SCHEME AND SYLLABI

FOR

THIRD TO EIGHTH SEMESTERS

OF

BACHELOR OF TECHNOLOGY

IN

INFORMATION TECHNOLOGY

FROM 2009 ADMISSION ONWARDS

CALICUT UNIVERSITY (P.O), THENHIPALAM

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

INFORMATION TECHNOLOGY

Combined I & II Semesters (Common for all branches)		Hours / Week			Marks		Sem-end duration-hours	Credits
Code	Subject	L	T	D/P	Inte-rnal	S em-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 Communication Engineering	2	1		30	70	3	4
EN09 108	Engineering Graphics			3	30	70	3	3
EN09 109(P)	***Computer Programming 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		**1300**						

Third Semester		Hours / week			Marks		Sem - End Duration Hours	Credits
Code	Subject	L	T	P/D	Inte-rnal	Sem-end		
EN09 301	Engineering Mathematics III	3	1	-	30	70	3	4
EN09 302	Humanities and Communication Skills	2	1	-	30	70	3	3
IT09 303	Data Structures	4	1	-	30	70	3	5
IT09 304	Discrete Computational Structures	3	1	-	30	70	3	4
IT09 305	Electronic Circuits	3	1	-	30	70	3	4
IT09 306	Switching Theory & Logic Design	3	1	-	30	70	3	4
IT09 307(P)	***Digital Electronics Lab***	-	-	3	50	50	3	2
IT09 308(P)	***Programming Lab***	-	-	3	50	50	3	2
Total		**18**	**6**	**6**	**280**	**520**	**24**	**28**
Total Marks		**800**						

Fourth Semester		Hours/ Week			Marks		Sem-end Duration Hours	Credits
Code	Subject	L	T	P/D	Inte-rnal	Sem-end		
EN09 401(B)	Engineering Mathematics IV	3	1	-	30	70	3	4
EN09 402	Environmental Studies	2	1	-	30	70	3	3
IT09 403	Computer Organization & Design	4	1	-	30	70	3	5
IT09 404	Principles of Communication Engineering	3	1	-	30	70	3	4
IT09 405	Data Modeling And Design	3	1	-	30	70	3	4
IT09 406	Microprocessor Based Design	3	1	-	30	70	3	4
IT09 407(P)	***Data Structures Lab***	-	-	3	50	50	3	2
IT09 408(P)	***Programming Environments Lab***	-	-	3	50	50	3	2
Total		**18**	**6**	**6**	**280**	**520**	**24**	**28**
Total Marks		**800**						

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Fifth Semester		Hours / week			Marks		End- Sem Duration Hours	Credits
Code	Subject	L	T	P/D	Inte-rnal	Sem-end		
IT09 501	Software Architecture & Project Management	4	1	-	30	70	3	5
IT09 502	Industrial Economics and principles of management	2	1	-	30	70	3	3
IT09 503	Embedded systems	3	1	-	30	70	3	4
IT09 504	Operating systems	3	1	-	30	70	3	4
IT09 505	Digital data Communication	3	1	-	30	70	3	4
IT09 506	Theory of Computation	3	1	-	30	70	3	4
IT09 507(P)	***Systems Lab***	-	-	3	50	50	3	2
IT09 508(P)	***Hardware Lab***	-	-	3	50	50	3	2
Total		**18**	**6**	**6**	**280**	**520**	**24**	**28**
Total Marks		**800**						

Sixth Semester		Hours/Week			Marks		Sem-end Duration Hours	Credits
Code	Subject	L	T	P/D	Inte-rnal	Sem-end		
IT09 601	Software quality management	4	1	-	30	70	3	5
IT09 602	Compiler Design	3	1	-	30	70	3	4
IT09 603	Computer Networks	3	1	-	30	70	3	4
IT09 604	Database Management Systems	3	1	-	30	70	3	4
IT09 605	Human Computer Interaction	2	1	-	30	70	3	3
IT09 606	Elective I	3	1	-	30	70	3	4
IT09 607(P)	***Database Management Lab***	-	-	3	50	50	3	2
IT09 608(P)	***Mini Project***	-	-	3	50	50	3	2
Total		**18**	**6**	**6**	**280**	**520**	**24**	**28**
Total Marks		**800**						

Seventh Semester		Hours / week			Marks		Sem-end duration Hours	Credits
Code	Subject	L	T	P/D	Inte-rnal	Sem-end		
IT09 701	Computer Graphics	4	1	-	30	70	3	5
IT09 702	Natural Language Processing And Knowledge Based Systems	2	1	-	30	70	3	3
IT09 703	Internet Technology	2	1	-	30	70	3	3
IT09 704	Cryptography and Network security	3	1	-	30	70	3	4
IT09 705	Elective II	3	1	-	30	70	3	4
IT09 706	Elective III	3	1		30	70	3	4
IT09 707(P)	***Network Programming Lab***	-	-	3	50	50	3	2
IT09 708(P)	***Computer Graphics and Multime-dia Lab***	-	-	3	50	50	3	2
IT09 709(P)	***Project***	-	-	1	100	-	-	1
Total		**17**	**6**	**7**	**380**	**520**	**24**	**28**

Eighth Semester		Hours / week			Marks		Sem-end duration-hours	Credits
Code	Subject	L	T	P/D	Inte-rnal	End-sem		
IT09 801	Mobile Communication System	4	1	-	30	70	3	5
IT09 802	High Speed Networks	2	1	-	30	70	3	3
IT09 803	Elective IV	3	1	-	30	70	3	4
IT09 804	Elective V	3	1	-	30	70	3	4
IT09 805(P)	***Seminar***	-	-	3	100	-	-	2
IT09 806(P)	***Project***	-	-	11	100	-	-	7
IT09 807(P)	***Viva Voce***	-	-	-	-	100	-	3
	Total	**12**	**4**	**14**	**320**	**380**	**12**	**28**

List Of Electives

VI Semester		
1	IT09 L01	Digital Signal Processing
2	IT09 L02	Optimization Technique
3	IT09 L03	Information Theory and coding
4	IT09 L04	Linear system Analysis
5	IT09 L05	Information Retrieval
VII & VIII Semester		
1	IT09 L06	Real Time Computer Control Systems
2	IT09 L07	Soft Computing
3	IT09 L08	Digital Image Processing
4	IT09 L09	VLSI Design
5	IT09 L10	Intelligent Computing
6	IT09 L11	Optical Communication Networks
7	IT09 L12	Fault Tolerant Systems
8	IT09 L13	Network Administration And Management
9	IT09 L14	e- Business
10	IT09 L15	Pattern Recognition
11	IT09 L16	Bio- Informatics
12	IT09 L17	Parallel Architecture And Algorithms
13	IT09 L18	Design & Analysis of Algorithms
14	IT09 L19	Neural Networks And Fuzzy logic
15	IT09 L20	Grid Computing
16	IT09 L21	Bluetooth technology
17	IT09 L22	Industrial Psychology
18	IT09 L23	Distributed Systems **(Global Elective-I from IT)**
19	IT09 L24	Management Information Systems **(Global Elective-II from IT)**
20	IT09 L25	Graph theory and Combinatorics **(Global Elective-III from IT)**
Global Electives		
1	EE09 L23	Process Control and Instrumentation
2	EE09 L25	Robotics & Automation
3	ME09 L23	Industrial Safety Engineering
4	EC09 L25	Biomedical Instrumentation
5	PE09 L23	Total Quality Management
6	CE09 L23	Experimental Stress Analysis
7	CE09 L24	Remote Sensing and GIS
8	BT09 L24	Bio-ethics and Intellectual Property Rights
9	CH09 L23	Nano materials and Nanotechnology
10	CH09 L24	Industrial Pollution Control

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 are wealths 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 (13 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 (13 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, *Textbook 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 homework, 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 302: 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 (8 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 (11 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 (11 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 (9 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
13. Schrodinger, *Nature and Greeks and Science and Humanism*, Cambridge University 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 (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

IT09 303: 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 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 & Tree implementation using array & Linked List - Binary trees - Binary tree traversals - pre-order, in-order & 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 & 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 Brooks.
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 homework, 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

IT09 304: 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*
3. *Computer Science*, McGraw Hill Book Company.
4. Kolman B & Busby R C, *Discrete and Mathematical Structures for Computer Science*, Prentice Hall of India.
5. C.L. Liu, *Elements of Discrete Mathematics*, Tata McGraw Hill, 2002
6. Donald F Stanat & David F Mc Allister, *Discrete and Mathematical Structures in Computer Science*, Prentice Hall.
7. 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 homework, 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

IT09 305: Electronic Circuits

(Common with CS09 305)

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)* 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

IT09 306: Switching Theory and Logic Design

(Common with CS09 306)

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 course provides the basic concepts of computations and logic designs of Arithmetic Logic Unit (ALU) of a Computer. Books have been carefully chosen to get examples from diverse computing application for practice along with theory.*

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 flip-flops - 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

IT09 307(P): Digital electronics Lab

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

Objectives

- *This course gives hands on experience on digital electronics components and systems, which are fundamental building blocks of the Computer systems. Experiments are structured to cover extensively the characteristics and features of indispensable digital electronic circuits and systems*

1. Combinational circuits Address, MUX- DEMUX, Encoders Decoders, and Design using ROM.
2. Study of Flip Flops using gates and Flip Flop ICs.
3. Ripple counters - Design of different sequences.
4. Clocked sequential circuits - Design.
5. Synchronous counters - Design.
6. Shift Registers - Right, Left, Serial, Parallel.
7. 7 - Segment display systems (With Counters and Decoders).
8. Design of combinatorial and sequential circuits using PLAs and PALs.
9. Astable MV and Schmitt Trigger using gates, Applications of 555 as AMV, MMV and Frequency divider.

Reference Books
1. K.Nawas , *Electronics Lab Manual*

Internal Continuous Assessment *(Maximum Marks-50)*

60%-Laboratory practical and record
30%- Tests
10%- Regularity in the class

IT09 308(P): Programming Lab

(Common with CS09 308(P))

Teaching scheme **Credits:** 2

3 hours practical 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%- Tests
10%- Regularity in the class

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 differential equations is also included to make the student get acquainted with the basics of PDE.*

Module I – Probability Distributions - (12 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 - (12 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 (10 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 (10 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 (9 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, *Text book of 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., 345p
9. *Survey of the Environment*, The Hindu Magazine
10. Wagner.K.D. 1998, *Environmental Management*, W.B. Saunders Co. Philadelphia, USA 499p

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)

30% - Assignments (minimum 2) such as homework, 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)* 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

IT09 403: Computer Organization and Design

(Common with CS09 403)

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.*

Module I (18 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 (15 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 homework, 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

IT09 404: Principles of Communication Engineering

Teaching scheme **Credits:** 4

4 hours lecture and 1 hour tutorial per week

Objectives

- *To familiarize the basic principles underlying the operation and design of a communication system, concept of communication principles and various communication systems.*
- *At the end of the course, the student will be equipped with the ability to analyse and design a communication system.*

Module I (15 hours)

Introduction: Communication principles – block diagram of modem communication system – study of electromagnetic spectrum - use of different spectra for different applications **Modulation methods:** Need for modulation – amplitude and modulations (FM and PM) – mathematical equations – spectra – side bands – bandwidth – power relations – modulation index- phase diagram – comparison of AM, FM, PM. Sampling theorem – analog pulse modulations- PAM and PTM (PPM, PDM or PWM) – digital pulse or coded modulations – PCM, properties like spectra , waveform, BW and SNR. CW modulation for digital signals – ASK, FSK, PSK – multiplexing systems for pulsed and CW modulations – TDM and FDM – comparison of textures and merits

Module II (13 hours)

Modulators: Generation of AM waves – linear modulations, collector, base emitter modulation. Square law modulations – diode and balanced modulators – suppression of carrier. Generation of FM waves – Reactance modulator method – Armstrong method – conversion of FM to PM and PM to FM waves. Generation of PAM, PPM, and PWM waves- conversion of PWM wave to PPM wave

Module III (13 hours)

Demodulation methods / Detectors: Demodulation of AM waves – Linear detectors – synchronous and envelope detectors – performance comparison – Demodulation of FM waves – slope detector – balanced slope detector – Foster – Seely discriminator
– Ratio detector – demodulation of PAM, PPM, PWM, PCM & PDM – errors

Module IV (11 hours)

Communication systems: Transmitters and receivers – class RF amplifier – class B push pull linear amplifier – lowlevel and high level modulation systems – their comparison – AM transmitter – FM transmitter – Direct and asynchronous transmitter – straight receiver – superheterodyne AM receiver – communication receiver – diversity reception – FM receivers

Text Books

1. Deshponde.N.D etal., *Communication Electronics* , TMH.
2. Kennedy Davis, *Electronic Communication systems*, TMH

Reference Books

1. Roddy D and Coolen .J, *Electronic Communications*, PHI
2. Anokh Singh, *Principles of Communication Engineering*, S. Chand & co

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

IT09 405: DATA MODELLING & DESIGN

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

Objectives

- *Notations introduced in Object Oriented design is powerful enough to be used as a notation for expressing a software design. The Unified Modelling Language is a combination of several earlier notations and is being promoted as a universal standard for object-oriented design.*

Module I (16 hours)
Object Oriented Programming Languages – Over view of Java – Object oriented programming – Data types, variables and Arrays – operators – control statements – classes – methods – inheritance – packages and interfaces – exception handling – multithreaded programming

Module II (14 hours)
UML – Overview of the UML – Architecture – Structural model – classes – attributes – and operations – Relationships – Diagrams – Class diagrams - Interfaces , types, roles – packages – instances – object diagrams

Module III (12 hours)
Behavioural modeling – interactions – use cases – use case diagrams – interaction diagrams, activity diagrams – Events and signals – State machine

Module IV (10 hours)
Architectural modeling – components – deployments – collaborations – component diagrams - deployment diagrams – systems and models

Text Books

1. Herbert Schildt,*The Complete Reference Java*, McGraw Hill
2. Booch G., Rumbaugh J. & Jacobsons I, *The Unified Modeling Language User Guide*, Addison Wesley

Reference Books

1. Page Jones M, *Fundamentals of Object- Oriented Design in UML*, Addison Wesley
3. Bahrami A, *The Unified Modeling Language User Guide*, McGraw Hill
4. Rumbaugh J., Jacobson I. & Booch G, *The Unified Modeling Language Reference Manual*, Addison Wesley
5. Larman C., Applying UML & Patterns, *An Introduction to Object-Oriented Analysis & Design*, Addison Wesley
6. Pooley R. & Stevens P., Using UML, *Software Engineering With Objects & Components*,

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

IT09 406: Microprocessor Based Design

(Common with CS09 406)

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. 1/ O interface- Port address decoding - PPI, 8279 interface - 8254 timer interface -165 50 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

IT09 407(P): Data Structure Lab

(Common with CS09 407(P))

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 Algorithms
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%- Tests
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

IT09 408 (P) PROGRAMMING ENVIRONMENTS LAB

3 hours practical per week

Teaching scheme **Credits:** 2

3 hours practical per week

Objectives

- *To teach the relevance and characteristics of different programming environments.*
- *To introduce the tools used for program development, maintenance, debugging etc.*

- Familiarization with features of an editor (for example Vi, Emacs)
- Shell programming, usage of tools like grep, awk etc
- Usage of Program development & maintenance tools (for example “make”)
- Usage of debugging tools (for example “gdb”)
- Familiarization with scripting languages (for example Perl, Tcl/Tk)
- Usage of lexical processing tools (for example Lex)
- Introduction to document formats (for example HTML, PDF). Scripting and generation of dynamic pages. Scripting languages and interaction
- Introduction to the tools providing GUI based human computer interaction (for example Qt.). Automatic generation of code for interaction using visual programming (for example Qt Designer)
- Introduction to tools for preparing documents (for example Word/Latex)

Reference Books

1. Behrouz Forouzan, *Unix and Shell Programming*, Tata McGraw Hill.
2. Martin C Brown, *The Complete Reference Perl, II edition*, Tata McGraw Hill.
3. F. Mittelbach, M. Goossens, J. Braams, D. Carlisle, C. Rowley, *The LaTeX Companion, 2nd Edition*, Addison-Wesley Professional.

Internal Continuous Assessment *(Maximum Marks-50)*

60%-Laboratory practical and record
30%- Tests
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

IT09 501: Software Architecture and Project Management

(Common with CS09 501)

Teaching scheme **Credits:** 5

4 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 (16 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 (16 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 (16 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 (17hours)

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 homework, 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

IT09 502: Industrial Economics and Principles of Management

(Comman for CSand 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 (10 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 (9 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.

Section B: Principles of Management

Objectives

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

Module III (10 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 (10 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.

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.
3. Venkata Ratnam C. S. & Srivastva B.K., *Personnel Management and Human Resources*, Tata McGraw Hill.
4. F. Mazda, *Engineering Management*, Addison Wesley Longman Ltd., 1998.
5. P. Kotler, *Marketing Management: Analysis, Planning, Implementation and Control*, Prentice Hall, NewJersey, 2001.
6. Prasanna Chandra, *Financial Management: Theory and Practice*, Tata McGraw Hill.

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.
4. Lucy C Morse and Daniel L Bobcock, *Managing engineering and technology*, Pearson Prentice Hall.
5. O.P. Khanna, *Industrial Engineering and Management*, Dhanpat Rai and Sons, Delhi, 2003.
6. Bhattacharya A.K., *Principles and Practice of Cost Accounting*, Wheeler Publishing.
7. Weist and Levy, *A Management guide to PERT and CPM*, Prentice Hall of India.
8. Koontz H, O'Donnel C & Weihrich H, *Essentials of Management*, McGraw Hill
9. 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 homework, 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

IT09 503: Embedded Systems

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives

- *Objective of the course is to teach students about architecture, hardware and software elements, programming models and practice and tools on embedded system design and implementation, common to computing streams.*
- *Thrust is on the available hardware and real time operating systems for the embedded systems design. Project works in the concerned field will supplement the learning process.*

Module - I: (10 hours)

Introduction:

Definition - Classification - Processors in the system - Other h/w units. Software components - Typical applications - Embedded systems on a chip (SoC) and use of VLSI circuits.

Module - II: (12 hours)

Hardware organization: Structured units of a processor - Processor selection factors

Common memory devices - Memory selection - Memory map - Internal devices & I/O devices map - Direct memory access - Interfacing the above.

Types of I/O devices - Serial devices - Parallel port devices - Sophisticated features - Timer and Counting devices - Advanced serial bus & I/O - High speed Buses - Common types - Advanced Buses.

Module - III: (15 hours)

Programming:

Compiling, cross-compiling - Optimized use of memory - Use of DFG for program analysis - Control Data Flow graph - Use of finite state machines model - Use of Petrinet models - Use of Petri table for Real time programming - Issues in multiprocessor systems.

Real time programming issues during software development process - Distinction between functions, ISR and tasks - Problems of sharing data in RTOS - Interprocess communication in RTOS.

Device drivers - Parallel port driver - Driver for internal programmable timing devices - Interrupt servicing mechanism - Context and periods for context switching - Deadline and Interrupt latency.

Module - IV: (15 hours)

Real Time Operating Systems:

Typical OS structure - RTOS structure - The context of its use - Schedule management for multiple tasks - Scheduling in real time - Interrupt routines in RTOS environment - RTOS task scheduling models - List of basic actions in pre-emptive scheduler and expected time taken - Strategy for synchronization - Discussion using Linux - OS securities issues - Mobile OS.

Case study of RTOS using MUCOS.

Case study for RTOS based programming - Coding for Automatic Chocolate vending machine using MUCOS.

Text Books

1. Raj Kamal, Embedded systems - architecture, programming and design, Tata McGraw-Hill

Reference Books

1. J.B. Peatman, *Design with Microcontrollers and Microcomputers*, McGraw-hill
2. David E. Simon, *An embedded software primer,* Pearson Education Asia
3. Daniel W. Lewis, *Fundamentals of Embedded Software where C and assembly meet*, Pearson Education Asia.

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

IT09 504: Operating Systems

(Common with CS09 504)

Teaching scheme **Credits:** 4

3 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 (13 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 (13 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 (13 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 (13 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 McGraw-Hill
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 homework, 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

IT09 505: Digital Data Communication

(Common with CS09 505)

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 propagation 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 homework, 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

IT09 506: Theory of Computation

(Common with CS09 506)

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 homework, 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

IT09 507(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.*

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)

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

Internal Continuous Assessment *(Maximum Marks-50)*

60%-Laboratory practical and record
30%- Tests
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

IT09 508(P) Hardware Lab

(Common with CS09 508(P))

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%- Tests
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

IT09 601: SOFTWARE QUALITY MANAGEMENT

Teaching scheme **Credits:** 5

4 hours lecture and 1 hour tutorial per week

Objectives

- *This course explains the role of standards and measurements used in accessing software quality.*
- *It helps students to learn how to test a system and find the system defects and inconsistencies.*

Module I (18 hours)

INTRODUCTION: Software Process assessment overview - Quality management - Quality assurance plan - Considerations - Verification and Validation - Concepts of Quality Control, Quality Assurance, Quality Management - Total Quality Management; Cost of Quality; QC tools - 7 QC Tools and Modern Tools; Other related topics - Business Process Re-engineering - Zero Defect, Six Sigma, Quality Function Deployment, Benchmarking, Statistical process control.

Module II (16 hours)

CONFIGURATION MANAGEMENT: The need for configuration Management - Software product nomenclature - Basic configuration management functions - Baselines - Responsibilities - Need for automated tools - Configuration management plan – SCM support functions - The requirement phase Design control - The implementation phase - Test phase - SCM for Tools - Configuration accounting and audit.

Module III (16 hours)

SOFTWARE STANDARDS AND INSPECTION: Definitions - The Reason for software standards - Benefits of standards - Establishing standards - Guidelines – Types of reviews - Inspection of objectives - Basic inspection principles - The conduct of inspection - Inspection training Models for Quality Assurance-ISO-9000 - Series, CMM, SPICE, Malcolm Baldrige Award – quality management models.

Module IV (15 hours)

TESTING AND MANAGING SOFTWARE QUALITY: Testing principles – Types of tests - Test planning - Test development - Test execution and reporting - Test tools and methods - Real Time testing - quality management paradigm - Quality motivation - Measurement criteria - Establishing a software quality program - Estimating software quality.

DEFECT PREVENTION: Principles of software defect prevention - Process changes for defect prevention - Defect prevention considerations - Managements role - Framework for software process change - Managing resistance to software process change - Case studies

Text Books

1. Watts S. Humphrey, *Introduction to the Team Software Process,* Addison Wesley, 2000
2. Watts S. Humphrey, *Introduction to the Personal Software Process,* Addison Wesley, 2000
3. Watts S. Humphrey, *Managing the Software Process,* Addison-Wesley, 1999
4. Stephen H.Kan, *Metrics and models in software quality engineering,* 2nd Edition, Addison Weslev, 2003

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as homework, 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

IT09 602: Compiler Design

(Common with CS09 602)

Teaching scheme **Credits:** 4

3 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 (13 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 (13 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 (13 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 (13 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

IT09 603: Computer Networks

(Common with CS09 603)

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 is 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 homework, 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

IT09 604: Database Management Systems

(Common with CS09 604)

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives

- *To introduce the basic concepts of databases connected with software engineering techniques and background information useful for the management of databases.*
- *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 homework, 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

IT09 605: Human Computer Interaction

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

Objectives

- *The course aims at how to take into account the human and contextual part of a system, which is important in creating popular applications.*
- *Human Computer Interaction teaches the right interaction and its implementation in fields like applied psychology, industrial engineering ergonomics.*
- *Objective of the course is to introduce the well-developed models based on the cognitive and social constraints for a new IT application.*

Module I (9 hours)
Introduction to model human processor – Input-output channel – Human memory – Thinking – Emotion – difference between individuals – Psychology and the design of interactive systems, Typical Computer – Text entry devices – Positioning: pointing and drawing – Display devices – Devices for virtual reality & 3D interaction – Physical controls, Sensors & Special devices – Printing & scanning – Memory – Processing & networks. Introduction to interaction – Model- frameworks & HCI – Ergonomics – interactive styles elements of WIMP interface – interaction & its context: Experience, and engagement – Paradigms for interaction.

Module II (11 hours)
Design Process
Introduction to interaction design – Process of design – User focus – Scenarios – Navigational design – Screen design & layout – Prototyping. HCI software, process – Usability engineering. Software prototyping & techniques. Principles to support usability Standards – Golden rules sample – Rule learning from HCI patterns – Implementation – elements of windowing systems Programming: - Using toolkits User interface management systems. Evaluation - Expert analysis – evaluate through user participation – Choosing –an evaluation method. Universal design principles – Multi-modal interaction – Design for diversity – Approaches to user support – Adaptive help systems.

Module III (10 hours)
Models & theories:
Cognitive models – Linguistic model – Physical & device model – socio-organizational issues – communication and collaboration model Uses of task analysis. Dialog notation & design – Diagrammatic notation – Textual dialog notation – Dialog analysis and design.

Module IV (9 hours)
Group Ware systems – computer mediated communication – Meeting & discussion support systems – shared applications and artifacts. Framework for Group Ware. Ubiquitous computing &realities – Ubiquitous computing applications research – virtual and augmented reality – Information and data visualization.

Text Books

1. Alan Dix Janet Finlay, Gregory D Abowd, Russell Beale Human , *Computer Interaction*; 3rd edition, Pearson Education Asia.

Reference Books

1. John M Carroll Hutran, *Computer Interaction in the New Millennium*, Pearson Education Asia
2. Ben Shneinderman, *Designing the User Interface: Strategies for Effective Human computer* Interaction, 3rd edition, Pearson Education Asia

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as homework, 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

IT09 607(P) : DATABASE MANAGEMENT LAB

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

Objectives

- *To teach data base technology and familiarize them with issues related to data base design through hands on practice.*
- *To be able to design new and modify databases, write queries and execute them.*

1 Database Customization

2 Creating Databases / Table spaces

3 Creating Objects

4 Moving Data

5 Recovery

6 Locking

7 Preparing Applications for Execution using a front end tool
Application Performance Tool.

Reference Books
1.Elmasri, Navathe, *Fundamentals of Database Systems*, Addison Wesley.
2.Ramakrishnan R., Gehrke J., *Database Management Systems*, McGraw Hill

Internal Continuous Assessment *(Maximum Marks-50)*

60%-Laboratory practical and record
30%- Tests
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

IT09 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 specialized in Information Technology or 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

Sem-endester Examination *(Maximum Marks-50)*

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

IT09 701: Computer Graphics

Teaching scheme **Credits:** 5

4 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, conics and curves.*

Module I (17 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 (15 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 (15 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 (18 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 homework, 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

IT09 702 Natural Language Processing And Knowledge Based Systems

Teaching scheme **Credits:** 3

2 hours lecture and 1 hour tutorial per week

Objectives

- *The course is intended to impart the use of computers to process written and spoken language for the practical and useful purposes: to translate languages, to get information from the web on text data .The course also gives a sound idea on knowledge based systems.*

Module I (10 hours)

Introduction: Issues and difficulties in NLP – Evaluating Language understanding Systems – The different levels of language representations – Organization of NLP Systems – Types of NLP Systems.

Module II (10 hours)

Grammars and Parsing: Grammars and sentence structures – Top down parser –Bottom up chart parser – Top down chart parsing – Augmented grammars – A simple Grammar with features – Parsing with features – Augmented Transition Networks (ATN)– Efficient parsers – Shift reduce parsers – deterministic parsers.

Module III (10 hours)

Knowledge Based System: Introduction - Definition-Architecture – Knowledge Representation and Formal Logic: Knowledge components –Levels of representation –Knowledge representation schemes –formal logic – Knowledge engineering and Inference – Process – Semantic networks-frames – Scripts – Production systems.

Module IV (9 hours)

Problem Solving Strategies: Exhaustive search – Large search spaces – Planning –Least commitment – Principle and constraint propagation- Classification and black board Models.

Text Books

1. Ralston, D.W., Principles of Artificial and Expert Systems Development, McGraw Hill Book Company International
2. James Allen, Natural Language Understanding, Pearson Education Inc., 2003

Reference Books

1. A. Gonzalez and D. Dankel, The Engineering of Knowledge-Based Systems Second Edition, Prentice Hall, 2004.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as homework, 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

IT09 703: Internet Technology

Teaching scheme **Credits:** 3

2 hours lecture and 1 hour tutorial per week

Objectives

- *This course demonstrates an in-depth understanding of the tools and Web technologies necessary for application design and development.*
- *The course covers client side scripting like HTML, JavaScript and introduces XML technologies.*

Module I (9 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 (8 hours)

Web Pages-Static Web page: Types and Issues, tiers, comparisons of Microsoft and java technologies, HTML- different tags, sections, image & pictures, listings, tables, frame, frameset, form. Dynamic Web Pages: The need of dynamic web pages; an overview of DHTML, cascading style sheet (css), comparative studies of different technologies of dynamic page creation. Active Web Pages: Need of active web pages; java applet life cycle.

Module III (12 hours)

Java Script : Data types, variables, operators, conditional statements, array object, date object, string object.

Java Servlet : Servlet environment and role, HTML support, Servlet API, The servlet life cycle, Cookies and Sessions. **JSP** :JSP architecture, JSP servers, JSP tags, understanding the layout in JSP, Declaring variables, methods in JSP, inserting java expression in JSP, processing request from user and generating dynamic response for the user, inserting applets and java beans into JSP, using include and forward action, comparing JSP and CGI program, comparing JSP and ASP program; Creating ODBC data source name, introduction to JDBC, prepared statement and callable statement.**J2EE**:An overview of J2EE web services, basics of Enterprise Java Beans, EJB vs. Java Beans, basics of RMI,JNI.

Module IV (10 hours)

Introduction to Web Technology-XML Technologies-HTML and Web Pages, XML Documents, Navigating XML Trees with XPATH, Schema Languages-DTD,XML Schema, Transforming XML Documents with XSLT,XML Programming using DOM API.

Text Books

1. Kurose J.F. & Ross K.W, *Computer Networking: A Top -Down Approach Featuring the Internet*, Pearson Education
2. Godbole A. S. & Kahate A, *Web Technologies,* Tata McGraw Hill.
3. Xavier C,*Web technology & Design*,New Age Publication.
4. Java Server Programming, J2EE edition. (VOL I and VOL II), WROX publishers.
5. Dr Anders Moller,Dr Michael Schwartzbach, *An introduction to XML and Web Technologies*, Addison Wesley.

Reference Books

1. Douglas E. Comer, *Computer Networks and Internets with Internet Applications*, Pearson Education
2. Stallings, *Computer Networking with Internet Protocols*, Pearson Education Asia.
3. Goncalves M., *Firewalls: A Complete Guide*, Tata McGraw Hill.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as homework, 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

IT09 704: Cryptography and Network Security

(Common with CS09 704)

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 (15 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 (14 hours)

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

Module III (14 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 (9 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 homework, 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

IT09 707 (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

Semester End Examination *(Maximum Marks-50)*

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

IT09 708(P) Computer Graphics And Multimedia Lab

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

Objectives

- *To implement the algorithms for drawing 2D and 3D object generation and object transformation.*
- *It also aims at familiarization of basic multimedia tools.*

LIST OF EXPERIMENTS

Lab 1: Basic raster drawing algorithms implementations (lines, circle, ellipse, polygons etc.)

Lab 2: Implementation of algorithms for 2D/3D object generation, transformations

Lab 3: Generate a 3D object, say a cube, and try to implement the following using any standard graphic library set (for example OpenGL library) on a selected OS

1. Viewing transformations
2. Modeling transformations
3. Projection transformations
4. Drawing a scene (2D picture of 3D space or a shot by camera) involving object

Lab 4: Generate a 3D object, say a sphere, based on surfaces or polygonal faces or wireframe approach and render it defining a material, light source and lighting model properties using any standard graphic library set (for example OpenGL library) on a selected OS

Lab 5: Model a scene containing several 3D objects, say table top having several objects - each object may be modeled as given in above experiment - also render the scene with hidden surfaces in mind - rendering considering a light source may also be practiced - this again is using standard graphic library set on a selected OS

Lab 6: Use source code of any freely available sound recording, encoding / decoding software - encoding / decoding portions may be removed before actual experimentation - study any three audio formats to learn about (a) file size (b) popularity (c) quality of audio reproduced. Do the following in a chosen OS

1. Record sound for 10 secs
2. Convert from one format to other
3. Playback both the formats and analyze the results

Lab 7: Study any 5 popular still image formats (JPEG, BMP included) - do the following in a chosen OS

1. Take a snap of face of a person using digital camera or a webcam
2. Use any photo editing tools (say, Adobe Photoshop) to get desired size, desired resolution photo (both color and black and white may be generated). Paint touching may also be practiced
3. Create the image of a decorated greeting card or an identity card using image creation tools and insert the photo and print it. Verify for color matching and size of the image

Lab 8: Use a MPEG decoder source code freely available from internet and do the following in a chosen OS

1. Play MPEG video
2. Modify the source code so that play can be done frame by frame

Lab 9: Use any web animation-authoring tool; say macromedia flash, on a chosen OS to create simple animations

Lab 10: Learn to use server and client software for streaming media - pick any freely available software on a chosen OS - create a web page with multimedia content and providing interaction in some form to a user

Reference Books

1. Foley J.D., Dam A.V., Feiner S.K. & Hughes J, *Computer Graphics: Principles and Practice*, Addison Wesley
2. Stevens R.T, *Graphics Programming In C*, BPB Publications
3. Stevens R.T. & Watkins C.D, *Advanced Graphics Programming in C & C++*, BPB Publications.
4. OpenGL Architecture Review Board, *OpenGL Programming Guide*, Pearson Education Asia
5. OpenGL Architecture Review Board, *OpenGL Reference Manual*, Pearson Education Asia
6. Addele Droblas Greenberg & Seith Greenberg, *Fundamental Photoshop*, McGraw Hill
7. Linda Richards, *Web Graphics for Dummies*, IDG Books

Internal Continuous Assessment *(Maximum Marks-50)*

60%-Laboratory practical and record
30%- Tests
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

IT09 709 (P): Project

Teaching scheme **Credits:** 1
1 hour 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 Information Technology 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 specialized in biomedical/electronics/ information technology/ computer science/instrumentation engg. (Please write areas of specializations 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 are 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

IT09 801 Mobile Communication Systems

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

Objectives

- *This course is an introduction to the field of mobile communications and focuses on the aspects of digital data transfer in wireless and mobile environments. The students require a basic understanding of communication and a rough knowledge of the Internet or networking in general.*

Module I (18 hours)
Antennas and Propagation: Antennas, Propagation models, Line-of-sight communications, Fading in the mobile environment - Signal Encoding Techniques: Digital data and Analog signals, Analog data and Analog signals, Analog data digital signals, Modulation techniques - Spread Spectrum: Concept, Frequency hopping, Direct Sequence, CDMA – Coding and Error Control. Satellite Communications: Parameters, FDM, TDM, GEO139, LEO 139, MEO 140, Routing, Localization – Cellular Networks: Principles, First generation Analog, Second Generation TDMA, Second generation CDMA, Third generation systems.

Module II (14 hours)
Telecommunication Systems: GSM, Architecture, Radio Interface, Protocols, Handover, Security – Cordless systems and WLL: IEEE 802.16, DECT – TETRA - UMTS and MIT 2000.

Module III (15 hours)
Wireless LAN technology: Over view, Infrared LANs, Spread spectrum LANs, Narrow band microwave LANs – 802.11 protocol: Architecture, Services, Medium access control, Physical layer – Bluetooth technology: Overview, Radio Specification, Baseband Specification, Link Manager Specification, Logical Link Control and Adaptation Protocol.

Module IV (18 hours)
Mobile IP: Goals, Assumptions, requirements, IP packet delivery, Agent advertisement and discovery, registration, Tunneling and encapsulation, Optimization, Reverse tunneling, IPv6, Dynamic host configuration protocol – Ad hoc networking: Routing, destination sequence distance vector, dynamic source routing, hierarchical routing, Alternative metrics – Mobile TCP: Traditional TCP, Indirect TCP, Snooping TCP, Fast retransmit, selective retransmission, Transaction oriented TCP – WAP: Architecture, Protocol description.

Text Books

1. Schiller J., *Mobile Communications*, Addison Wesley

Reference Books

1. W. Stallings, *Wireless Communications and Networks*, Prentice Hall, 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)* 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

IT09 802 High Speed Networks

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

Objectives

- *This course covers all aspects of high-speed networking and their impact on the overall network performances.*

Module I (9 hours)
High speed lans: fast ethernet, switched fast ethernet –Fddi, sonet / sdh: frame structure, architecture layers, pay Loads – frame relay: protocols and services, congestion Control.

Module II (9 hours)
ISDN: Overview, Standards, Interfaces and functions, ISDN Layers: Physical, Data link, Network, - Services – BISDN Architecture and Protocols.

Module III (11 hours)
ATM Networks: Protocol Architecture, ATM Layer, Cell Structure, Cell header, ATM Adaptation Layer, Various types, Segmentation and Reassembly, Convergence sub-layers ATM Traffic and Congestion Control: Service categories, Traffic related attributes, Traffic management framework, Traffic management, ABR traffic management, Signaling, Protocol signaling, Meta signaling, TCP/IP over ATM.

Module IV (10 hours)
Optical Networks: Wavelength Division Multiplexing, Optical Networking evolution, Network Architectures, Enabling Technologies, Various issues in Wavelength Routed Networks, Optical Circuit switching, IP over ATM over SONET over WDM, IP over SONET over WDM, IP over WDM – Various Models.

Text Books

1. William Stallings, *ISDN and broadband ISDN with Frame Relay and AT',* Fourth edition, Pearson Education 2000
2. Rainer Handel, Manfred N. Huber, and Stefan Schroder, *ATM Networks –Concepts, Protocols, Applications*, Second edtion, Addison Wesley, 1994

Reference Books

1. C.Siva Ram Murthy and G. Mohan, *WDM optical Networks – Concepts,Design,and Algorithms*, Printice Hall India, 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

IT09 805 (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 information technology 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

IT09 806(P) : Project

Teaching scheme **Credits:** 7
11 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 specialized 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

IT09 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

ELECTIVES

IT09 L01 : DIGITAL SIGNAL PROCESSING

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

Objectives

- *Current communication technology is based on digital signal processing. Here the fundamental principles of various transforms and the tools used in analysis and design of discrete-time systems for signal processing are introduced.*

Module I(12 hours)
Discrete time signals and systems - discrete signal sequences - linear shift invariant systems - discrete signals - stability and casualty - difference equations - frequency domain representations - fourier transform and its properties - relationship between system representations, review of Z-transforms

Module II (15 hours)
Discrete Fourier transform - representation of discrete Fourier series - properties of discrete Fourier series - periodic convolution - DFT - properties of DFT - computation of DFT - circular convolution - linear convolution using DFT - FFTs - DIT-FFT and DIF-FFT - FFT algorithm for composite N

Module III (13 hours)
Design of digital filters - IIR and FIR filters - low pass analog filter design - Butterworth and Chebyshev filters - design examples - bilinear transformation and impulse invariant techniques - FIR filter design - linear phase characteristics - window method

Module IV (12 hours)
Realization of digital filters - discrete form I and II - cascade and parallel form - finite word length effects in digital filters - quantizer characteristics - saturation overflow - quantization in implementing systems - zero input limit cycles - introduction to DSP processors

Text Books

Reference Books

1. Proakis & Manolalus, *Digital Signal Processing, Principles, Algorithm & Applications,*. Prentice Hall.
2. Oppenheim & Schafer, *Discrete Time Signal Processing*, Prentice Hall.
3. Ludeman L.C, *Fundamentals of Digital Signal Processing*, Harper & Row Publishers .
4. Van Valkenburg M.E, *Analog Filter Design,* Holt Saunders.
5. Terrel T.J. & Shark L.K, *Digital Signal Processing*, Macmillan

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as homework, 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

IT09 L02 : OPTIMIZATION TECHNIQUES

Teaching scheme **Credits:** 4

3 hours lecturer and 1 hour tutorial per week

Objectives

- *To introduce different methods, algorithms and solution procedures to solve optimization problems.*
- *To formulate and develop mathematical models for the solution for the real world problems in the area of Computer related applications.*

Module I (13 hours)

Overview of Operations Research - Concept of Linear Programming Model - Development of LP Models - Graphical Method - Linear Programming Methods – Duality Transportation Problem - Assignment Problem - Network Techniques

Module II (13 hours)

Integer Programming - Formulations - Cutting-plane Algorithm - Branch-and-Bound Technique - Zero-One Implicit Enumeration Technique

Module III (13 hours)

Inventory Control - Queuing Theory - Decision Theory - Game Theory

Module IV (13 hours)

Dynamic Programming - Applications of Dynamic Programming - Project Management

Text Books

1. R. Panneerselvam, *Operations Research*, Prentice Hall of India, 2002. Chapters 1 to 12.

Reference Books

1. S. Kalavathy, *Operations Research*, Vikas Publishing House Pvt.
2. S. Dharani Venkatakrishnan *Operations Research – Principles And Problems*, Keerthi Publishing House, 1992
3. Kanti Swarup, Manmohan, P.K. Gupta, *Operations Research,*. Sultan Chand & Sons,1991.

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

IT09 L03: INFORMATION THEORY & CODING

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives

- *The subject deals with the fundamentals of information quality, error control in communication process and various systems of coding information for reliable communications.*
- *Built on a sound mathematical basis, the methods developed in this field of study are essential in a study of communication systems, information technology and computing. A background in algebraic structures would prove helpful while learning this subject.*

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 (14 hours)

Introduction to algebra - groups - fields - binary field arithmetic - construction of galois field - basic properties - computations - vector spaces - matrices - BCH codes - description - decoding - reed solomon codes

Module IV (10 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. Das J., Malik S.K. & Chatterje P.K, *Principles of Digital Communication*, New Age International Limited.
2. Sam Shanmugham, Digital *and Analog Communications*, John.
3. Simon Haykin, *Digital Communications*, John.
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 homework, 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

IT09 L04: LINEAR SYSTEM ANALYSIS

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

Objectives

- *This course material includes the analysis of the behaviour of linear systems and apply modern control theories to the synthesis of dynamical systems.*
- *On completion of this course students will be able to analyse and design complex signals and systems in the time and frequency domains.*

Module I: System concepts and modeling of systems (11 hours)
Systems – sub systems – elements – systems approach – classification of systems – static and dynamic systems – sub systems – linear and non linear systems – distributed and lumped systems – time invariant and time varying systems – stochastic – deterministic systems – system modeling and approximations – super position principle – homogeneity and additivity – modeling of electrical systems – active and passive elements – resistance inductance and capacitance – dynamic equations using Kirchhoff's current and voltage laws – RL, RC and RLC circuits and their dynamic equations – block diagrams and signal flow graph – masons gain formula.

Module II: Modeling of non electrical systems (11 hours)
Modeling of translation and rotational mechanical systems – differential equations for mass spring dashpot elements, D'alembert's principle – rotational inertia – stiffness and bearing friction – gear trains – equivalent inertia and friction referred to primary and secondary shafts – dynamic equations for typical mechanical systems – electro mechanical analogues - force – current and force – voltage analogue – capacitance and resistance of thermal, hydraulic pneumatic systems – dynamic equations for simple systems – comparison of electrical, electromechanical, hydraulic and pneumatic systems.

Module III: Transfer function and time domain analysis (15 hours)
Use of laplace transforms – concept of transfer function – impulse response – convolution integral – response to arbitrary inputs – transfer function of typical systems discussed in module I – time domain analysis – test inputs – step - velocity and tramp inputs – transient and steady state response – first and second order – under damped and over damped responses – maximum overshoot – settling time- rise time and time constant – higher order systems – steady state error – error constants and error different types of inputs – Fourier series expansion of periodic functions – symmetric conditions – exponential form of Fourier series – Fourier integrals and Fourier transform – spectral properties of signals – analysis by Fourier methods.

Module IV: State space analysis and stability of systems (15 hours)
Concept of state – state space and state variables – advantage over transfer function approach – state equations for typical electrical and mechanical and electro mechanical systems – representation for linear time varying and time variant systems – solution of state equation for typical test inputs – zero sate and zero input response – concept of stability – bounded input bounded output stability – Lyapunov's definition of stability – symptitic stability – Stability in the sense of Lyapunov – Routh Hurwitz criterion of stability for Single Input Single Output linear systems described by transfer function model.

Reference Books

1. Cheng D K, *Linear System Analysis* Addison Wesley.
2. Tripati J N, *Linear System Analysis*, New Age International.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as homework, 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

IT09 L05: INFORMATION RETRIEVAL

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

Objectives

- *In the current scenario of information explosion, tools and techniques for deriving the right information at the right time will give a competitive edge to an organization. This paper examines this aspect in detail in the context of the World Wide Web. It covers many forms of information, such as text, image, audio and video formats, and presents several research issues related to different IR tasks.*

Module I (12 hours)
Introduction: Information versus Data Retrieval, IR: Past, present, and future. Basic concepts: The retrieval process, logical view of documents. Modeling: 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 Books

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. C.D. Manning and H. Schutze, *Foundations of Statistical natural Language Processing (Chapters 13, 14, and 15 only)*, The MIT Press, Cambridge, London.2001
3. David Hand, Heikki Mannila, Padhraic Smyth, *Data Mining*, 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

IT09 L06: REAL TIME COMPUTER CONTROL SYSTEMS

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives

- *The emphasis of the course will be primarily on abstract models of timed computation and the analysis of scheduling algorithms.*
- *The aim of the course is to bring students up to a point that they understand the motivation, theoretical background, and some of the work that has been done in the field of real-time systems.*

Module I (14 hours)

Architectures for Computer Control Systems: Centralized Architecture, Distributed Computer control architecture, Data highway system, Foreseable future trends, Digital control algorithms: Introduction computer control, self tuning and adaptive algorithms Supervisory control systems: Introduction, Multilayer hierarchical Structures, System decomposition, Open- loop coordination strategies, Model reality differences, Closed - loop coordination strategies, integrated system optimization and parameter estimation (ISOPE), Double iterative strategies, Illustrative example.

Module II (13 hours)

Construction of software for real-time computer control systems: Introduction, Problems of real-time software construction, Design techniques and tools, MASCOT, Structured Development of real- time systems. Dependability, Fault detection and fault tolerance: Use of redundancy, Fault tolerance in mixed hardware- software systems, Fault detection measures, Fault detection mechanisms, Damage containment and assessment, Provision of fault tolerance.

Module III (12 hours)

Languages for real-time control: Basic requirements, Software components, Creation and management of tasks, Interrupts and device handling, Communication between software components, Mutual exclusion, Exception handling.

Module IV (13 hours)

Expert systems in real-time control: Knowledge based process management, Representation of knowledge, Reasoning in real-time, Applications of knowledge based systems for process management. Real-time operating systems: Real-time multitasking operating systems, Task management, task scheduling and dispatch, Task co-operation and communication, Producer consumer problem. Distributed processing: Distributed data, Distributed control.

Reference Books

1. S.S. Lamba & Y.P.Singh, Distributed Computer Control Systems,
2. Sylvia Goldsmith, *Real-time Systmes Development*, Prentice Hall, 1993
3. Ian Pyle, Peter Hruschka, etal, *Peter Hruschka, etal , Real-Time System*, Wiley Series, 1993

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

IT09 L07: 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 optimisation 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 behaviour of programs based on soft computing.*

Module I (13 hours)
Fuzzy systems: Crisp sets – Fuzzy sets – Operation and properties. Fuzzy relations – Equivalence and tolerance relations. Fuzzy membership function- types and definitions. Membership value assignments – Rule based systems. Type of fuzzy inference. Structure and parameters of a Fuzzy system- computer assignment.

Module II (13 hours)
Neural Networks: Biological inspiration – Neuron model and Network architectures perception – architecture, learning rule. Limitations of multiplayer perception- Back propagation algorithm –learning rule – computer assignments.

Module III (13 hours)
Genetic Algorithm: Goals of optimization – Introduction to GA – terminologies. Simple GAData structure. Genetic operation – crossover, mutation, fitness scaling, Inversion- A Multi parameter mapped fixed point coding – computer assignments.

Module IV (13 hours)
Evolutionary programming: Single and multi objective optimization-general algorithm-Binary GA, Real parameter GA, constraint handling in GA Evolution strategies general programming – computer assignments. Applications to various branches of Engineering and science- Application of fuzzy, neural, GA and EP in computer science, electrical, communication, instrumentation and control, mechanical and civil engineering.

Text Books

1. Timothy J. Ross 'Fuzzy logic with Engineer application' McGraw Hill.

Reference Books

1. Martin T. Hagam Howard B.Deruth, Mark Beale, *Neural Network Design* International Thomson Computer Pres
2. Alexei Fedorov, *Neural Network Design,* Addison Wesley, 2002.
3. David E. Gold Berg, *Genetic Algorithm,* Pearson Education 2002.
4. Kalyanmoy Deb, *Multi objective optimization using Evolutionary Algorithm*, John Wiley and sons 2002

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as homework, 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

IT09 L08: 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 (13 hours)
Digital Image Fundamentals: digital image representation –fundamental steps involved in digital image processing – components of image processing system – image sensing and acquisition – image sampling and quantization – basic relationships between pixels – examples of fields that use digital image processing. **Image Transforms:** introduction to Fourier transform – DFT – FFT – cosine, sine, hadamard, haar, slant and KL transforms.

Module II (13 hours)
Image Enhancement: basic gray level transformations – histogram processing – enhancement using arithmetic/logic operations – basics of spatial and frequency domain filtering – smoothing spatial and frequency domain filters - sharpening spatial and frequency domain filters. **Color Image Processing:** fundamentals – color models – pseudo color image processing – color transformations – color image smoothing and sharpening – color segmentation – noise in color images.

Module III (13 hours)
Image Restoration: model of the image degradation/restoration process – noise models – restoration in the presence of noise only-spatial filtering – periodic noise reduction by frequency domain filtering – linear, position-invariant degradations – estimating the degradation function – inverse, wiener, constrained least square and geometric mean filtering – geometric transformations. **Wavelets and Multi resolution processing:** background – Multi resolution expansions – wavelet transforms in one dimension and two dimensions – fast wavelet transform – wavelet packets.

Module IV (13 hours)
Image Compression & Image Segmentation: fundamentals – image compression models – elements of information theory – error-free compression – Lossy compression – image compression standards. **Morphological Image Processing:** preliminaries – dilation and erosion – opening and closing – hit-or-miss transform – some basic morphological algorithms. **Image Segmentation** : **-** detection of discontinuities – edge linking and boundary detection – thresholding – region based segmentation. Representation and Description: representation – boundary descriptors – regional descriptors – relational descriptors.

Text Books

1. Rafael C. Gonzalez and Richard E. Woods, *Digital Image Processing*", 2nd edition, Pearson Education Pvt. Ltd, 2002.

Reference Books

1. Anil K. Jain, *Fundamentals of Digital Image Processing*, Prentice Hall of India, 2001
2. Rafael C. Gonzalez and Richard E. Woods, *Digital Image Processing*, Addison Wesley, 2000

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

IT09 L09: 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 (13 hours)
MOS DEVICES AND CIRCUITS: The MOS circuit fundamentals – Depletion and enhancement mode pull-ups – Transit times of clock period – Effects of Scaling down its dimensions of MOS circuits and systems. MOS PROCESS: Models of analyze transistor circuits – The MOS fabrication process – N MOS lambda based layout – rules(6).

Module II (12 hours)
DATA AND CONTROL FLOW IN SYSTEMATIC STRUCTURE: Notation – Two phase locks – Shift registers – Implementation – Dynamic registers – Designing subsystems – Register to register transfer – Combinational logic – sequential logic finite state machine.

Module III (12 hours)

SYSTEM LEVEL DESIGN: Design of an ALU Subsystem – Carry look ahead adders parallel multipliers – PLA – decoders – encoders – Multiplexers – Buses – Encoding and Control Operators data path chip.

Module IV (15 hours)

DESIGN SYSTEM CONCEPTS: Definitions – Steps in the design of a VLSI Part-Planning Logic design and simulation – Physical design –Placement and wiring –Development of routing algorithm – testing Design database –CAD Tools.

APPLICATION OF VLSI TO SOLVE COMPUTATION PROBLEM: Concurrency in computers-Algorithms for VLSI process array – Matrices vector multiplication – Convolution algorithm.

Text Books

1. Pucknell D.Mshraghim.k, *Basic VLSI Design,Principles and Applications*, Pretince Hall,1985.
2. Carver Meed and Lynn Conway, *Introduction to VLSI Systems*, Addison Wesley-1980 chap1-8.

Reference Books

1. Nacolm R.Haskard and Ian,C May, *Analog VLSI Design NMOS and CMOS*, Prentice Hall,1985.
2. Thomas E.Dillinger, *VLSI Engineering*, Prentice Hall,1988.

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

IT09 L10: INTELLIGENT COMPUTING

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives

- *To expose students to a variety of intelligent system applications currently being explored in the field, including agents and multi agent system, data mining and information retrieval.*
- *To introduce concepts, models, algorithms and tools for development of intelligent systems.*
- *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 computatation*

Module I (16 hours)

Introduction**:** History of AI - Intelligent agents - Nature of environments – structure of agents and its functions - problem solving agents - search strategies-solving problems by searching- Breadth-first - Depth-first - Depth-limited- Iterative deepening- Bidirectional - Informed search methods- A*- AO*- Adversarial search - Alpha-Beta Pruning.

Knowledge Representation: Knowledge-Based Agent- logic -Propositional Logic - First-Order Logic (FOL) - quantifiers - Goal-Based Agent – knowledge engineering - Frame Systems and Semantic Networks - Scripts.

Module II (12 hours)

Reasoning: Reasoning patterns in prepositional logic - Inference in First-Order Logic- Unification - Forward and Backward Chaining - Resolution - Reasoning systems - Theorem Provers - reasoning with default information - Truth Maintenance sytems.

Module III (12 hours)

Planning: Simple Planning Agent - from Problem Solving To Planning – Basic Representations For Planning - Practical Planners- Hierarchical Decomposition - Resource Constraints - Uncertainty - Probabilistic Reasoning Systems.

Module IV (12 hours)

Learning: General Model Of Learning Agents - Inductive Learning – Computational Learning Theory Learning In Neural And Belief Networks - Reinforcement Learning - Types Of Communicating Agents – robotics: Tasks, Parts, Configuration Spaces, Navigation And Motion Planning.

Text Books

1. Stuart J.Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, Pearson Education Asia, II edition, 2003.

Reference Books

1. Elaine Rich and Kevin Knight, *Artificial Intelligence*, Tata Mc Graw Hill publisher – 2nd edition
2. Dan W.Patterson, *Introduction to Artificial Intelligence and Expert Systems*, 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)* 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

IT09 L11: OPTICAL COMMUNICATION NETWORKS

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives

- *The course aims at providing the students,the fundamentals of present optical communication systems and Discusses both theoretical and applied issues of fiber optics operations.*
- *By the end of this course, students will be able to analyze and design optical networks by studying the optical network elements needed for the implementation of all optical network nodes.*

Module I (14 hours)

Introduction, First generation and second generation optical networks, Optical Layer, All- Optical Networks, Transmission Basics, Fibers and Amplifiers. Wavelength Division Multiplexing (WDM) Network Elements: Optical Line Terminals, Optical Line Amplifiers, Optical Add/drop Multiplexers. Optical Cross Connects - Enabling Technologies - WDM Optical Network Architectures: Broadcast and Select Networks, Wavelength Routed Networks – MAC protocols for Broadcast and select networks.

Module II (14 hours)

Wavelength routing algorithms: Classification, RWA algorithms, Fairness and Admission control, Distributed Protocols – Wavelength Convertible Networks: Need and Structure, Routing in Convertible Networks – Rerouting Algorithms: Benefits, Issues, Light path Migration, Rerouting Schemes, AG and MWPG methods.

Virtual Topology Design: Sub-problems, Problem formulation, Design Heuristics, Regular Topology Design, Graph coloring – Virtual topology reconfiguration: Need, Reconfiguration due to traffic changes.

Module III (12 hours)

Control and Management: Network Management Functions, Optical Layer Services, Layers, Fault Management, Configuration Management, Connection Management – Network Survivability: Basic concepts, Protection in SONET and IP Networks, Optical Layer Protection Schemes, Multiplexing Techniques, Provisioning.

Module IV (12 hours)

Optical Internets: Optical Circuit Switching, Burst Switching, Packet Switching, Access Networks: FTTC, Optical Multicast Routing: Node Architecture, Source based and Steiner Tree based Multicast tree generation.

Text Books

1. Rajiv Ramaswami and Kumar N. Sivarajan, *Networks – A Practical Perspective*, Morgan Kauffmann Publishers, 2002.
2. C. Siva Ram Murthy and G. Mohan, *WDM Optical Networks – Concepts, Design, and Algorithms*, Printice Hall India, 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)* 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

IT09 L12: FAULT TOLERANT SYSTEMS

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

Objectives

- *To equip the students the knowledge of concepts and terminologies of fault tolerant systems, system design including: Reliability, Dependability, Error Detection, Error Recovery Fault Treatment and Redundancy Management.*
- *Thos course addresses design, modeling, analysis and integration of hardware and software to achieve dependable computing system employing on-line fault tolerance*

Module I (13 hours)
Introduction: Fault Prevention -Fault tolerance – anticipated and unanticipated Faults- Test generation for digital systems- Combinational logic. Network Boolean difference method test generation for sequential circuits- fault simulation.

Module II (15 hours)
Error Model : General coding scheme – Parity checking code- arithmetic code – code for computer memories –checking errors in logical operation – communication coding.
Fault Tolerance: Coding technique-fault tolerant self checking and fail safe circuits-fault tolerant in combinatorial and sequential circuits- synchronous and asynchronous fail safe circuits.

Module III (12 hours)
Architecture : Fault tolerant computers - general purpose commercial systems-fault tolerant multiprocessor and VLSI based communication architecture.

Module IV (12 hours)
Fault Tolerant Software: Design-N-version programming recovery block - acceptance tests-fault trees-validation of fault tolerant systems.

Text Books

1. K.K.Pradhan, *Fault Tolerant computing theory and techniques volume III*, Prentice Hall, 2001.
2. Anderson and Lee, *Fault Tolerant principles and practice*, PH 1989.

Reference Books

1. Parag K. Lala, "Fault Tolerant and Fault Testable, Hardware design" PHI 1985
2. LALA, " Digital systems design using PLD's ",PHI 1990
3. N. N. Biswas, "Logic Design theory", PHI 1990
4. Shem , toy Levei , Ashok K.Agarwala , "Fault Tolerant System design", Tata McGraw Hill, 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)* *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

IT09 L13: NETWORK ADMINISTRATION AND MANAGEMENT

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives

- *At the end of the course, the student will understand major functional areas of network management, remote network monitoring, web page management, security network monitoring and control.*
- *The various topics in this course material covers the extend breadth and depth of a complete network management plan for a moderate to large network enterprise.*

Module I (13 hours)

Network Management goals, organization, and functions- Network monitoring-Network control-Network management tools-network statistics measurement systems-Network management systems-Commercial network management systems-System management- Enterprise management solutions.

Module II (13 hours)

SNMPv1 Network management organization and communication function models structure of SNMP management information-stanadards-SNMPv2 system architecture protocol- protocol specification-SNMPv3 architecture.

Module III (13 hours)

Remote network monitoring concepts-Group management-RMON alarms-practical issues-ARM network management-Telecommunication network management-TMN conceptual model-architecture-Network management applications.

Module IV (13 hours)

Administering windows NT systems- startup-shutdown and server configuration-user accounts-managing process-risk and file system-backups-Network configuration-Print services-Security-
Linux Administration- Routing-Network hardware-Domains Name Systems-Sharing system files-E-mail-Network management and debugging-Security

Text Books

1. Evi Nemeth, *Linux Administration Handbook*, Prentice Hall 2002
2. Aelean Frisch, *Essential Windows NT system Administration* first edition,Jan 1998, O'Reilley & Associates Inc
3. Mani Subramanian, *Network Management, Principles and Practice,* Addison Wesley, 2000.

Reference Books

1. William Stallings, *Network Security essentials, Applications and Standards* Pearson Education Asia,2001
2. Ulyess Black, *Network management standards*, McGraw Hill 1995
3. William Stallings, *SNMP, SNMP v2, SNMP v3 and RMON1*", 2 and 3rd Edition, Pearson Education Asia 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)* *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

IT09 L14 : e-Business

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives

- *To familiarize Students with the emerging trends and technologies defining the rules of business and to examine the business to consumer, business to distribution and business to supply chain management.*

Module I (13 hours)

e-Commerce and e-Business, e-Business trends, e-Business design:– Construction, Self diagnosis, Reversing the value chain, Choosing a narrow focus. e-Business Architecture:- Importance of Application Integration, New era of Cross Functional Integrated Applications, Integrating Application Clusters into an e-Business Architecture, Aligning the e-Business Design with Application Integration.

Module II (14 hours)

Customer Relationship Management:- Need for Customer Relationship Management, Defining CRM, New CRM Architecture, Supporting Requirements of the Next- Generation CRM Infrastructure, Organizational Challenges in Implementing CRM, Next- Generation CRM Trends. Selling-Chain Management:- Definition, Business Forces & Technology forces driving the need for Selling-Chain Management, Order Acquisition Process Management, Elements of Selling-Chain Infrastructure.

Module III (12 hours)

Enterprise Resource Planning:- Definition, ERP Decision, ERP usage in the Real World, ERP Implementation, Future of ERP Application. Supply Chain management:- Definition, Basics of Internet enabled SCM, e-Supply Chain Fusion, e-Supply Chain Fusion Management Issues, e-Supply Chains in 200X.

Module IV (13 hours)

e-Procurement:- Procurement as Top Management Issue, Operating Resource Procurement, Procurement Business Problem, Next Generation Integrated Procurement Applications, Elements of Buy-Side e-Procurement Solutions, Buy-Side Applications for the Procurement Professional, Elements of Sell-Side e-Procurement Solutions.

Developing the e-Business Design:- Knowledge Building, Capability Evaluation, e- Business Design, e-Business Design in Action : The case of E*TRADE. Translating e - Business Strategy into Action.

Text Books

1. Ravi Kalakota and Marcia Robinson, *e-Business: A Roadmap for Success*, Addison-Wesley, 2000.

Reference Books

1. Amor, *E-Business (R)evolution*, Pearson Education, 2003.
2. Schiller J., *Mobile Communications*, Addison Wesley
3. Shurtey, *e-Business with Net Commerce*, Pearson Education, 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

IT09 L15 : 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 supervised learning – maximum likely hood estimation – the Bayes classifier – learning the mean of a normal density – general Bayesian learning – *non parametric technique* – 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 – creation 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, *Patterns Classification And Scene Analysis*, John Wiley
2. Gonzalez R C & Thomson M G, *Syntactic Pattern Recognition*, Addison Wesley

Reference Books

1. Fu K S, Eaglewood Cliffs N J, *Syntactic Pattern Recognition And Application*, Prentice Hall

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)

30% - Assignments (minimum 2) such as homework, 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

IT09 L16 : BIO INFORMATICS

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives

- *The course teaches the science of storing, extracting, organizing, analysing and interpreting biological data.*
- *This course will emphasise how to use the computer as a tool for Bio Medical research, which introduces Genetic science Alignment techniques and Data generating technique.*

Module I (13 hours)

Coding -Common health care language - coding techniques – coded and quasi-coded data Medical vocabulary – industry wide communication standards HL7 – unified medical language system – quality of care paradigms, risk management bioethics.

Information networks - Internet – facilities used in the internet web browsers STTP 5, HTTP, HTML, URL – European molecular biology network – national centre for bio- technology information.

Module II (12 hours)

Patient record maintenance - Electronic patient record – models or ERP – environmental services – metrics – telemedicine – community networks – telemedicine peripherals and equipment selection – anatomy of video conferencing technology.

Module III (14 hours)

Basic Genetic Science : Study of cell, nucleus, chromosomes and their components Evaluation of chromosomes, Impact of chromosomes on genes, gene study. Protein information resources - Biological data basics – primary secondary data basics – Protein pattern data basics – DNA sequences data basics - DNA analysis - Genes structure and DNA sequences – interpretation of EST structures – different approach to EST analysis.

Module IV (13 hours)

Alignment techniques - Data base searching - comparison of two sequences– identity and similarity – global and global similarity – global and local alignment- multiple sequence alignment – data basis of multiple alignment – secondary data base. Expert system - Principles of expert system – statistical decision trees – integration of decision support in clinical processors.

Text Books

1. T.K. Attwood , D.J. Parry-Smith, *Introduction to Bioinformatics*, Pearson Education, 1999.

Reference Books

1. Coiera E, *Guide to medical informatics, The internet and telemedicine, Chajsman & Hall medical*, London 1997.
2. Bernser, E.S, *Clinical decision support systems, Theory and practice*, *Springer-Verlag*, New York, 1999
3. Dan E. Krane , Michael L.Raymer, *Fundamental Concepts of Bioinformatics*, Pearson Education, 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

IT09 L17: PARALLEL ARCHITECTURE AND ALGORITHMS

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives

- *Course material gives an introduction to parallel and distributed computing that studies problem solving using a large number of inter connected processors.*
- *This teaches the various models of parallel computation and also gives knowledge about the algorithms for merging, sorting, searching and FFT.*

Module I(13 hours)

Introduction: Need of high speed computing – increase the speed of computers – history of parallel computers and recent parallel computers; solving problems in parallel – temporal parallelism – data parallelism – comparison of temporal and data parallel processing – data parallel processing with specialized processors – inter-task dependency

Module II(12 hours)

Instruction level parallel processing: pipelining of processing elements – delays in pipeline execution – difficulties in pipelining – superscalar processors – very long instruction word (VLIW) processor – commercial processors – multithreaded processors – future processor architectures.

Module III(13 hours)

Structure of Parallel Computers: A generalized structure of a parallel computer – classification of parallel computers – vector computers – a typical vector super computer – array processors – systolic array processors – shared memory parallel computers – interconnection networks – distributed shared memory parallel computers – message passing parallel computers – cluster of workstations.

Module IV(14 hours)

Analysis of parallel algorithms – merging on the CREW, EREW models and better algorithm for EREW model, sorting: a network for sorting, sorting on a linear array, sorting on CRCW, CREW, EREW models; searching a sorted sequence – searching a random sequence on SM SIMD; searching on a tree and on a mesh. Matrix operations: transposition, matrix-by-matrix multiplication, matrix-by-vector multiplication; solving systems of linear equations – fast fourier transform, discrete fourier transform; Graph theory: connectivity matrix, connected components, all-pairs shortest paths, minimum spanning tree.

Text Books

1. V. Rajaraman and C. Siva Ram Murthy, *Parallel Computers – Architecture and Programming*, PHI, 2000.
2. Selim G. Akl, *The Design and Analysis of Parallel algorithms,* PHI, 1999
3. Michael J. Quinn, *Parallel Computing – The Theory and Practice*, McGraw-Hill, INC, 1994

Reference Books

1. Michael J. Quinn, *Parallel Computing – Theory and Practice*, McGraw-Hill,INC, 1994

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as homework, 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

IT09 L18: DESIGN & ANALYSIS OF ALGORITHMS

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives

- *To introduce basic concepts and mathematical aspects of algorithms.*
- *To create analytical skills, to enable the students to design algorithms for various applications, and to analyze the algorithms.*

Module I (15 hours)

Analysis: RAM model - cost estimation based on key operations - big Oh - big omega - little Oh - little 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 - amortized weight balanced trees.

Module II (14 hours)

Design: divide and conquer - Strassen's algorithm, o(n) median finding algorithm - dynamic programming - optimal binary search trees - Floyd-Warshall algorithm - CYK algorithm - greedy - Huffman coding - Knapsack, Kruskal's and Prim's algorithms.

Module III (10 hours)

Backtracking – n-Queen’s Problem – Branch and bound – Assignment problem – Knapsack problem – Traveling salesman problem.

Module IV (13 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.

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., Hopcraft J.E. & Ullman J.D., *The Design And Analysis of Computer Algorithms*, Addison Wesley.
4. Anany Levitin, “*Introduction to the Design and Analysis of Algorithm*”, Pearson Education Asia, 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

IT09 L19: NEURAL NETWORKS & FUZZY LOGIC

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives

- *This course is intended to introduce some of the methods and techniques by means of which it is possible to incorporate human like performance in machine. At the end of this course students will be able to design and develop such systems using neural networks and fuzzy logic.*

Module I (13 hours)

Introduction to artificial neural networks - biological neurons - Mc Culloch and Pitts modals of neuron - types of activation function - network architectures - knowledge representation - learning process - error-correction learning - supervised learning - unsupervised learning - single unit mappings and the perceptron - perceptron convergence theorem (with out proof) - method of steepest descent - least mean square algorithms - adaline/medaline units - multilayer perceptrons - derivation of the back-propagation algorithm

Module II (13 hours)

Radial basis and recurrent neural networks - RBF network structure - covers theorem and the separability of patterns - RBF learning strategies - K-means and LMS algorithms - comparison of RBF and MLP networks - recurrent networks - Hopfield networks - energy function - spurious states - error performance - simulated annealing - the Boltzman machine - Boltzman learning rule - the mean field theory machine - MFT learning algorithm - applications of neural network - the XOR problem - traveling salesman problem - image compression using MLPs - character retrieval using Hopfield networks

Module III (13 hours)

Fuzzy logic - fuzzy sets - properties - operations on fuzzy sets - fuzzy relations - operations on fuzzy relations - the extension principle - fuzzy measures - membership functions - fuzzification and defuzzification methods - fuzzy controllers - Mamdani and Sugeno types - design parameters - choice of membership functions - fuzzification and defuzzification methods – applications

Module IV (13 hours)

Introduction to genetic algorithm and hybrid systems - genetic algorithms - natural evolution - properties - classification - GA features - coding - selection - reproduction - cross over and mutation operators basic GA and structure

Introduction to Hybrid systems - concept of neuro-fuzzy and neuro-genetic systems

Text books

1. 1. Simon Haykins, *Neural Network A - Comprehensive Foundation*, Macmillan College,
2. Proc, Con, Inc
   2. Zurada J.M, *Introduction to Artificial Neural Systems*, Jaico publishers.

Reference Books

1. Driankov D., Hellendoorn H. & Reinfrank M, *An Introduction to Fuzzy Control*, Narosa
2. Ross T.J, *Fuzzy Logic with Engineering Applications*, McGraw Hill.
3. Bart Kosko, *Neural Network and Fuzzy Systems*, Prentice Hall, Inc., Englewood Cliffs
4. Goldberg D.E, *Genetic Algorithms in Search Optimisation and Machine Learning*, Addison Wesley
5. Suran Goonatilake & Sukhdev Khebbal (Eds.), *Intelligent Hybrid Systems*, John Wiley

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

IT09 L20 : GRID COMPUTING

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives

- *This course introduce emerging computational and networking infrastructure.*
- *Also enable entirely new approaches to applications and problem solving.*

Module I (13 hours)

IT Infrastructure Evolution - Productivity Paradox and Information Technology - Business Value of Grid Computing - Grid Computing Technology— An Overview - Grids in Other Industries

Module II (13 hours)

Grid-Enabling Network Services - Managing Grid Environments - Grid-Enabling Software Applications - Grid Computing Adoption in Research and Industry

Module III (13 hours)

Data Grids - Desktop Supercomputing: Native Programming for Grids - Grids in Life Sciences – Desktop grids

Module IV (13 hours)

Grids in the Telecommunications Sector- Cluster Grids - HPC Grids - The Open Grid Services Architecture. Hive Computing for Transaction Processing Grids - Creating and Managing Grid Services - Application Integration.

Text Books

1. Ahmar Abbas, *Grid Computing : A Practical Guide to Technology and Applications*, Charles River Media, 2004.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as homework, 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

IT09 L21: BLUETOOTH TECHNOLOGY

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

Objectives

- *This is a course on the concepts, architecture, design, and performance evaluation of bluetooth technology. At the conclusion of this course the student will have an understanding of these principles and be capable of implementing network protocols and applications for personal pervasive systems.*

Module I (11 hours)
Basic Concepts - Origin, Blue tooth SIG, Protocol Stack, Security, applications and Profiles, Management, Test , and qualification Technology Basics. RF and IR Wireless Communication.

Module II (14 hours)

Bluetooth Module - Antennas Patterns, Gain and losses; Types of antennas: on chip antennas, Radio interface: FH, Modulation, symbol timing, power emission and control ,Performance Parameters, RF architecture, Blur RF, Base band:- Blue tooth Device address system Timing ,Physical links , Packet, structuring types and construction, channel coding and time base synchronization.

Module III (13 hours)

Link controller and management - LCP, controller states, Pico net and scattered operations, Master/Slave Role switching LC Architectural Overview, LMC-Link set up, Quality of service, LMP version, Name Represent, Test Mode.

Module IV (14 hours)

.Bluetooth host- L LC and adaptation Protocol L2cap signaling : Connections: Blue Tooth profiles; Version 1.0; Generic Profiles, Serial and Object exchange

Security Encryption and security Key generation ,security Modes and architecture , Low power Operation and QOS Management.

Text Books

1. Jennifer Brayand c.f. stuntman, *Blue tooth Connect without cables*, Pearson Education 2001.

Reference Books

1. Brent A. Miller and C.Bisdikian, *Blue Tooth Revealed*, Pearson Education 2001.
2. Nathan J.Miller, *Bluetooth Demystified*, Tata Mc Graw Hill 2001, London.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

IT09 L22 : INDUSTRIAL PSYCOLOGY

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives

- *The course is expected to expose to the students various techniques in analyzing and improving relationships that are expected by people employed all industries while conducting within an organization. It looks at various psychological issues and attempts to solve them.*

Module I (13 hours)

Introduction – psychology as a science – areas of applications – steady of individual – individual differences – steady of behavior – stimulus – response behavior – heredity and environment – human mind – cognition – character – thinking – attention – memory - emotion – traits – attitude – personality.

Module II (13 hours)

Organizational behavior – definition – development – fundamental concepts – nature of people – nature of organization – an organizational behavior system – models – autocratic model – hybrid model – understanding a social – system social culture – managing communication – downward, upward and other forms of communications.

Module III (13 hours)

Motivation – motivation driver – human needs – behavior modification – goal setting – expectancy model – comparison models – interpreting motivational models – leadership – path goal model – style – contingency approach

Module IV (13 hours)

Special topic in industrial psychology – managing group in organization – group and inter group dynamic – managing change and organizational development – nature planned change – resistance – characteristic of OD-OD processes.

Reference Books

1. Davis K & Newstrom J W, *Human Behavior At Work*, McGraw Hill International.
2. Schermerhorn J.R Jr., Hunt J.G & Osborn R.N, *Managing Organizational Behavior*, John Willy.
3. Luthans, *Organizational behavior*, McGraw Hill International.
4. Morgan C.T, King R.A, Rweisz J & Schoples J, *Introduction to Psychology*, McGraw Hill.
5. Blum M.L & Naylor J.C, *Industrial Psychology,* CBS Publisher, Horper & Row

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)

30% - Assignments (minimum 2) such as homework, 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

IT09 L23: DISTRIBUTED SYSTEMS

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

Objectives

- *The development of distributed systems followed the emergence of high-speed local area networks, the availability of high performance PCs, workstations and servers has resulted in a recent shift towards distributed systems, and away from centralized, multi user systems. This trend has been accelerated by the development of distributed system software designed to support the development of distributed applications.*
- *This course is 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)
Interprocess communication and coordination - message passing communication - request/reply communication - transaction communication - name and directory services - distributed mutual exclusion - leader election

Module IV (16 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 Systems Concepts And Design*, Prentice Hall Inc.
3. Coulouris G., Dollimore J. & Kindberg T, *Distributed Systems 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)* *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

IT09 L24: MANAGEMENT INFORMATION SYSTEMS

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

Objectives

- *This course will introduce the methods and the influence of the information systems in management milieu and use MIS as an effective tool in management and decision making.*

Module I (12 hours)
Information systems - functions of management - levels of management - framework for information systems - systems approach - systems concepts - systems and their environment - effects of system approach in information systems design - using systems approach in problem solving - strategic uses of information technology

Module II (10 hours)
An overview of computer hardware and software components - file and database management systems - introduction to network components - topologies and types - remote access - the reasons for managers to implement networks - distributed systems - the internet and office communications

Module III (14 hours)
Application of information systems to functional - tactical and strategic areas of management, decision support systems and expert systems

Module IV (16 hours)
Information systems planning - critical success factor - business system planning - ends/means analysis - organizing the information systems plan - systems analysis and design - alternative application development approaches - organization of data processing - security and ethical issues of information systems

Text Books

1. Robert Schultheis & Mary Sumner, *Management Information Systems-The Manager's View*, Tata McGraw Hill.

Reference Books

1. Laudon K.C. & Laudon J.P, *Management Information Systems - Organization and Technology*, Prentice Hall of India
2. Sadagopan S, *Management Information Systems*, Prentice Hall of India
3. Basandra S.K, *Management Information Systems*, Wheeler Publishing.
4. Alter S, *Information Systems: A Management Perspective*, Addison Wesley.
5. Effy Oz, *Management Information Systems*, 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)* 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

IT09 L25: GRAPH THEORY & COMBINATORICS

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives

- *This course comprehends the graphs as a modeling and analysis tool in computer science & Engineering. It introduces the structures such as graphs & trees and techniques of counting and combinations, 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 - Kruskal's and Prim's algorithms for minimal spanning trees - Dijkstra's shortest path algorithm - bellman-ford algorithm - all-pairs shortest paths - Floyed-Warshall algorithm - the max-flow min-cut theorem - maximum bipartite matching.

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 - nonhomogeneous recurrence relations - method of generating functions.

Text Books

1. Grimaldi R.P, *Discrete and Combinatorial Mathematics: An Applied Introduction*, Addison Wesley.

Reference Books

1. Clark J. & Holton D.A, *A First Look at Graph Theory*, Allied Publishers (World Scientific).
2. Corman T.H., Leiserson C.E. & Rivest R.L, *Introduction to Algorithms*, Prentice Hall India
3. Mott J.L., Kandel A. & Baker T.P, *Discrete Mathematics for Computer Scientists and Mathematicians*, Prentice Hall of India.
4. Liu C.L, *Elements of Discrete Mathematics*, McGraw Hill.
5. 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

GLOBAL ELECTIVES

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 L25 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,* Mc-Graw 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 L23: Industrial Safety Engineering

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

Objectives

- *To provide on concept of safety in industry, principle of accident prevention, major hazards, consequences and concept of reliability.*

Pre-requisites: *Nil*

Module I (14 Hours)
Introduction to the concept of safety-Need-safety provisions in the factory Act-Laws related to the industrial safety-Measurement of safety performance, Safety Audit, Work permit system, injury and accidents-Definitions-Unsafe act –unsafe condition- causes, investigations and prevention of accidents, hazards, type of industrial hazards-nature, causes and control measures, hazard identifications and control techniques-HAZOP, FMEA,FMECA etc.

Module II (14 Hours)
Concept of Industrial hygiene, programmes-Recognition –Evaluation- Control, Noise- source – effects and noise control, exposure limits –standards, Hearing conservation programmes, Fire –fire load-control and industrial fire protection systems, Fire Hydrant and extinguishers, Electrical Hazards, protection and interlock-Discharge rod and earthling device, safety in the use of portable tools.

Module III (13 Hours)
Logics of consequence analysis-Estimation-Toxic release and toxic effects-Threshold limit values, Emergency planning and preparedness, Air pollution-classification- Dispersion modeling -pollution source and effects- -control method and equipments-Gravitational settling chambers-cyclone separators-Fabric filter systems-scrubbers etc.

Module IV (13 Hours)
Concept of reliability-Definition-Failure rate and Hazard function, System reliability models-series, parallel systems, reliability hazard function for distribution functions-exponential-normal – lognormal-weibull and gamma distribution.

Text books

1. Thomas J. Anton, *Occupational Safety and Health Management*, McGraw Hill
2. Ian T.Cameron & Raghu Raman, *Process Systems Risk Management*, ELSEVIER Academic press.
3. C.S.Rao, *Environmental Pollution Control Engineering*, New Age International Limited
4. L. S. Srinath, *Reliability Engineering*, East west Press, New Delhi.

Reference books

1. Frank E. McErloy,P.E; C.S.P, *Accident Prevention Manual for Industrial Operations*,NSC Chicago.
2. Lees F.P, *Loss Prevention in Process Industries*, Butterworths, New Delhi.
3. BHEL,*Occupational Safety Manual*, Tiruchirappalli.

4. Dr. A.K. Gupta, *Reliability, Maintenance and Safety Engineering*, Laxmi Publications, New Delhi.

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

EC09 L025: 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

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 L23 EXPERIMENTAL STRESS ANALYSIS*

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

Objective

- *To make students aware of various measurement techniques and experimental planning and procedures adopted in laboratory*

Module I (14 hours)
Strain gauges - definition of gauge length - sensitivity and range - characteristics of an ideal strain gauge - different types of mechanical strain gauges, optical strain gauge - acoustic strain gauge - pneumatic strain gauge - merits and demerits - electrical strain gauges - inductance, capacitance and piezo electric gauges - bonded and unbonded resistance gauges and their application in stress analysis - fixing techniques and measurement of strains - rosettes - determination of principal stress - construction of stress, strain circles - analytical solution

Module II (13 hours)
Photo elasticity - basics of optics, stress optic law - plane and circularly polarized light and their use in photos elasticity - polariscopes - diffusion type - lens type polariscopes - isoclinics and isochromatics

Module III (14 hours)
Model materials - calibration methods for finding material fringe values - model fringe values - examples of beam flexure and diametrically loaded circular plates.
Non Destructive Testing Methods – Ultrasonic Methods – Hardness methods – Rebound Hammer – Detection of embedded reinforcement.
Computer based data acquisition systems.

Module IV (13 hours)

Model analysis - direct and indirect models - laws of structural similitude - choice of scales - limitation of model studies - buckingham pi-theorem - dimensional analysis - model materials - Begg's deformater and its use - simple design of direct and indirect models

Text Books

1. Dally, J. W. and Raliey W.F., Experimental Stress Analysis, McGraw Hill.
2. Srinath L.S., Experimental Stress Analysis, Tata McGraw Hill
3. Roy, T.K., Experimental Analysis of stress and strain

Reference Books

1. Dove and Adams, Experimental Stress Analysis and Motion measurement, Prentice Hall
2. Hetenyi M., Hand book of Experimental Stress Analysis, John Wiley
3. Bently JP – Principles of Measurement Systems, Longman, 1983
4. Nakra & Chowdhary – Instrumentation Measurement & Analysis – Tata McGraw Hill, 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

CE09 L24: REMOTE SENSING AND GIS

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objective

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.

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

BT 09 L24 BIOETHICS & INTELLECTUAL PROPERTY RIGHTS

Teaching Scheme :

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

Objectives :

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

Prerequisite : No prerequisite

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

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

CH09 L23 NANOMATERIALS AND NANOTECHNOLOGY

Teaching scheme **Credits:** 4

3 hours lecture & 1 hour tutorial per week

Objectives

- *To impart the basic concepts of nanotechnology*
- *To develop understanding about application of nanomaterials.*

No Pre-requisites

Module 1 (13 Hours)

Introduction to nanotechnology, nanoscale, electromagnetic spectrum, top down and bottom up approach, particle size, chemistry and physics of nanomaterials, electronic phenomenon in nanostructures, optical absorption in solids, quantum effects.

Module 2 (13 Hours)

Nanomaterials, preparation of nanomaterials like gold, silver, different types of nano-oxides, Al_2O_3, TiO_2, ZnO etc. Sol-gel methods, chemical vapour deposition, ball milling etc. Carbon nanotubes, preparation properties and applications like field emission displays. Different types of characterization techniques like SEM, AFM, TEM & STM.

Module 3 (13 Hours)

Nanocomposites, nanofillers, high performance materials, polymer nanocomposites, nanoclays, nanowires, nanotubes, nanoclusters etc. Smart materials, self assembly of materials, safety issues with nanoscale powders.

Module 4 (13 Hours)

Nanomanipulation, Micro and nanofabrication techniques, Photolithography, E-beam, FIB etc. Nanolithography., softlithography, photoresist materials. Introduction to MEMS, NEMS and nanoelectronics. Introduction to bionanotechnology and nanomedicines.

Text Books

References:

1. Nanocomposite science and technology, Pulikel M. Ajayan, Wiley-VCH 2005
2. Nanolithography and patterning techniques in microelectronics, David G. Bucknall, Wood head publishing 2005
3. Transport in Nanostructures, D.K. Ferry and S.M. Goodmick, Cambridge university press 1997.
4. Optical properties of solids, F. Wooten, Academic press 1972
5. Micro and Nanofabrication, Zheng Cui, Springer 2005
6. Nanostructured materials, Jackie Y. Ying, Academic press 2001
7. Nanotechnology and nanoelectronics, W.R, Fahrner, Springer 2005
8. Nanoengineering of structural, functional and smart materials, Mark J. Schulz, Taylor & Francis 2006.
9. Hand book of Nanoscience, Engineering, and Technology, William A. Goddard, CRC press 2003.
10. Nanoelectronics and Information Technology, Rainer Waser, Wiley-VCH 2003.
11. The MEMS Handbook Frank Kreith, CRC press 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

CH09 L24 INDUSTRIAL POLLUTION CONTROL

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

Objectives

- *To impart the basic concepts of industrial pollution control*
- *To develop understanding about water, air, light pollution control*

No Pre-requisites

Module 1 (13hours)
Classification of industrial wastewater - types of pollutants and their effects - monitoring and analysis methods - water pollution laws and standards - industrial wastewater treatment - processes and equipment

Module II (13hours)
Water pollution control in industries - pulp and paper, textile processing, tannery wastes, dairy wastes, cannery wastes, brewery, distillery, meet packing, food processing wastes, pharmaceutical wastes, chlor-alkali industries, fertilizer industry, petrochemical industry, rubber processing industry, starch industries, metal industries, nuclear power plant wastes, thermal power plant wastes.

Module III (13hours)

Air pollution control in industries: source and classification of industrial air pollutants - monitoring equipment and method of analysis - damages to health, vegetation and materials - air pollution laws and standards - treatment method in specific industries - thermal power plants - cement - fertilizers - petroleum refineries - iron and steel - chlor-alkali - pulp and paper

Module IV (13hours)

Industrial odour control - sources and solutions - odour control by adsorption and wet scrubbing - industrial noise control methods - sludge treatment and disposal - industrial hazardous waste management, waste minimization. Environmental Impact Assessment and risk assessment-Environmental Audit and Environmental management system- Concept of common effluent treatment plants.

References:

1. Nelson & Nemerow, Industrial Water pollution-Origin, Characteristics and treatment, Addison, Wesley Publishing Co.
2. Gerard Kiely,Environmental Engineering, McGraw Hill
3. Rao M.N. & Rao H,Air Pollution, Tata McGraw Hill
4. Sincero A.P.& Sincero G.A., Environmental Engineering, A Design Approach, Prentice Hall of India
5. Rao C.S., Environmental Pollution Control Engineering, New Age Int. Pub.
6. Mahajan S.P., Pollution Control in Process Industries, Tata McGraw Hill
7. Babbitt H.E, Sewage & Sewage Treatment, John Wiley
8. Abbasi S.A, & Ramasami E, Biotechnical Methods of Pollution Control, Universities Press(India) 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)* *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