobcock, *Managing engineering and technology*, Pearson Prentice Hall.
3. O.P. Khanna, *Industrial Engineering and Management*, Dhanpat Rai and Sons, Delhi, 2003.
4. P. Kotler, *Marketing Management: Analysis, Planning, Implementation and Control*, Prentice Hall, NewJersey, 2001.
5. Venkata Ratnam C. S. & Srivastva B.K., *Personnel Management and Human Resources*, Tata McGraw Hill.
6. Prasanna Chandra, *Financial Management: Theory and Practice*, Tata McGraw Hill.
7. Bhattacharya A.K., *Principles and Practice of Cost Accounting*, Wheeler Publishing.
8. Weist and Levy, *A Management guide to PERT and CPM*, Prentice Hall of India.
9. Koontz H, O'Donnel C & Weihrich H, *Essentials of Management*, McGraw Hill
10. Ramaswamy V.S & Namakumari S, *Marketing Management : Planning, Implementation and Control*, MacMillan.

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)* — *2 x 2 marks=4 marks*, *1 x 1mark = 1 mark*

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* — *2 x 5 marks=10 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* — *2 x 10 marks=20 marks*

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

Maximum Total Marks: 35

Note : Section A (Engineering Economics) and Section B (Principles of Management) should be written in separate answer sheets.

CS09 503: Signal Processing

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

Objectives

- *To impart the basic concepts of continuous and discrete signals and systems*
- *To develop understanding about frequency domain approaches used for analysis of continuous and discrete time signals and systems.*

Module I (14 hours)
Signals – classification – continuous-time/discrete-time, deterministic/non-deterministic, periodic/ aperiodic, even/odd, energy/power signals – elementary signals – exponential, sinusoidal, unit step, impulse, ramp – time-shifting, scaling, folding.
System – classification – continuous-time/discrete-time, static/dynamic, linear/non-linear, time-invariant/variant, deterministic/stochastic, causal/non-causal, stable/unstable.
Linear Time Invariant (LTI) systems – impulse response – convolution integral – convolution-sum – condition for BIBO stability for CT and DT signals in terms of impulse response.

Module II (12 hours)
Representation of signals – Periodic signals – continuous-time fourier series (CTFS) – Trigonometric and exponential – symmetry conditions – amplitude & phase spectrum – properties of CTFS – Parserval's theorem for power signals – power spectral density.
Non-periodic signals - continuous-time Fourier transform (CTFT) – amplitude & phase spectra - gate function – sampling function – properties – convolution – Parseval's theorem for energy signals – energy-spectral density - Frequency response.
Linear Constant-Coefficient Differential equations - review of Laplace transform – transfer function - relation between Laplace transform and Fourier transform - poles and zeros – pole-zero plots - basic concept of BIBO stability.

Module III (12 hours)
Periodic signals - Discrete-time Fourier series (DTFS) – properties of DTFS – aperiodic signals – discrete-time Fourier transform (DTFT) – properties of DTFT - Parseval's theorem – energy spectral density – – frequency response - sampling – sampling theorem – impulse train - Nyquist rate - aliasing.

Module IV (14 hours)
Linear Constant-Coefficient Difference Equations (LCCDE) - Z-transform – Region of Convergence (ROC) – properties – inverse Z-transform – convolution - Long division method, partial fraction expansion method, residue method – one-sided Z-transform – properties – initial value & final value theorem - solution of LCCDE with initial conditions – zero input response and zero state response - system function – poles and zeros – basic concept of BIBO stability.

Text Books

1. Oppenheim A.V. & Schafer R.W., *Signals and systems*, Pearson Education
2. Proakis J.G. & Manolakis D.G., *Digital signal processing, principles, algorithms & applications* – Pearson Education
3. Gurung, *Signals and Systems* – Printice Hall India, New Delhi

Reference Books

1. Bandyopadhyay M N , Introduction to Signals and Systems and DSP, PHI
2. Ramesh Babu P., *Signals and Systems*, Scitech Publications (India) Private Limited
3. Sanjit K. Mitra, *Digital Signal Processing – A computer based approach*, Tata McGraw-Hill.
4. Dr. D. Ganesh Rao, *Digital Signal Processing*, Sanguine Technical Publishers.
5. Dr. D. Ganesh Rao, *Signals and Systems*, Sanguine Technical 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

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 504: Operating Systems

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

Objectives

- *To impart the knowledge on the need and requirement of an interface between Man and Machine; to enable the learners to identify the difference between the system software and the application software and their design requirements.*
- *To teach the features of operating systems and the fundamental theory associated with process, memory and file management components of operating systems.*

Module I (16 hours)
Review of operating system strategies - resources - processes - threads - objects, -operating system organization - design factors - functions and implementation considerations - devices - characteristics - controllers - drivers – device management - approaches - buffering - device drivers - typical scenarios such as serial communications - storage devices etc.

Module II (14 hours)
Process management - system view - process address space - process and resource abstraction - process hierarchy - scheduling mechanisms - various strategies - synchronization - interacting & coordinating processes - semaphores - deadlock - prevention - avoidance - detection and recovery.

Module III (17 hours)
Memory management - issues - memory allocation - dynamic relocation various management strategies - virtual memory - paging - issues and algorithms segmentation - typical implementations of paging & segmentation systems.

Module IV (18 hours)
File management - files - implementations - storage abstractions - memory mapped files - directories and their implementation - protection and security - policy and mechanism - authentication - authorization - case study of Unix kernel and Microsoft windows NT (concepts only).

Text Books

1. Nutt G.J., *Operating Systems - A Modern Perspective*, Addison Wesley.

Reference Books

1. Silberschatz & Galvin, *Operating System Concepts*, Addison Wesley
2. Crowley C, *Operating Systems- A Design Oriented Approach*, Tata McGrawHill
3. Tanenbaum A.S., *Modern Operating Systems*, Prentice Hall, 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 505: Digital Data Communication

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

Objectives

- *To introduce the concepts of communication of digital data by looking at the various aspects of generation, transmission and reception.*
- *To introduce the various protocols involved in communication of digital content.*

Module I (13 hours)
Data and Signals – Analog and Digital – Data transmission – Basics – Transmission impairments – Data rate limits – performance – Digital transmission – Analog transmission – Bandwidth utilization – channel capacity – multiplexing – spread spectrum – asynchronous transmission – synchronous transmission – signal propogation delay – transmission media - guided media – unguided media

Module II (13 hours)
Digital to analog conversion – analog to digital conversion – transmission modes – error detection and correction – introduction – block coding – cyclic codes – checksum – data compression.

Module III (13 hours)
Telephone network – dial up modems – digital subscriber line – cable TV networks for data transfer switching – switching – circuit switched networks – datagram networks – virtual circuit networks – structure of a switch.

Module IV (13 hours)
Data link control – framing – flow control – error control – protocol basics – character oriented protocols – bit oriented protocols – noiseless channels – noisy channels – HDLC – point to point protocol.

Text Books

1. Behrouz Forouzan, *Data Communication and Networking*, Tata McGraw Hill.

Reference Books

1. William Stallings, *Data and Computer Communications*, Prentice Hall International Pvt. Ltd.
2. Fred Halsall, *Data Communication, Computer Networks and Open Systems*, Pearson Education.
3. Harold Kolimbris, *Digital Communication 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)* 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 506: Theory of Computation

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

Objectives

- *To teach the fundamentals on computational models and computability.*
- *To introduce the introductory concepts of languages and their classification*
- *To familiarize the students on recognizers and automata.*
- *To impart knowledge on classifying algorithms into the various computability classes and proofs of some standard algorithms.*

Module I (13 hours)
Introduction to formal proof - Inductive proofs - Concepts of automata theory - Deterministic finite automata - Nondeterministic finite Automata - equivalence of deterministic and nondeterministic finite automata - Nondeterministic Finite automata with a transitions - Regular expressions - Finite automata and regular expressions - Algebraic laws for Regular expressions - Pumping lemma for regular languages - closure properties of regular languages - Decision properties of regular languages - Equivalence and minimization of automata.

Module II (13 hours)
Context free Grammars - Derivations - sentential forms - The language of grammar - Parse trees - Ambiguity in grammar and languages - Inherently ambiguous languages - Pushdown automata - Formal definition - Graphical notation - The language of a PDA - Acceptance by PDA - Empty stack - Final state - PDAs to grammars - Deterministic PDAs and CFLs - Non deterministic PDAs - Chomsky Normal Form - Greibach Normal Form - Pumping lemma for CFLs - Closure properties of CFLs - Decision properties of CFLs - CYK algorithm.

Module III (14 hours)
Turing Machines - Notation - Instantaneous Description - Transition Diagram - The language of a Turing Machine - Halting of TMs - Programming techniques for Turing Machines - Extension to basic TMs - Nondeterministic TMs - Restricted TMs - Recursive and Recursively Enumerable Languages - Halting problem of TMs - Undecidable problem about TMs - Rice's Theorem - Post Correspondence problem - Undecidability of Post Correspondence Problem - Undecidable problems on Languages.

Module IV (12 hours)
Intractable problems - The classes P and NP - Polynomial time reducibility -NP-Complete problems - The Satisfiability problem - NP-Completeness of the satisfiability problem - NP-Completeness of CSAT - NP-Completeness of 3SAT - Node cover problem - Directed Hamiltonian circuit problem - The class of languages Co-NP - Problems solvable in polynomial space.

Text Books

1. Raymond Greenlaw & H. James Hoover, *Fundamentals of the Theory of Computation : Principles and Practice*, Morgan Kaufmann Publishers.

Reference Books

1. Hopcroft J.E, Motwani R & Ullman J. D., *Introduction to Automata Theory, Languages and Computation*, Pearson Education.
2. Hopcroft J. E. & Ullman J. D., *Introduction to Automata Theory, Languages and Computation*, Narosa.
3. Linz: P., *An Introduction to Formal Languages & Automata*, Narosa.
4. Martin I C, *Introduction to Languages and the Theory of Computation*, 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 507(P) : Programming Paradigms Lab

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

Objectives

- *To impart the working experience on paradigms of programming.*
- *To focus on teaching the paradigms not the platforms. However, adequate knowledge about platform is a need for successful experimentation.*

Lab. 1: (object-oriented programming in - Java /C+ +) - programming to bring out the concept of classes and objects- for example the abstract data type binary tree.

Lab 2: (object-oriented programming) - programming to demonstrate inheritance and class hierarchy - for example define a base class "shape" and derived classes for rectangle, square, ellipse, circle with proper class hierarchy.

Lab.3: (object oriented programming) programming to demonstrate polymorphism, virtual functions - for example define base class for vectors and use inheritance to define complex and real vector with standard operations.

Lab.4: (functional programming - in Lisp) - programming to demonstrate functional specification for a solution - for example implementation of quick sort.

Lab.5: (functional programming) - programming to demonstrate implementation of conventional data structures - for example implementation of binary search tree with insertion, deletion and search operations.

Lab.6: (functional programming) - programming to demonstrate the use of available data structures in functional programming languages - for example implementation of set with membership, union and intersection operations

Lab.7: (logic programming - in prolog) - programming to demonstrate ready implementation of propositional logic statements- for example to find the gcd of two given integers.

Lab.8: (logic programming) - programming to demonstrate language specific features - for example implementation of a logic program to check whether a given NFA accepts the given string.

Lab.9: (concurrent programming- in Java) - demonstration of concurrency support - for example programming to find the least common ancestor of two given nodes in a binary tree.

Lab.10: (concurrent programming- in Java) - demonstration of synchronized concurrency - for example programming for the readers and writers problem.

Reference Books

1. Sethi R., *Programming Languages: Concepts and Constructs*, Addison Wesley
2. Appleby D. & Vandekopple J.J., *Programming Languages: Paradigm and Practice*, Tata McGraw Hill
3. Luger & Stubblefield, *Artificial Intelligence*, Addison Wesley
4. Samuel A. Rebelsky, *Experiments in Java*, Pearson Education.

Internal Continuous Assessment *(Maximum Marks-50)*

60%-Laboratory practical and record
30%- Test/s
10%- Regularity in the class

CS09 508(P) Hardware Lab

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

Objectives

- *To teach the relevance and characteristics of hardware and operating system components of a digital computer system through various laboratory experiments.*
- *To enable the students to develop the ability to interface devices to computer systems through various interfacing techniques.*

Lab 1: Identification of components/cards and PC assembling from components

Lab 2 : Assembly language program for implementing arithmetic operations.

Lab3,4: Implementation of a file manager using DOS/BIOS interrupts.

Lab 5: TSR (Terminate and Stay Resident) Programming.

Lab 6: ADC interface.

Lab 7: Stepper Motor interface using DAC.

Lab 8,9: Parallel Interface: Printer and HEX keyboard..

Lab 10: Serial Interface: PC to PC serial interface using MODEM.

Reference Books

1. Messmer H.P., *The Indispensable PC Hardware Book*, Addison Wesley
2. Hall D. V., *Microprocessors and Interfacing*, Tata McGraw Hill.
3. Norton P., *DOS Internals*.

Internal Continuous Assessment *(Maximum Marks-50)*

60%-Laboratory practical and record
30%- Test/s
10%- Regularity in the class

Semester End Examination *(Maximum Marks-50)*

70% - Procedure, conducting experiment, results, tabulation, and inference
20% - Viva voce
10% - Fair record

CS09 601 : Embedded Systems

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

Objectives

- *To teach students about architecture, hardware and software elements, programming models and practices and tools for embedded system design and implementation.*
- *To focus on the hardware and real time operating systems used for the embedded systems design.*

Pre-requisites: *Knowledge of digital design, computer organization*

Module I (14 hours)
Embedded systems: Overview, Design challenges-Optimising design metrics, Common design metrics-Processor technology-General purpose processors, Single purpose processors and Application specific processors.
IC technology: Full-custom/VLSI, Semi-custom ASIC, Compilation/Synthesis, libraries/IP, Test/Verification, Custom Single-purpose processors: Hardware-Combinational Logic, Transistors and logic gates, Basic combinational and Sequential logic design, Custom single purpose processor design and optimisation.
General-purpose processors: Software: Basic architecture, Datapath, Control unit, Memory, Instruction execution, Pipelining, Superscalar and VLIW architectures, Instruction set, Program and data memory space, Registers, I/O, Interrupts, Operating Systems, Development environment, Design flow and tools, Testing and debugging.
Application-specific instruction-set processors, Microcontrollers, Digital signal processors.
Standard single-purpose processors: Peripherals-some examples such as Timers, counters, Analog-digital converters, etc.

Module II (14 hours)

Memory: Write-ability and storage permanence. Common memory types, Composing memories, memory hierarchy and cache - Cache mapping techniques: replacement, write techniques, Cache impact on system performance, Advanced RAM, the basic DRAM, types of DRAMS, DRAM integration problem, Memory management unit (MMU)
Interfacing: Basic protocol concepts, Microprocessor interfacing: I/O addressing, interrupts, DMA, Arbitration methods, Multi-level bus architectures, Advanced communication principles, Parallel, Serial and Wireless communication, Error detection and correction, Bus standards and protocols.
An example: Digital camera - User's perspective, Designer's perspective, Specification, Informal functional specification, Non-functional specification, Executable specification Design, Implementation alternatives

Module III (13 hours)

State machine and concurrent process models: Models vs. languages, text vs. graphics, A basic state machine model: finite-state machines, FSM with datapath model FSMD, Hierarchical/Concurrent state machine model (HCFSM) and the State charts language, Program-state machine model (PSM),The role of an appropriate model and language
Concurrent process model: Concurrent processes, create, terminate suspend, resume and join, Interprocss Communication and synchronization methods and their implementation
Case studies : Windows CE, QNX

Module IV (11 hours)
Design technology: Automation-The parallel evolution of compilation and synthesis, Synthesis levels, Logic synthesis, Two-level and, Multi-level logic minimization, FSM synthesis, Technology mapping, Integration logic synthesis and physical design, Register-transfer synthesis, Behavioural synthesis, System synthesis and

hardware/software codesign, Intellectual property cores, New challenges posed by cores to processor providers and users.

Text Books

1. Frank Vahid and Tony Givargis, *Embedded System Design: A Unified Hardware/Software Introduction*, Wiley, 2002.

Reference Books

1. Jack Ganssle, *The Art of Designing Embedded Systems*, 2nd ed., Elsevier, 2008.
2. Raj Kamal, *Embedded systems - architecture, programming and design*, Tata McGraw Hill, 2007.
3. Steve Heath, *Embedded Systems Design*, 2nd ed., Elsevier, 2006.
4. Tammy Noergaard, *Embedded Systems Architecture: A Comprehensive Guide for Engineers and Programmers*, Elsevier, 2008.
5. A.N.Sloss, D. Symes, and C. Wright, *ARM System Developer's Guide: Designing and*

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 602: Compiler Design

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

Objectives

- *To introduce the various techniques involved in the translation of source programs into object programs by a compiler.*
- *To understand the inner working of a compiler using the various data structures used in the translation process.*

Module I (15 hours)
Introduction - analysis of the source program - phases of a compiler - compiler construction tools - lexical analysis - role of the lexical analyzer - specification of tokens - recognition of tokens - lexical analyzer generators.

Module II (16 hours)
Syntax analysis : role of the parser - context-free grammars - top-down parsing -bottom-up parsing - operator precedence parsing - LR parsers (SLR, canonical LR, LALR) - parser generators.

Module III (16 hours)
Syntax-directed translation - syntax-directed definitions - S-attributed definitions - L-attributed definitions - bottom-up and top-down translation - type checking - type systems - specification of a type checker - run-time environments - source language issues - storage organization - storage allocation strategies - access to non-local names - parameter passing - symbol tables.

Module IV (18 hours)
Intermediate code generation - intermediate languages - declarations - assignment statements - Boolean expressions - procedure calls - introduction to code optimization - sources of optimization - introduction to data-flow analysis - introduction to code generation - issues in the design of a code generator - the target machine - a simple code generator

Text Books

1. Aho A.V., Sethi R., Ullman J.D., *Compilers: Principles, Techniques and Tools*, Addison Wesley.

Reference Books

1. Aho A. V., Ullman J.D. *Principles of Compiler Design*, Narosa
2. Muchnick S.S., *Advanced Compiler Design Implementation*, Harcourt Asia (Morgan Kaufman)
3. Holub A.I., *Compiler Design in C*, Prentice Hall India
4. Appel A.W., *Modern Compiler Implementation in C*, Cambridge University Press
5. Kenneth C Lauden, *Compiler Construction - Principles and practice*, Thomson Brooks/Cole - Vikas Publishing House.
6. Dick Grune, Henri E Bal, Ceriel J.H Jacobs, Koen G Langendoen, *Modern Compiler design*, Dreamtech.
7. K.D.Cooper and Linda Torczon, *Engineering a Compiler*, Morgan Kaufmann/Elsevier, 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 603: Computer Networks

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

Objectives

- *To teach the mode of operation of different types of computer networks that are used to interconnect a distributed community of computers and various interfacing standards and protocols.*

Module I (13 hours)
Local Area Networks: Ethernet, Token Ring Media Access Control, Token Ring Maintenance, FDDI, Resilient Packet Ring, Wireless: Bluetooth, Wi-Fi, WiMAX, Cell Phone Technologies. Circuit switching, Message switching, Packet Switching - Datagrams, Virtual circuit, source routing, Cell Switching - Cells, Segmentation and Reassembly, Virtual Paths, ATM design goals, Physical Layers for ATM.

Module II (13 hours)
Internetworking - Networking devices - Bridges, Routers, Gateways, Routing- Network as a graph, distance vector (RIP), link state (OSPF), Metrics, Routing for mobile hosts, Global Internet - Subnetting, CIDR, BGP, Routing areas.

Module III (13 hours)
Internetworking - IPv4 and IPv6, Multicast addresses, Multicast routing, DVMRP, PIM, MSDP, Multiprotocol label switching- Destination based forwarding, Explicit routing, virtual private networks and tunnels.

Module IV (13 hours)
End-to-End Protocols: Transport layer – duties, Simple Demultiplexer (UDP), Reliable byte Stream (TCP). end-to-end issues - segment format, connection establishment and termination, Triggering transmission, Adaptive retransmission, record boundaries. TCP extensions, Alternative design choices. Remote Procedure Call Fundamentals, RPC Implementation, Upper OSI layers - session layer, presentation layer, application layer.

Text Books

1. L. Peterson & Bruce S. Davie, *Computer Networks- A systems approach*, 4/e Morgan Kaufmann publishers an imprint of Elsevier

Reference Books

1. Behrouz Forouzan, *Introduction to data communication and networking*, Tata McGraw- Hill Publishing Company Ltd.
2. Halsall F., Data Communication, *Computer Networks and Open Systems*, Addison Wesley.
3. Keshav S, *An Engineering Approach to Computer Networking*, AWL.
4. Andrew S. Tanenbaum, *Computer Networks*, PHI.
5. Leon-Garcia A. & Widjaja I., *Communication Networks*, 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 604: Database Management Systems

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

Objectives

- *To introduce the basic concepts of data bases connected with software engineering techniques and background information useful for the management of data bases. The syllabus includes the file organization, database design and transaction processing techniques.*

Module I (14 hours)
Introduction: characteristics of database approach - advantages of using DBMS - database concept and architecture - data models - schemes - instances - data independence - database languages and interfaces - database modeling using entity-relationship (ER) - entity sets attributes and keys - relationships - type role and structural constraints - weak entity types - enhanced entity-relationship (EER) and object modeling - sub classes - super classes and inheritance - specialization and generalization - modeling of union types.

Module II (12 hours)
File organization and storage: secondary storage devices - RAID technology - operations in files - heap files and sorted files - hashing techniques - types of single level ordered index, multi-level indexes - B-trees and B+ trees - indexes on multiple keys - other types of indexes.

Module III (13 hours)
Database design: functional dependencies - normal forms - general definition of second and third normal forms - Boyce-Codd normal form - multi valued dependencies and fourth normal form - join dependencies and fifth normal form - inclusion dependencies - practical database design tuning - database design process relational model concepts - relational algebra operations - queries in SQL – insert, delete and update statements in SQL views in SQL.

Module IV (13 hours)
Transaction processing : desirable properties of transactions, schedules and recoverability - serializability of schedules - concurrency control - locking techniques - time stamp ordering multi version concurrency control - granularity of data items - database recovery techniques based on deferred up data and immediate updating - shadow pages - ARIES recovery algorithm - database security and authorization - security issue access control based on granting/revoking of privileges introduction to statistical database security.

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 A., Korth H.F., & Sudarshan S., *Database System Concepts*, Tata McGraw Hill
4. Ullman J.D., *Principles of Database Systems*, Galgotia Publications
5. Date C.J., *An Introduction to Database Systems*, Addison Wesley

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 605: Computer Graphics

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

Objectives

- *To teach the fundamentals of computer graphics including algorithms for drawing 2D and 3D primitives, object transformations and the like.*

Module I (10 hours)
Introduction - Display devices - Random-scan and raster scan monitors - Color CRT - Plasma panel displays - LCD Panels - Plotters - Film Recorders - Graphics Workstations - Display processors - Graphics software - Input/Output Devices - Touch Panels - Light Pens - Graphics Tablets - 2D Drawing Geometry - Mathematics for Computer Graphics - A Brief Concept of Trigonometry - Polar Coordinates - Parametric Functions - Vectors - Scalar Product - Cross Product - Matrices - Scalar Multiplication - Matrix Addition and Multiplication - Matrix Inverse - 2D Transformation - Use of Homogeneous Coordinate Systems, Translation, Scaling, Rotation, Mirror Reflection, Rotation about an arbitrary point - Zooming and Panning - Rubber Band Methods - Dragging - Parametric Representation of a Line Segment

Module II (8 hours)
Graphic Operations - Windowport and viewport - Elimination of totally visible and totally invisible lines with respect to a rectangular window using line and point codes - Explicit line clipping algorithm - Sutherland Cohen Algorithm - Mid-point subdivision algorithm - Filling - Stack based and queue based seed fill algorithms - Scan line seed fill algorithm - Generation of Bar Charts - Pie Charts - Character Generation

Module III (9 hours)
Conics and Curves - Bresenham's Circle Drawing Algorithm – Ellipse drawing algorithm - Generation of Ellipses through transformation on circles - Curve Drawing - Parametric Representation - Cubic Curves - Drawing Cubic Bezier and B-Spline Curves - Beta splines - Rational splines

Module IV (12 hours)
3D Graphics - Transformations - Right handed coordinate system - transformation matrices for translation - Scaling and Rotation around axes - parallel projection - Multiviews - front, top and side views - Oblique view - Projection on xy plane with Rays along a given direction - Perspective projection - Transformation matrix to yield one vanishing point - Perspective view with viewpoint lying on z-axis - effect of Translating the object - Computing the vanishing point - Numerical Examples - Hidden surface removal - Back Face removal - Depth Buffer Method

Text Books

1. Hearn D., Baker P.M, *Computer Graphics*, Prentice Hall India.

Reference Books

1. Newmann W & Sproull R.F., *Principles of Interactive Computer Graphics*, McGraw-Hill
2. Rogers D.F., *Procedural Elements for Computer Graphics*, McGraw-Hill
3. Foley J. D., Van Dam A., Feiner S. K., & Hughes J. F., *Computer Graphics Principles and Practice*, Second Edition, Addison Wesley.

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 607(P) : Systems Lab

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

Objectives

- *To make the learners understand the operating system structures and the implementation aspects of various OS functions and schedulers.*
- *To teach data base technology and familiarize them with issues related to data base design through hands on practice.*

Operating systems

1. Implementation of dining philosophers problem by multiprogramming using threads, semaphores and shared memory
2. Implementation of ls/dir command of Unix/Dos to display contents of a given floppy disk.
3. Program to generate disk usage status report for a given Unix/Dos formatted floppy disk giving details like free space availability etc.
4. Implementation of banker's algorithm
5. Inter-process communication using mailboxes and pipes
6. Program to find the least common ancestor of two given nodes in a binary tree (Concurrent Programming)
7. Program for the readers and writers problem (Concurrent Programming)

Database management systems

1. Conversion of a given relational scheme to 3NF and BCNF
2. Implementation of B tree and B+ tree
3. Implementation of a database stored in an RDBMS accessible through a web browser.
4. Program to convert SQL subset into relational algebra (tools like YACC may be used.)
5. Implementation of optimistic concurrency control algorithm

Reference Books

1. Nutt G.J., *Operating Systems - A Modern Perspective*, Addison Wesley
2. Bach M.J., *The Design of the Unix Operating System*, Prentice Hall India
3. Elmasri, Navathe, *Fundamentals of Database Systems*, Addison Wesley
4. Ramakrishnan R., Gehrke J., *Database Management Systems*, McGraw Hill

Internal Continuous Assessment *(Maximum Marks-50)*

60%-Laboratory practical and record
30%- Test/s
10%- Regularity in the class

Semester End Examination *(Maximum Marks-50)*

70% - Procedure, conducting experiment, results, tabulation, and inference
20% - Viva voce

10% - Fair record

CS09 608(P) : Mini Project

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

Objectives

- *To estimate the ability of the student in transforming the theoretical knowledge studied so far into a working model of a computer / information system.*
- *For enabling the students to gain experience in organisation and implementation of a small project and thus acquire the necessary confidence to carry out main project in the final year.*

In this practical course, each group consisting of three/four members is expected to design and develop a moderately complex computer / information system with practical applications; this should be a working model. The basic concepts of product design may be taken into consideration while designing the project. A committee consisting of minimum three faculty members specialised in computer science and engineering will perform assessment of the mini project. Students have to submit a report on the mini project and demonstrate the mini project before the evaluation committee.

The division of the total marks is into two namely, 60% of the total marks to be awarded by the guide / Co-ordinator and the remaining 40% by the evaluation committee.

Internal Continuous Assessment *(50 marks)*
40% - Design and development
30% - Final result and Demonstration
20% - Report
10% - Regularity in the class

Semester End Examination *(Maximum Marks-50)*

20% - Demonstration of mini project
50% - Practical test connected with mini project
20% - Viva voce
10% - Fair record

CS09 701: Wireless Networks and Mobile Communication Systems

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

Objectives

- *This introductory course is intended to introduce the basics of wireless and mobile networks in the context of the recent trends in this area and their proliferation in day to day life. Local Area Network (LAN), Wide area Network (WAN) and Inter networking are dealt with.*

Pre-requisites: *Knowledge of Data communication, Computer networks, and Operating systems*

Module I (12 hours)
Introduction: PCS Architecture, Cellular Telephony - popular cellular telephony networks, Cordless telephony, Third generation Wireless systems
Mobility Management: Handoff, Roaming Management, Handoff Management - Detection and Assignment, Radio Link Transfer, Types of Handoff

Module II (12 hours)
Network signaling: Signal system 7, Interconnection and message routing, Mobility Management using TCAP, PCN/PSTN call control using ISUP, Intersystem Handoff and authentication in IS-41, PACS Network signaling, Cellular Digital Packet Data Architecture, CDPD Air interface, Radio Resource Allocation

Module III (8 hours)
GSM Overview, GSM Network signaling, GSM Mobility Management, GSM Short Message Service, Mobile Number portability

Module IV (7 hours)
General Packet Radio Service: Functional Groups, Architecture, GPRS Network nodes and Interfaces, Introductory ideas about WAP

Text Books

1. Yi-Bang Lin and Imrich Chlamtac, *Wireless and Mobile Architectures*, Wiley Student Edition, 2008.

Reference Books

1. William Stallings, *Wireless Communications and Networks*, Prentice Hall, 2004
2. Schiller J., *Mobile Communications*, Addison Wesley
3. Ivan Stojmenovic(Ed), *Handbook of Wireless Networks and Mobile Computing*, John Wiley and sons, Inc, 2nd Edn, 2007.
4. Vijay K.Garg, *Wireless Communications and Networking*, Morgan Kaufmann Publishers / Elsevier, 2009.

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 702: Design and Analysis of Algorithms

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

Objectives

- *To provide a sound basis of algorithm design and analysis techniques.*
- *To introduce the various computing models and their capabilities with respect to computing.*

Module I (16 hours)
Analysis: RAM Model - Cost estimation based on key operations - big Oh - big omega - little Oh - omega and theta notations - recurrence analysis - Master's Theorem - Solution to recurrence relations with full history probabilistic analysis - linearity of expectations - Worst and Average case analysis of Quick Sort -Merge Sort - Heap Sort - Binary Search - Hashing Algorithms - lower bound proofs for the above problems -amortized analysis - aggregate - accounting and potential methods - Analysis of Knuth - Morris-Pratt algorithm - Amortised weight balanced trees - Red-Black Trees.

Module II (16 hours)
Design: Divide and Conquer - Strassen's algorithm, o(n) median finding algorithm - Dynamic programming - Matrix Chain Multiplication - Optimal polygon triangulation - Optimal Binary Search trees - Floyd-Warshall algorithm - CYK algorithm - Greedy-Huffman coding - Knapsack, Kruskal's and Prim's algorithms for MST – backtracking - branch and bound - traveling Salesman Problem - Matroids and theoretical foundations of Greedy algorithms.

Module III (15 hours)
Complexity: Complexity classes - P, NP, Co-NP, NP Hard and NP Complete problems - Cook's theorem(Proof not expected) - NP- Completeness reductions for clique - Vertex Cover - Subset Sum -Hamiltonian Cycle - TSP - integer programming - approximation algorithms - Vertex Cover - TSP-Set covering and subset sum - Bin packing - Graph coloring.

Module IV (18 hours)
Probabilistic algorithms: Pseudo random number generation methods - Monte Carlo algorithms - Probablistic counting - Verifying matrix multiplication - Primality testing - Miller Rabin Test - integer Facorisation - Pollard's rho heuristic - amplification of stochastic advantage - application to cryptography - interactive proof systems - les vegas algorithms - Randomized selection and sorting - Randomized solution for eight queen problem -Universal Hashing - Dixon's integer factorization algorithm.

Text Books

1. Corman T.H, Lieserson C.E & Rivest R.L, *Introduction to Algorithms*, Prentice Hall India, Modules I, II and III.
2. Motwani R. & Raghavan P, *Randomized Algorithms*, Cambridge University Press, Module IV

Reference Books

1. Basse S., *Computer Algorithms: Introduction to Design And Analysis*, Addison Wesley
2. Manber U., *Introduction to Algorithms: A Creative Approach*, Addison Wesley
3. Aho V., Hopcroft J.E. & Ullman J.D., *The Design And Analysis of Computer Algorithms*, Addison Wesley
4. Kenneth A Berman, Jerome L. Paul, *Fundamentals of sequential and parallel algorithms*, Vidya Vikas Publications

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 703 : Internet Technology

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

Objectives

- *To introduce the algorithms and protocols implemented to have human interaction with internet with an emphasis on application layer and multimedia networking.*
- *To introduces the techniques and methods of E-Commerce. .*

Module I (10 hours)
Principles of Application Layer Protocols - The Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, DNS-The Internet's Directory Service - Socket Programming with TCP, Socket Programming with UDP, Building a Simple Web Server, Content Distribution.

Module II (10 hours)
Multimedia networking- Multimedia Networking Applications, Streaming Stored Audio and Video - Making the Best of the Best-Effort Service: An Internet Phone Example - Protocols for Real-Time Interactive Applications - Beyond Best-Effort - Scheduling and Policing Mechanisms - Integrated Services - RSVP - Differentiated Services.

Module III (9 hours)
Network Security - Principles of Cryptography, Authentication, Integrity, Key Distribution and Certification - Access Control: Firewalls, Attacks and Countermeasures - Security in Many Layers: Case Studies.

Module IV (10 hours)
E-commerce- Modes of E-commerce, Security needs in E-commerce environment - E-commerce payment systems, credit cards, E-commerce transactions, digital payments in B2C arena, B2B payment systems, B2B - E-commerce and Supply Chain Management, Evolution, Procurement process & Supply Chain Management, Trends in Supply Chain Management and collaborative commerce, Net Marketers - characteristics, types, e-distributors, e-procurement.

Text Books

1. Kurose J.F. & Ross K.W, *Computer Networking: A Top -Down Approach Featuring the Internet*, Pearson Education
2. Kenneth C. Laudon, Carol Guercio Traver, *E-Commerce-Business, Technology, Society*, Pearson Education.

Reference Books

1. Nalin K. Sharda, *Multimedia Information Networking*, Prentice Hall of India.
2. Douglas E. Comer, *Computer Networks and Internets with Internet Applications*, Pearson Education
3. Stallings, *Computer Networking with Internet Protocols*, Pearson Education Asia.
4. Goncalves M., *Firewalls: A Complete Guide*, Tata McGraw Hill.
5. Kalakota R. & Whinston A.B., *Frontiers of Electronic Commerce*, Addison Wesley.
6. Schneider G.P. & Perry J.T., *Electronic Commerce, Course Technology*, McGraw Hill, New Delhi, 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 704 : Cryptography and Network Security

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

Objectives

- *To introduce the principles and practices of cryptography and network security*
- *To discuss algorithms and schemes to handle the security issues*
- *To introduce web security*

Module I (14 hours)

Introduction: Security basics – Aspects of network security – Attacks – Different types - Security attacks -Security services and mechanisms. Cryptography: Basic Encryption & Decryption – Classical techniques - Transposition & substitution ciphers –Caesar substitution – Polyalphabetic substitutions – Symmetric key algorithms – Fiestel Networks – Confusion - Diffusion - DES Algorithm – Strength of DES – Comparison & important features of modern symmetric key algorithms

Module II (13 hours)

Public key cryptosystems – The RSA Algorithm – Diffice Hellman key exchange – comparison of RSA & DES – Elliptic Curve Cryptography – Number Theory Concepts

Module III (13 hours)

Hash Functions – Digest Functions – Digital Signatures – Authentication protocols. – Network & Application Security: Kerberos – X509 Authentication service – Electronic mail security – Pretty Good privacy –S/MIME – secure Electronic Transactions.

Module IV (12 hours)

IP security – architecture – features – Web security – Socket layer and transport layer security – Secure electronic transactions – Firewalls

Text Books

1. William Stallings, *Network Security Essentials Applications & Standards*, Pearson Education Asia.

Reference Books

1. Schneier B., *Applied Cryptography: Protocols, Algorithms, and Source Code in C*, John Wiley
2. Wenbo Mao , *Modern cryptography - Theory and Practice*, Pearson Education Asia
3. Niven & Zuckerman H.S., *An Introduction to The Theory of Numbers*, John Wiley
4. Pfleeger C.P., Pfleeger S.L., *Security in Computing*, Pearson Education (Singapore) Pvt. Ltd.
5. Michel E. Whiteman, Herbert J.Mattord, *Principles of Information Security*, Thomson, Vikas Publishing House.

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 707(P) : Compiler Lab

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

Objectives

- *To familiarize the design of all phases of compilers up to a stage of intermediate code generation.*
- *To enable the students to design and implement modern compilers for any environment.*

Lab 1,2 : Generation of lexical analyzer using tools such as LEX.

Lab 3,4 : Generation of parser using tools such as YACC.

Lab 5,6 : Creation of Symbol tables.

Lab 7,8 : Creation of type checker.

Lab 9,10 : Generation of intermediate code.

Reference Books

1. Sethi R., *Programming Languages: Concepts and Constructs*, Addison Wesley
2. Appleby D. & Vandekopple J.J., *Programming Languages: Paradigm and Practice*, Tata McGraw Hill
3. Luger & Stubblefield, *Artificial Intelligence*, Addison Wesley
4. Samuel A. Rebelsky. *Experiments in Java*. Pearson Education.

Internal Continuous Assessment *(Maximum Marks-50)*

60%-Laboratory practical and record
30%- Test/s
10%- Regularity in the class

Semester End Examination *(Maximum Marks-50)*

70% - Procedure, conducting experiment, results, tabulation, and inference
20% - Viva voce
10% - Fair record

CS09 708 (P) : Network Programming Lab

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

Objectives

- *To teach the working of various networking protocols*

Lab 1 : Implementation of PC to PC file transfer using serial port and MODEM.

Lab 2,3 : Software Simulation of IEEE 802.3, 802.4 and 802.5 protocols.

Lab.4,5 : Software Simulation of Medium Access Control protocols –
1) GoBackN,
2) Selective Repeat and
3) Sliding Window.

Lab 6 : Implementation of a subset of Simple Mail Transfer Protocol using UDP.

Lab 7,8 : Implementation of a subset of File Transfer Protocol using TCP/IP

Lab 9 : Implementation of "finger" utility using Remote Procedure Call (RPC)

Lab.10 : Generation and processing of HTML forms using CGI.

Reference Books

1. S Richard S.W., *Unix Network Programming*, Prentice Hall India
2. Comer D.E., *Internetworking with TCP/IP*, Vol. 1,2 & 3, Prentice Hall India
3. Campione et. al M., *The Java Tutorial Continued*, Addison Wesley

Internal Continuous Assessment *(Maximum Marks-50)*

60%-Laboratory practical and record
30%- Test/s
10%- Regularity in the class

CS09 709 (P) : Project

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

Objectives

- *To judge the capacity of the students in converting the theoretical knowledge into practical systems/investigative analysis.*

Project work is for duration of two semesters and is expected to be completed in the eighth semester. Each student group consisting of not more than five members is expected to design and develop a complete system or make an investigative analysis of a technical problem in the relevant area. The project may be implemented using software, hardware, or a combination of both. The project work may be undertaken in computer science engineering or allied areas like -

OS platforms: Relevant to the current state of the art with support for networked environment, distributed computing and development of multi-platform applications, Internet technologies: Architectural concepts, XML, Scripting languages, Middleware (Component) technologies, Front end / GUI: Code development or development based on tools, RDBMS/Back End: Relevant to current state with database connectivity to different platforms, Languages: Qt, Glade or any similar 4GLs, Scripting languages and C & C-Linux (under GNU gcc) etc, Universal network applications development platforms such as JAVA, OS internals: Device drivers, RPC, Threads, Socket programming etc.,Networking: Mechanisms, protocols, security etc., Embedded systems: RTOS, Embedded hardware with software for an application,Code optimization, security etc.

Project evaluation committee consisting of the guide and three/four faculty members specialised in biomedical/electronics/ computer science/instrumentation engg. (Please write areas of specialisations relevant to the concerned branch concerned) will perform the screening and evaluation of the projects.

Each project group should submit project synopsis within three weeks from start of seventh semester. Project evaluation committee shall study the feasibility of each project work before giving consent. Literature survey is to be completed in the seventh semester.

Students should execute the project work using the facilities of the institute. However, external projects can be taken up in reputed industries, if that work solves a technical problem of the external firm. Prior sanction should be obtained from the head of department before taking up external project work and there must be an internal guide for such projects.

Each student has to submit an interim report of the project at the end of the 7th semester. Members of the group will present the project details and progress of the project before the committee at the end of the 7th semester.

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

Internal Continuous Assessment

20% - Technical relevance of the project	:
40% - Literature survey and data collection	
20% - Progress of the project and presentation	:
10% - Report	
10% - Regularity in the class	

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