UNIVERSITY OF CALICUT

M.Tech. DEGREE COURSE
COMPUTER SCIENCE AND ENGINEERING

Curricula, Scheme of Examinations and Syllabi
(With effect from 2009 admissions)

(As per order no. GA IV/E1/1894/2003 dated 06-08-2010.)

Scheme of M.Tech Programme in Computer Science and Engineering

Semester I

Course Code	Subject	Hours/week			Marks		Total marks	Sem-end exam duration - Hrs	Credits
		L	T	P/D	Internal	Sem-end			
MCS10 101	Advanced Mathematical Structures	3	1	0	100	100	200	3	4
MCS10 102	Operating system Design	3	1	0	100	100	200	3	4
MCS10 103	Database Design	3	1	0	100	100	200	3	4
MCS10 104	Compiler Design	3	1	0	100	100	200	3	4
MCS10 105	Elective I	3	1	0	100	100	200	3	4
MCS10 106(P)	Seminar I	0	0	2	100	0	100	-	2
MCS10 107(P)	Advanced Software Lab	0	0	2	100	0	100	-	2
TOTAL		15	5	4	700	500	1200		24

Elective I

MCS10 105 (A) COMPUTATIONAL INTELLIGENCE
MCS10 105 (B) OPTICAL COMMUNICATION
MCS10 105 (C) GAME THEORY
MCS10 105 (D) QUANTUM COMPUTING

Note: Remaining 6 hours / week is meant for departmental assistance by students
L-Lecture T-Tutorial P-Practical

Semester – II

Course Code	Subject	Hours/week			Marks		Total	Sem-end exam duration - Hrs	Credits
		L	T	P	Internal	Sem-end			
MCS10 201	Digital Communication Techniques	3	1	0	100	100	200	3	4
MCS10 202	Algorithms and Complexity	3	1	0	100	100	200	3	4
MCS10 203	Advanced Language Technologies	3	1	0	100	100	200	3	4
MCS10 204	Elective II	3	1	0	100	100	200	3	4
MCS10 205	Elective III	3	1	0	100	100	200	3	4
MCS10 206(P)	Seminar II	0	0	2	100	0	100	-	2
MCS10 207(P)	Web Technology Lab	0	0	2	100	0	100	-	2
TOTAL		15	5	4	700	500	1200		24

Elective II

MCS10 204 (A) DATA COMPRESSION
MCS10 204 (B) CRYPTOCOMPLEXITY
MCS10 204 (C) INFORMATION THEORY

Elective III

MCS10 205 (A) ADVANCED NETWORKING TECHNOLOGIES
MCS10 205 (B) BIO- INFORMATICS
MCS10 205 (C) SOFT COMPUTING

Note: Remaining 6 hours / week is meant for departmental assistance by students

Semester III

Course Code	Subject	Hours/week			Marks			Total	Sem-end exam duration - Hrs	Credits
		L	T	P	Internal		Sem-end			
MCS10 301	Elective 1V	3	1	0	100		100	200	3	4
MCS10 302	Elective V	3	1	0	100		100	200	3	4
MCS10 303(P)	Industrial Training	0	0	0	50		-	50	-	1
MCS10 304(P)	Master Research Project Phase I	0	0	22	Guide 150	EC* 150	-	300	-	6
TOTAL		6	2	22	550		200	750		15

NB: The student has to undertake the departmental work assigned by HOD
*EC – Evaluation Committee

Electives –IV

MCS10 301 (A) DIGITAL IMAGE PROCESSING
MCS10 301 (B) RESEARCH METHODOLOGY
MCS10 301 (C) WIRELESS COMMUNICATION TECHNOLOGIES

Electives –V

MCS10 302 (A) HIGH SPEED NETWORKS
MCS10 302 (B) INFORMATION THEORY AND CODING
MCS10 302 (C) INTERNET MODELS

Semester IV

Course Code	Subject	Hours per week			Internal Marks		Sem–end exam		Total marks	Credits
		L	T	P/D	Guide	Evaluation Comittee	Extl. Guide	Viva-Voce		
MCS 10 401(P)	Masters Research Project (Phase II)	-	-	30	150	150	150	150	600	12
TOTAL				30	150	150	150	150	600	12

NB: The student has to undertake the departmental work assigned by HOD

Semester I

MCS10 101 Advanced Mathematical Structures

Prerequisite: Discrete Computational Structures

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

Objective:

To familiarize the students with the advanced concepts in mathematical structures like Markov models, Queuing Networks etc. And these concepts will help the students in their master research project work.

Module1: 13Hrs . Stochastic Processes: Renewal Processes- Reward and Cost Models, Poisson Process, Point Process Regenerative Processes, Renewal Theorems

Module 2 : 12 Hrs Markov Models: Discrete Time Markov Chain- Transition Probabilities Communication Classes- Irreducible Chains. Continuous Markov Chain- Pure Jump Continuous- Time Chains, Regular Chains, Birth and Death Process. Semi-Markov Processes.

Module 3 : 13Hrs . Single Class and Multi class Queuing Networks: Simple Markovian queues- M/G/1 queue – Open Queuing Networks Closed Queuing Networks- Mean Value Analysis- Multi- class traffic Model- Service Time distributions- BCMP Networks- Priority Systems.

Module 4: 13 Hrs Time delays and blocking in queuing Networks- Time delays in single server queue- time delays in networks of queues- Types of Blocking – Two finite queues in a closed network- aggregating Markovian States.

References

1. Ronald W. Wolff, stochastic Modeling and Theory of Queues, Prentice- Hall International Inc 1989.
2. Peter G Harrison and Naresh M Patel, Performance Modeling of Communication Networks and Computer Architectures, Addison – Wesley, 1992
3. Gary N Higginbottom, Performance Evaluation of Communication Networks, Artech House, 1998
4. Anurag Kumar, D. Manjunath and Joy Kuri, Communication Networking: An Analytical Approach, Morgan Kaufman Publ. 2004
5. D. Bertsekas and R. Gallager, Data Networks, Prentice- Hall of India 2001
6. Ross K W, Multiservice Loss Models for Broadband Telecommunication Networks, Springer- Verlag, 1995
7. Warland J, An Introduction to Queuing Networks, Prentice- Hall ,1988

8. Cinlar E, Introduction to Stochastic Processes, Prentice- Hall , 1975
9. Karlin S and Taylor H, A first Course in Corse in Stochastic Processes, 2nd Edition Academic Press, 1975

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module I

Question 1 : 20 marks

Question 2 : 20 marks

Module II

Question 3 : 20 marks

Question 4: 20 marks

Module III

Question 5 : 20 marks

Question 6: 20 marks

Module IV

Question 7 : 20 marks

Question 8: 20 marks

MCS10 102: Operating System Design

Prerequisite: Operating Systems

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

Objective:

To provide a design oriented approach towards operating systems. A detailed study of the different functions of the operating system is given. Case studies of some of the operating systems such as Windows NT and Linux also have to be carried out.

Module1: (12 Hours)
Introduction- Introduction, Hardware interface, Operating system interface. design problems, Operating System design techniques. Implementing processes – The system call interface, system initialization, process switching, system call interrupt handling, program error interrupts, disk driver system, implementing waiting, flow of control through OS, signaling and interrupts, event table managers, process implementation. Parallel systems- Parallel hardware, OS for two processor systems, race conditions with shared processes, atomic actions, multiprocessor OS, threads.

Module 2: (13 **Hours)**
Interprocess communication patterns- competing and co-operating, problems, race conditions and atomic actions, new message passing system calls, IPC pattern: mutual exclusion, signaling and rendezvous models, producer-consumer and client server models. Deadlocks- Conditions for deadlock, dealing with deadlocks, two-phase locking, message variations, synchronization, semaphores. Design techniques- some example design techniques. Memory management- levels of memory management, linking and loading process, memory management design, dynamic memory allocation, keeping track allocation of blocks, multiprogramming issues, memory protection, memory management system calls.

Module 3: (14 **Hours)**
Virtual memory- Fragmentation and compaction, dealing with fragmentation- paging, swapping, overlay, page replacement- global and local page replacement algorithms, thrashing and load control, dealing with large page tables, sharing memory. Design techniques- examples of multiplexing and late binding. I/O devices - devices and controllers, terminal devices, communication devices, disk devices, disk controllers, SCSI interfaces, tape devices, CD devices. I/O subsystems- I/O system software, disk device driver access strategies, modeling disks, unification of files and device,

generalized disk device drivers, disk caching. File systems- File abstraction, naming, file system objects and operations. – case study in Windows NT and Linux

Module 4: (14 Hours)

File system organization- organization, file descriptors, locating file block son disks, implementation of logical to physical block mapping, file sizes, Booting the OS, file system reliability, file security and protection. Resource management and protection- resources in an OS, resource management issues, types of resources, integrated scheduling, queuing models of scheduling, real-time OS, protection of resources, user authentication, mechanism for protecting hardware resources, representation of protection information, mechanisms for software protection, Design techniques- Caching, hierarchical names and naming of objects. – case study in Windows NT and Linux.

References

1. Charles Crowley, *Operating systems- a design oriented approach*, Tata Mcgraw-hill edition, New Delhi, 1998.
2. Silberschatz and Galvin, *Operating system concepts*, Addison Wesley, 1998.
3. Tanenbaum Andrew S, *Modern Operating system* , Eaglewood Cliffs, NJ: Prentice Hall, 1992
4. Gary J.Nutt, *Operating systems- A modern perspective*, 2nd edition, Addison wesley, 2000.
5. Stallings William, Operating systems- Internals and design principles, 4 th Edn, PHI, 2002

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module I

Question 1 : 20 marks

Question 2 : 20 marks

Module II

Question 3 : 20 marks

Question 4: 20 marks

Module III

Question 5 : 20 marks

Question 6: 20 marks

Module IV

Question 7 : 20 marks

Question 8: 20 marks

MCS10 103: Database Design

Prerequisite: Database Management Systems

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

Objective:

To provide the students with the concepts of database systems and their design. An introduction to data warehousing, data mining and about the emerging technologies in databases are also given.

Module I (13 hours)
Database System concepts and applications, Data modeling using Entity-Relationship model, Record Storage and File organization.

Module II (13 hours)
The Relational Data Model, Relational constraints and the Relational Algebra, SQL, ER to Relational mapping, Examples of RDBMS.

Module III (13 hours)
Database Design Theory and Methodology- Functional Dependencies and Normalization for Relational Databases, Relational Database design algorithms, Practical Database Design and Tuning**.**

Module IV (14 hours)
Object Oriented Database concepts, Object Relational and Extended Relational Database Systems, Data Warehousing and Data Mining, Emerging Database Technologies and Applications.

References

1. Elmasri, Navathe. *Fundamentals of Database Systems*, Third Edition, Pearson Education, 2000.
2. T. CONNOLLY, C. BEGG, *Database Systems*, 3/e, Pearson Education, 2003.
3. Silberschatz A., Korth H. F., & Sudarshan S., *Database System Concepts*, Tata McGraw Hill, 2003
4. Ullman J. D., *Principles of Database Systems*, Galgotia Publications,1996.

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per

subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module I

Question 1 : 20 marks

Question 2 : 20 marks

Module II

Question 3 : 20 marks

Question 4: 20 marks

Module III

Question 5 : 20 marks

Question 6: 20 marks

Module IV

Question 7 : 20 marks

Question 8: 20 marks

MCS10 104 : Compiler Design

Prerequisite: Compiler Construction

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

Objective:

An introduction to advanced topics in compiler design is given. It also provides the concepts of code analysis, optimization techniques and code scheduling in Compiler design..

Module I: Introduction to Advanced Topics (13 Hours)
Review of compiler phases – Introduction to Advanced Topics – Informal Compiler Algorithm Notation – Symbol Table Structure – Intermediate Representations – Run Time Issues – Support for Polymorphic and Symbolic Languages.

Module II: Analysis (13 hours)
Control Flow Analysis – Data Flow Analysis – Dependency analysis – Alias analysis

Module III: Optimization (13 hours)
Introduction – Review of Early Optimizations – Redundancy Elimination – Loop Optimizations – Procedure Optimization

Module IV: Machine Dependent tasks (13 hours)
Register Allocation – Local and Global Instruction Scheduling – Advanced Topics in Code Scheduling – Low Level Optimizations – Introduction to interprocedural analysis and scheduling.

References

1. STEVEN MUCHNICK. *Advanced Compiler Design Implementation*, Morgan Kauffmann Publishers, 1997
2. AHO, A. V, SETHI, R. and ULLMAN, J. D. *Compilers: Principles, Techniques and Tools*, Addison Wesley, 1986
3. APPEL A. W. *Modern Compiler Implementation in Java*, Cambridge University Press, 2000.
4. KENNETH. C. LOUDEN, Compiler Construction. Principles and Practice. Thomson, 2003.

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per

subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module I

Question 1 : 20 marks

Question 2 : 20 marks

Module II

Question 3 : 20 marks

Question 4: 20 marks

Module III

Question 5 : 20 marks

Question 6: 20 marks

Module IV

Question 7 : 20 marks

Question 8: 20 marks

ELECTIVE I

MCS10 105 (A) COMPUTATIONAL INTELLIGENCE

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

Objective:

To provide the students with the concepts of intelligence in computing. Gives an overview of Expert system learning, genetic algorithm and programming and an introduction to AI programming languages like LISP and PROLOG.

Module I (14 hours)
Artificial Intelligence: History and Applications, Production Systems, Structures and Strategies for state space search- Data driven and goal driven search, Depth First and Breadth First Search, DFS with Iterative Deepening, Heuristic Search- Best First Search, A* Algorithm, AO* Algorithm, Constraint Satisfaction, Using heuristics in games- Minimax Search, Alpha Beta Procedure.

Module II (14 hours)
Knowledge representation - Propositional calculus, Predicate Calculus, Theorem proving by Resolution, Answer Extraction, AI Representational Schemes- Semantic Nets, Conceptual Dependency, Scripts, Frames, Introduction to Agent based problem solving.

Module III (12 hours)
Machine Learning- Symbol based and Connectionist, Social and Emergent models of learning, The Genetic Algorithm- Genetic Programming, Overview of Expert System Technology- Rule based Expert Systems, Introduction to Natural Language Processing.

Module IV (13 hours)
Languages and Programming Techniques for AI- Introduction to PROLOG and LISP, Search strategies and Logic Programming in LISP, Production System examples in PROLOG.

References

1. GEORGE.F.LUGER, *Artificial Intelligence- Structures and Strategies for Complex Problem Solving*, 4/e, 2002, Pearson Education.
2. E. RICH, K.KNIGHT, *Artificial Intelligence*, 2/e, Tata McGraw Hill
3. WINSTON. P. H, *LISP*, Addison Wesley
4. IVAN BRATKO, *Prolog Programming for Artificial Intelligence*, 3/e, Addison Wesley, 2000.

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module I

Question 1 : 20 marks

Question 2 : 20 marks

Module II

Question 3 : 20 marks

Question 4: 20 marks

Module III

Question 5 : 20 marks

Question 6: 20 marks

Module IV

Question 7 : 20 marks

Question 8: 20 marks

MCS10 105 (B) Optical Communication

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

Objective:

To provide an introduction to the optical fiber communication systems used in computer networking. It also gives the basic concepts of optical sources, modulation schemes and optical amplifiers.

Module 1: (12 hours)
Solution to Maxwell's equation in a circularly symmetric step index optical fiber, linearly polarized modes, single mode and multi mode fibers, concept of V number, graded index fibers, total number of guided modes (no derivation), attenuation mechanisms in fibers, dispersion in single mode and multi mode fibers, dispersion shifted and dispersion flattened fibers, attenuation and dispersion limits in fibers, Kerr nonlinearity, self phase modulation, combined effect of dispersion and self phase modulation.

Module 2: (13 hours)
Optical sources - LED and laser diode - Principles of operation, concepts of line width, phase noise, switching and modulation characteristics . Optical detectors - pn detector, pin detector, avalanche photo diode - Principles of operation, concepts of responsivity, sensitivity and quantum efficiency, noise in detection, typical receiver configurations (high impedance and trans-impedance receivers).

Module 3: (14 hours)
Coherent systems - Homodyne and heterodyne systems, coherent systems using PSK, FSK, ASK and DPSK modulations, related noise effects, performance degradation induced by laser phase and intensity noise, degradation due to fiber dispersion, degradation induced by nonlinear effects in fiber propagation.

Module 4: (14 hours)
Optical amplifiers - semiconductor amplifier, rare earth doped fiber amplifier (with special reference to erbium doped fibers), Raman amplifier, Brillouin amplifier - principles of operation, amplifier noise, signal to noise ratio, gain, gain bandwidth, gain and noise dependencies, intermodulation effects, saturation induced crosstalk, wavelength range of operation.

Text books:
1. Leonid Kazovsky, Sergio Benedetto and Alan Willner : Optical Fiber Communication

Systems , Artech House, 1996.
2. John Senior: Optical Fiber Communications, Second Edition, PHI, 1992
3. Silvello Betti, Giancarlo De Marchis and Eugenio Iannone : Coherent Optical Communications Systems, John Wiley, 1995.
4. G.P.Agrawal : Nonlinear Fiber Optics, Second edition, Academic Press, 2000.

Reference Books :

1. Gerd Keiser: Optical Fibre Communications (3rd Ed.), McGraw Hill, 2000.
2. John Gowar: Optical Communication Systems (2nd Ed.), Prentice Hall, 1993
3. Govind P. Agrawal: Fiber-Optic Communication Systems (3rd Ed.), John Wiley & Sons, 2002
4. C. DeCusatis: Fibre Optic Data Communication, Technological Trends and Advances, Academic Press 2002
5. Karminvov & T. Li: Optical Fibre Telecommunications,Vol A&B, Academic Press 2002

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module I

Question 1 : 20 marks

Question 2 : 20 marks

Module II

Question 3 : 20 marks

Question 4: 20 marks

Module III

Question 5 : 20 marks

Question 6: 20 marks

Module IV

Question 7 : 20 marks

Question 8: 20 marks

MCS10 105 (C) GAME THEORY

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

Objective:

To Give an introduction to the basic concepts in game theory such as Co- operative and Non Co- operative game theory, mechanism design and their implementation etc.

Module-1:**(12 hrs)**
Introduction to Non Co-operative Game Theory: Extensive Form Games, Strategic Form Games, Pure Strategy Nash Equilibrium

Module-2:**(13 hrs)**
Non co-operative Game Theory (in detail), Mixed Strategies, Existence of Nash Equilibrium, Computation of Nash Equilibrium, Two Player Zero-Sum Games, Bayesian Games

Module-3:**(14 hrs)**
Mechanism Design : An Introduction, Dominant Strategy Implementation of Mechanisms, Vickrey-Clorke-Groves Mechanisms, Bayesian Implementation of Mechanisms, Revenue Equivalence Theorem, Design of Optimal Mechanisms

Module-4:**(14 hrs)**
Cooperative Game Theory, Correlated Strategies, Correlated Equilibria, The Two Person Bargaining Problem, Games in Coalitional Form, The Core Shapley Value, Other Solution Concepts for Co-operative Games

References

1. Roger B. Myerson. *Game Theory: Analysis of Conflict.* Harvard University Press, September 1997.
2. Andreu Mas-Colell, Michael D. Whinston, and Jerry R. Green. *Microeconomic Theory*. Oxford University Press, New York, 1995.
3. Martin J. Osborne, Ariel Rubinstein. *A Course in Game Theory*. The MIT Press, August 1994.
4. Philip D. Straffin, Jr. *Game Theory and Strategy*. The Mathematical Association of America, January 1993.
5. Ken Binmore, *Fun and Games : A Text On Game Theory*, D. C. Heath & Company, 1992.
6. Paul Klemperer, *Auctions: Theory and Practice*, The Toulouse Lectures in Economics, Princeton University Press, 2004.

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module I

Question 1 : 20 marks

Question 2 : 20 marks

Module II

Question 3 : 20 marks

Question 4: 20 marks

Module III

Question 5 : 20 marks

Question 6: 20 marks

Module IV

Question 7 : 20 marks

Question 8: 20 marks

MCS10 105 (D) QUANTUM COMPUTING

Prerequisites: Theory of Computation

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

Objective:

To impart one of the new concepts in computing. With this it is intended to provide the students with the basic concepts in quantum computing, model for computation, different algorithms used and coding theory.

Module I: Foundations (14 Hours)
Finite Dimensional Hilbert Spaces – Tensor Products and Operators on Hilbert Space – Hermitian and Trace Operators - Basic Quantum Mechanics necessary for the course.

Module II: Model of Computation (12 hours)
Quantum Gates and operators and Measurement – Quantum Computational Model – Quantum Complexity – Schemes for Physical realization (Only peripheral treatment expected).

Module III: Algorithms and Complexity (14 hours)
Shor's Algorithm – Application to Integer Factorization – Grover's Algorithm – Quantum Complexity Classes and their relationship with classical complexity classes.

Module IV: Coding Theory (13 hours)
Quantum Noise – Introduction to the theory of Quantum Error Correction – Quantum Hamming Bound – Coding Schemes – Calderbank-Shor-Steane codes – Stabilizer Codes.

References

1. NIELSEN M. A. and I. L. CHAUANG, Quantum Computation and Quantum Information, Cambridge University Press, 2002.
2. GRUSKA, J. Quantum Computing, McGraw Hill, 1999.
3. HALMOS, P. R. Finite Dimensional Vector Spaces, Van Nostrand, 1958.
4. JULIAN BROWN. Minds, Machines and the Multiverse: The Quest for the Quantum Computer by Julian Brown. Simon and Schuster, 2000.

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module I

Question 1 : 20 marks

Question 2 : 20 marks

Module II

Question 3 : 20 marks

Question 4: 20 marks

Module III

Question 5 : 20 marks

Question 6: 20 marks

Module IV

Question 7 : 20 marks

Question 8: 20 marks

MCS 10 106(P) SEMINAR I

Hours per week: 2 hours practical **Credits:** 2

Objective:

To assess the debating capability of the student to present a technical topic. Also to impart training to a student to face audience and present his/her ideas and thus creating self esteem and courage that are essential for an engineer.

Each student is expected to present a seminar on a topic of current relevance in Computer Science and Engineering about 45 minutes. They are expected to refer current research and review papers from standard journals like ACM, IEEE, JPDC, IEE etc. - at least three cross references must be used - the seminar report must not be the reproduction of the original paper. A committee consisting of at least three faculty members shall assess the presentation of the seminar and award marks to the students based on merits of topic of presentation. Each student shall submit two copies of a write up of the seminar topic. One copy shall be returned to the student after duly certifying it by the chairman of the assessing committee and the other will be kept in the departmental library. Internal continuous assessment marks are awarded based on the relevance of the topic, presentation skill, quality of the report and participation.

Internal Continuous Assessment *(Maximum Marks-100)*

Presentation +Discussion	: 60
Relevance + Literature	: 10
Report	: 20
Participation	: 10
Total marks	**: 100**

MCS10 107 (P) ADVANCED SOFTWARE LAB

1. Study Of Architecture Characteristics Using Simulators (Like Simple Scalar).
2. TCP Client Server Program Using Sockets In Java
3. Simulation Of Congestion/QoS Protocols
4. Implementation Of Heap Structures
5. Implementation Of Search Structures
6. Implementation Of Multimedia Data Structures
7. Implementation of Data Structure Applications.
8. Study Of Case Tools (Rational Rose).

Internal Continuous Assessment *(Maximum Marks-100):*

Regularity & Class work	-	30 marks
Record	-	20 marks
Tests, Viva	-	50 marks

SEMESTER 2

MCS10 201 Digital Communication Techniques

Prerequisite: A first course in 'Digital Communication' at the undergraduate level

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

Objective:

In order to provide the students with the techniques used in digital communication so that they will have an awareness of the basics of communication techniques used in computer networks.

Module 1: Random Variables and Processes (12 hours)
Review of Random variable: Moment generating function, Chernoff bound, Markov's inequality, Chebyshev,s inequality, Central limit Theorem, Chi square, Rayleigh and Rician distributions, Correlation, Covariance matrix- Stationary processes, wide sense stationary processes, ergodic process, cross correlation and autocorrelation functions- Gaussian process

Module 2: Communication over Additive Gaussian Noise Channels (14 hours)
Characterization of Communication Signals and Systems- Signal space representation- Connecting Linear Vector Space to Physical Waveform Space- Scalar and Vector Communication over Memory less Channels. Optimum waveform receiver in additive white Gaussian noise (AWGN) channels - Cross correlation receiver, Matched filter receiver and error probabilities. Optimum Receiver for Signals with random phase in AWGN Channels- Optimum receiver for Binary Signals- Optimum receiver for M-ary orthogonal signals- Probability of error for envelope detection of M- ary Orthogonal signals**.** Optimum waveform receiver for coloured Gaussian noise channels- Karhunen Loeve expansion approach, whitening.

Module 3: Synchronization in Communication Systems (14 hours)
Carrier Recovery and Symbol Synchronization in Signal Demodulation- Carrier Phase Estimation- Effect of additive noise on the phase estimate- Maximum Likelihood phase estimation- Symbol Timing Estimation- Maximum Likelihood timing estimation- Receiver structure with phase and timing recovery-Joint Estimation of Carrier phase and Symbol Timing- Frequency offset estimation and tracking.

Module 4: Communication over Band limited Channels (14 hours)

Communication over band limited Channels- Optimum pulse shaping- Nyquist criterion for zero ISI, partial response signaling- Equalization Techniques- Zero forcing linear Equalization- Decision feedback equalization- Adaptive Equalization.

Text Books:

1. J.G. Proakis, “Digital Communication”, MGH 4TH edition, 1995.

Reference Books:

1. Edward. A. Lee and David. G. Messerschmitt, “Digital Communication”, Allied Publishers (second edition).
2. J Marvin.K.Simon, Sami. M. Hinedi and William. C. Lindsey, “Digital Communication Techniques”, PHI.
3. William Feller, “An introduction to Probability Theory and its applications”, Vol 11, Wiley 2000.
4. Sheldon.M.Ross, “Introduction to Probability Models”, Academic Press, 7th edition.

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module I

Question 1 : 20 marks

Question 2 : 20 marks

Module II

Question 3 : 20 marks

Question 4: 20 marks

Module III

Question 5 : 20 marks

Question 6: 20 marks

Module IV

Question 7 : 20 marks

Question 8: 20 marks

MCS10 202 Algorithms and Complexity

Prerequisite: Design and Analysis of Algorithms

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

Objective:

To provide an introduction to the different complex algorithms in computer programming such as graph algorithms, randomized algorithmsetc and the complexity classes such as NP-Hard and NP- Complete problems.

Module I: (13 hours)
Analysis: RAM model – Notations, Recurrence analysis - Master's theorem and its proof - Amortized analysis - Advanced Data Structures: B-Trees, Binomial Heaps, Fibonacci Heaps, Disjoint Sets, Union by Rank and Path Compression

Module II: (13 hours)
Graph Algorithms and complexity: Matroid Theory, All-Pairs Shortest Paths, Maximum Flow and Bipartite Matching.

Module III: (14 hours)
Randomized Algorithms : Finger Printing, Pattern Matching, Graph Problems, Algebraic Methods, Probabilistic Primality Testing, De-Randomization

Module IV: (14 hours)
Complexity classes - NP-Hard and NP-complete Problems - Cook's theorem NP completeness reductions. Approximation algorithms – Polynomial Time and Fully Polynomial time Approximation Schemes. Probabilistic Complexity Classes, Probabilistic Proof Theory and Certificates.

References

1. Dexter Kozen, *The Design and Analysis of Algorithms*, Springer, 1992.
2. T. H. Cormen, C. E. Leiserson, R. L. Rivest, *Introduction to Algorithms*, Prentice Hall India, 1990.
3. S. Basse, *Computer Algorithms: Introduction to Design and Analysis*, Addison Wesley, 1998.
4. U. Manber, *Introduction to Algorithms: A creative approach*, Addison Wesley, 1989.
5. V. Aho, J. E. Hopcraft, J. D. Ullman, *The design and Analysis of Computer Algorithms*, Addison Wesley, 1974.

6. R. Motwani andP. Raghavan, *Randomized Algorithms*, Cambrdige University Press, 1995.
7. C. H. Papadimitriou, *Computational Complexity*, Addison Wesley, 1994
8. Leonard Adleman. *Two theorems on random polynomial time*. In Proceedings of the 19th IEEE Symposium on Foundations of Computer Science, pages 75–83, 1978.
9. J. Gill. *Computational complexity of probabilistic Turing machines*. SIAM Journal of Computing, 6:675–695, 1977.
10. C. Lautemann. *BPP and the Polynomial Hierarchy*. Information Processing Letters, 17:215–217, 1983.
11. M. Sipser. *A complexity theoretic appraoch to randomness*. In Proceedings of the 15th ACM Symposium on Theory of Computing, pages 330–335, 1983.
12. L.G. Valiant and V.V. Vazirani. *NP is as easy as detecting unique solutions*. Theoretical Computer Science, 47:85–93, 1986.

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module I

Question 1 : 20 marks

Question 2 : 20 marks

Module II

Question 3 : 20 marks

Question 4: 20 marks

Module III

Question 5 : 20 marks

Question 6: 20 marks

Module IV

Question 7 : 20 marks

Question 8: 20 marks

MCS10 203 ADVANCED LANGUAGE TECHNOLOGIES

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

Objective:

Gives the students an introduction to natural language processing, information retrieval, multilinguality and speech processing. It also discusses the applications like machine translation, natural language generation etc.

Module 1. Introduction (13 hours)
Natural Language Processing – Linguistic Background **–** Spoken Language Input and Output Technologies – Written Language Input **–** Mathematical Methods **–** Statistical Modeling and Classification Finite State Methods Grammar For Natural Language Processing – Parsing – Semantic and Logic Form – Ambiguity Resolution – Semantic Interpretation.

Module 2. Information Retrieval (14 hours)
Information Retrieval Architecture – Indexing– Storage – Compression Techniques – Retrieval Approaches – Evaluation – Search Engines– Commercial Search Engine Features– Comparison– Performance Measures – Document Processing – NLP Based Information Retrieval – Information Extraction. Categorization – Extraction Based Categorization– Clustering– Hierarchical Clustering– Document Classification and Routing– Finding and Organizing Answers From Text Search – Use Of Categories and Clusters For Organizing Retrieval Results – Text Categorization and Efficient Summarization Using Lexical Chains – Pattern Extraction.

Module 3. Generic Issues (13 hours)
Multilinguality – Multilingual Information Retrieval and Speech Processing – Multi modality – Text and Images – Modality Integration – Transmission and Storage – Speech Coding– Evaluation Of Systems – Human Factors and User Acceptability.

4. Applications (12 hours)

Machine Translation – Transfer Metaphor – Interlingua and Statistical Approaches – Discourse Processing – Dialog and Conversational Agents – Natural Language Generation – Surface Realization and Discourse Planning.

Text Books:

1. Daniel Jurafsky and James H. martin, "Speech and Language Processing", 2000.
2. Ron Cole, J.Mariani, et al., "Survey of the State of the Art in Human Language Technology", Cambridge University Press, 1997.

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module I

Question 1 : 20 marks

Question 2 : 20 marks

Module II

Question 3 : 20 marks

Question 4: 20 marks

Module III

Question 5 : 20 marks

Question 6: 20 marks

Module IV

Question 7 : 20 marks

Question 8: 20 marks

ELECTIVE II

MCS10 204 (A) Data Compression

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

Objective:

To familiarize the students with the different data compression techniques for image compression, audio compression, video compression etc. It also gives a comparison of different compression algorithms and their implementation.

Module 1: (12 hrs)
Introduction, Basic Techniques, Dictionary Methods

Module II: (13 hrs)
Image Compression, Transform based techniques, Wavelet Methods, adaptive techniques

Module III: (14 hrs)
Video compression, Audio Compression, Fractal techniques.

Module IV: (14 hrs)
Comparison of compression algorithms. Implementation of compression algorithms.

References

1. David Solomon, *Data compression: the complete reference*, 2nd edition, Springer-verlag, New York. 2000.
2. Stephen Welstead, *Fractal and wavelet Image Compression techniques*, PHI, NewDelhi-1, 1999.

3. Khalid Sayood, *Introduction to data compression*, Morgan Kaufmann Publishers, 2003 reprint.

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module I

Question 1 : 20 marks

Question 2 : 20 marks

Module II

Question 3 : 20 marks

Question 4: 20 marks

Module III

Question 5 : 20 marks

Question 6: 20 marks

Module IV

Question 7 : 20 marks

Question 8: 20 marks

MCS10 204 (B) Cryptocomplexity

Prerequisite: Analysis of Algorithms

Teaching scheme:

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

Objective:

To provide the students with the concepts of cryptology and complexity theory. Discusses the different protocols like diffie hellman, elgamal etc and randomized algorithms and complexity classes.

Module I: (12 hours)

Review of Relevant Mathematics, Complexity Theory, Foundations of Cryptology, Hierarchies based on NP.

Module II: (13 hrs)

Randomized algorithms and Complexity classes, probabilistic Polynomial time classes, Quantifiers, Graph Isomorphism and lowness.

Module III: (13 hrs)

RSA Cryptosystem, primality and factoring, Primality Tests, Factoring Methods, Security of RSA.

Module IV: (14 hrs)

Diffie Hellman's, ElGamal's and other protocols, Arthur Merlin Games and Zero knowledge.

References

1. Jorg Roth, *Complexity Theory and Cryptology – An introduction to cryptocomplexity*, Springer, 2005.
2. H. Anton, *Elementary Linear algebra*, John Wiley and Sons, New York, eighth edition, 2000.
3. G. Brassard. *A note on the complexity of cryptography*, IEEE Transactions on Information Theory, 25(2):232-233, 1979

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per

subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module I

Question 1 : 20 marks

Question 2 : 20 marks

Module II

Question 3 : 20 marks

Question 4: 20 marks

Module III

Question 5 : 20 marks

Question 6: 20 marks

Module IV

Question 7 : 20 marks

Question 8: 20 marks

MCS10 204 (C) Information Theory

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

Objective:

To familiarize the concepts in information theory such as entropy and loss less source coding, channel capacity and coding theorem, rate distortion theory etc.

Module 1: Entropy and Loss less Source coding (12 hours)
Entropy- Memory less sources- Markov sources- Entropy of a discrete Random variable- Joint, conditional and relative entropy- Mutual Information and conditional mutual information- Chain relation for entropy, relative entropy and mutual Information- Lossless source coding- Uniquely decodable codes- Instantaneous codes- Kraft's inequality - Optimal codes- Huffman code- Shannon's Source Coding Theorem.

Module 2: Channel Capacity and Coding Theorem (14 hours)
Asymptotic Equipartition Property (AEP)- High probability sets and typical sets- Method of typical sequence as a combinatorial approach for bounding error probabilities. Channel Capacity- Capacity computation for some simple channels- Arimoto-Blahut algorithm- Fano's inequality- Shannon's Channel Coding Theorem and its converse- Channels with feed back- Joint source channel coding Theorem.

Module 3: Continuous Sources and Channels (14 hours)
Differential Entropy- Joint, relative and conditional differential entropy- Mutual information- Waveform channels- Gaussian channels- Mutual information and Capacity calculation for Band limited Gaussian channels- Shannon limit- Parallel Gaussian Channels-Capacity of channels with colored Gaussian noise-
Water filling.

Module 4: Rate Distortion Theory (12 hours)
Introduction - Rate Distortion Function - Properties - Continuous Sources and Rate Distortion measure - Rate Distortion Theorem - Converse - Information Transmission Theorem - Rate Distortion Optimization.

Text Book
T. Cover and Thomas, “Elements of Information Theory”, John Wiley & Sons 1991.

Reference Books
1.Robert Gallager, “Information Theory and Reliable Communication”, John Wiley & Sons.
2.R. J. McEliece, “The theory of information & coding”, Addison Wesley Publishing Co., 1977.

3.T. Bergu, “Rate Distortion Theory a Mathematical Basis for Data Compression” PH Inc. 1971.
4.Special Issue on Rate Distortion Theory, IEEE Signal Processing Magazine, November 1998.

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module I

Question 1 : 20 marks

Question 2 : 20 marks

Module II

Question 3 : 20 marks

Question 4: 20 marks

Module III

Question 5 : 20 marks

Question 6: 20 marks

Module IV

Question 7 : 20 marks

Question 8: 20 marks

ELECTIVE III

MCS10 205 (A) ADVANCED NETWORKING TECHNOLOGIES

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

Objective:

To introduce the concepts in network troubleshooting, network OS, IP next generation, Storage Area Networking, Optical Network etc. It also gives an overview of the network monitoring and control protocols.

Module 1. Network Troubleshooting, Components and OS (12 Hrs)
Troubleshooting and Management – Host Configuration, Connectivity, Testing Path Characteristics, Packet Capture, Device Discovery and Mapping – Troubleshooting Strategies – Components – Bridges, Routers and Switches – Network OS – Novel Netware, Linux, Windows 2000 and Macintosh OS.

Module 2. IPv6 and SAN (14 Hrs)
IP next generation – Addressing, Configuration, Security, QOS - VOIP- Issues in VOIP – Distributed Computing and Embedded System – Ubiquitous Computing - VPN.- Understanding Storage Networking – Storage Networking Architecture – The Storage in Storage Networking, The Network in Storage Networking, Basic Software for Storage Networking – SAN Implementation Strategies.

Module 4. Optical Network (13 Hrs)
WDM – WDM Network Design – Control And Management – IP Over WDM – Photonic Packet Switching.

Module 5. Network Management (13 Hrs)
Monitoring and Control – SNMP, V2, V3, RMON, RMON2.

References:

1. John D. Sloan , ”Network Troubleshooting”, Aug’2001 – O’Reilly.
2. Radic Perlman, “Interconnections: Bridges, Routers, Switches and Internetworking Protocols “ ,Second Edition, Addison Wesley professional, 1999.
3. Andrew S. Tanenbaum, ”Modern operating system “, Pearson Education
4. Silvano gai, ” Internetworking IPV6 with CISCO Routers” , McGraw– Hill computer communication series.

5. Tom clark, ” Designing Storage Area Network: A practical reference for implementing fiber channel and IP SAN’s ”, Second Edition, Addison Wesley professional ,2003.
6. Richard M Barker Paul Massiglia – John Wiley & Sons inc, “Storage Area Network Essentials: A complete guide to understanding and implementing SANS“ ,2001.

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module I

Question 1 : 20 marks

Question 2 : 20 marks

Module II

Question 3 : 20 marks

Question 4: 20 marks

Module III

Question 5 : 20 marks

Question 6: 20 marks

Module IV

Question 7 : 20 marks

Question 8: 20 marks

MCS10 205 (B) Bio-Informatics

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

Objective:

Bio- Informatics is an emerging field and this course will give the students an introduction to this area and various concepts related to bio- informatics such as search engines, data mining, pattern matching etc.

Module 1. Introductory concepts (14 Hrs)
The Central Dogma – The Killer Application – Parallel Universes – Watson's Definition – Top Down Versus Bottom up – Information Flow – Convergence – Databases – Data Management – Data Life Cycle – Database Technology – Interfaces – Implementation – Networks – Geographical Scope – Communication Models – Transmissions Technology – Protocols – Bandwidth – Topology – Hardware – Contents – Security – Ownership – Implementation – Management.

Module 2. Search Engines and Data Visualization (12 Hrs)
The search process – Search Engine Technology – Searching and Information Theory – Computational methods – Search Engines and Knowledge Management – Data Visualization – sequence visualization – structure visualization – user Interface – Animation Versus simulation – General Purpose Technologies.

Module 3. Statistics and Data Mining (12 Hrs)
Statistical concepts – Microarrays – Imperfect Data – Randomness – Variability – Approximation – Interface Noise – Assumptions – Sampling and Distributions – Hypothesis Testing – Quantifying Randomness – Data Analysis – Tool selection statistics of Alignment – Clustering and Classification – Data Mining – Methods – Selection and Sampling – Preprocessing and Cleaning – Transformation and Reduction – Data Mining Methods – Evaluation – Visualization – Designing new queries – Pattern Recognition and Discovery – Machine Learning – Text Mining – Tools.

Module 4. Pattern Matching (14 Hrs)
Pair wise sequence alignment – Local versus global alignment – Multiplesequence alignment – Computational methods – Dot Matrix analysis – Substitution matrices – Dynamic Programming – Word methods – Bayesian methods – Multiple sequence alignment – Dynamic Programming – Progressive strategies – Iterative strategies – Tools – Nucleotide Pattern Matching – Polypeptide pattern matching – Utilities – Sequence Databases. Drug Discovery – components – process – Perspectives – Numeric considerations – Algorithms – Hardware – Issues – Protein structure – Ab Initio Methods – Heuristic methods – Systems Biology – Tools – Collaboration and Communications – standards - Issues – Security – Intellectual property.

Text books:

1. Bryan Bergeron, “Bio Informatics Computing”, Second Edition, Pearson Education, 2003.

References:

1. D. E. Krane and M. L. Raymer, Fundamental Concepts of Bioinformatics, Pearson Education, 2003.
2. T. K. Attwood and D. J. Parry-Smith, Introduction to Bioinformatics, Pearson Education, 2003.
3. J. H. Zar, Biostatistical Analysis, 4/e, Pearson Education, 1999.

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module I

Question 1 : 20 marks

Question 2 : 20 marks

Module II

Question 3 : 20 marks

Question 4: 20 marks

Module III

Question 5 : 20 marks

Question 6: 20 marks

Module IV

Question 7 : 20 marks

Question 8: 20 marks

MCS10 205 (C) Soft Computing

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

Objective:

To provide the students with the concepts of soft computing techniques such as neural networks, fuzzy systems, genetic algorithms etc.

Module 1. Introduction To Soft Computing And Neural Networks (12 Hrs)
Evolution of Computing - Soft Computing Constituents – From Conventional AI to Computational Intelligence - Adaptive Networks – Feed forward Networks – Supervised Learning Neural Networks – Radia Basis Function Networks - Reinforcement Learning – Unsupervised Learning Neural Networks – Adaptive Resonance architectures.

Module 2. Fuzzy Sets And Fuzzy Logic (13 Hrs)
Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations - Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Logic – Fuzzy Expert Systems – Fuzzy Decision Making.

Module 3. Neuro-Fuzzy Modeling (14 Hrs)
Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling – Classification and Regression Trees – Data Clustering Algorithms – Rulebase Structure Identification – Neuro-Fuzzy Control.

Module 4. Machine Learning (14 Hrs)
Machine Learning Techniques – Machine Learning Using Neural Nets – Genetic Algorithms (GA) – Applications of GA in Machine Learning - Machine Learning Approach to Knowledge Acquisition. Support Vector Machines for Learning – Linear Learning Machines – Support Vector Classification – Support Vector Regression - Applications.

Text Books:

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, “Neuro-Fuzzy and Soft Computing”, Prentice-Hall of India, 2003.
2. James A. Freeman and David M. Skapura, “Neural Networks Algorithms, Applications, and Programming Techniques”, Pearson Edn., 2003.

References:

1. George J. Klir and Bo Yuan, “Fuzzy Sets and Fuzzy Logic-Theory and Applications”, Prentice Hall, 1995.
2. Amit Konar, “Artificial Intelligence and Soft Computing”, First Edition,CRC Press, 2000.
3. Simon Haykin, “Neural Networks: A Comprehensive Foundation”, Second Edition Prentice Hall, 1999.
4. Mitchell Melanie, “An Introduction to Genetic Algorithm”, Prentice Hall, 1998.
5. David E. Goldberg, “Genetic Algorithms in Search, Optimization and Machine Learning”, Addison Wesley, 1997.

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module I

Question 1 : 20 marks

Question 2 : 20 marks

Module II

Question 3 : 20 marks

Question 4: 20 marks

Module III

Question 5 : 20 marks

Question 6: 20 marks

Module IV

Question 7 : 20 marks

Question 8: 20 marks

MCS 10 206(P) Seminar II

Hours per week: 2 hours practical **Credits:** 2

Objective:

To assess the debating capability of the student to present a technical topic. Also to impart training to a student to face audience and present his/her ideas and thus creating self esteem and courage that are essential for an engineer.

Each student is expected to present a seminar on a topic of current relevance in Computer Science and Engineering about 45 minutes. They are expected to refer current research and review papers from standard journals like ACM, IEEE, JPDC, IEE etc. - at least three cross references must be used - the seminar report must not be the reproduction of the original paper. A committee consisting of at least three faculty members shall assess the presentation of the seminar and award marks to the students based on merits of topic of presentation. Each student shall submit two copies of a write up of the seminar topic. One copy shall be returned to the student after duly certifying it by the chairman of the assessing committee and the other will be kept in the departmental library. Internal continuous assessment marks are awarded based on the relevance of the topic, presentation skill, quality of the report and participation.

Internal Continuous Assessment *(Maximum Marks-100)*

Presentation +Discussion	: 60
Relevance + Literature	: 10
Report	: 20
Participation	: 10

Total marks : 100

MCS 10 207(P) WEB TECHNOLOGY LAB

1. Scripting Languages- 2 Experiments
Dynamic HTML with JavaScript – Multimedia Objects – Cascading Style Sheets.

2. CGI Applications- 4 Experiments
Perl Programming – Cookies – Database Applications – XML and Web Applications – PHP – MySql Database – Apache Web Server

3. Java Network Programming -4 Experiments
I/O Streaming Models in Java – Socket Programming – Client/Server Model Protocol Simulation – Ping Simulation – Web Page Retrieval – RMI Single Call and Singleton Models – Content Handlers – RMI-IIOP and CORBA Distributed Applications.

4. Java and XML- 4 Experiments
Client/Server Applications – Document Object Models – SAX Models – XML and Databases – XML Parsers – Document Type Definitions – XSL – SOAP Protocol.

5. Multi Tier Applications -4 Experiments
Web Servers – Deployment of Servlets – Java Server Pages – Real Time Applications – Session Tracking Models – e-Business Applications – Handling Multimedia Data – Database Applications – Deployment of Enterprise Java Beans.

Internal Continuous Assessment *(Maximum Marks-100):*

Regularity & Class work - 30 marks

Record - 20 marks

Tests, Viva - 50 marks

SEMESTER 3

ELECTIVE IV

MCS10 301 (A) Digital Image Processing

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

Objective:

To introduce the students with the concepts of digital image processing fundamentals, image enhancement techniques, segmentation, feature analysis and their applications.

Module 1. Fundamentals Of Image Processing (12 Hrs)
Introduction – Steps in Image Processing Systems – Image Acquisition – Sampling and Quantization – Pixel Relationships – Colour Fundamentals and Models, File Formats, Image operations – Arithmetic, Geometric and Morphological.

Module 2. Image Enhancement (14 Hrs)
Spatial Domain Gray level Transformations Histogram Processing Spatial Filtering – Smoothing and Sharpening. Frequency Domain : Filtering in Frequency Domain – DFT, FFT, DCT – Smoothing and Sharpening filters – Homomorphic Filtering.
.

Module 3. Image Segmentation And Feature Analysis (14 Hrs)
Detection of Discontinuities – Edge Operators – Edge Linking and Boundary Detection – Thresholding – Region Based Segmentation – Morphological WaterSheds – Motion Segmentation, Feature Analysis and Extraction. Multi Resolution Analysis: Image Pyramids – Multi resolution expansion – Wavelet Transforms. Image Compression: Fundamentals – Models – Elements of Information Theory– Error Free Compression – Lossy Compression – Compression Standards.

Module 4. Applications of Image Processing (13 Hrs)
Image Classification – Image Recognition – Image Understanding – Video Motion Analysis – Image Fusion – Steganography – Digital Composting – Mosaics – Colour Image Processing..

REFERENCES:

1. Rafael C.Gonzalez and Richard E.Woods, “Digital Image Processing” Second Edition, Pearson Education, 2003.
2. Milan Sonka, Vaclav Hlavac and Roger Boyle, “Image Processing, Analysis and Machine Vision”, Second Edition, Thomson Learning, 2001
3. Anil K.Jain, “Fundamentals of Digital Image Processing”, Person Education, 2003.

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination: 100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module I

Question 1 : 20 marks

Question 2 : 20 marks

Module II

Question 3 : 20 marks

Question 4: 20 marks

Module III

Question 5 : 20 marks

Question 6: 20 marks

Module IV

Question 7 : 20 marks

Question 8: 20 marks

MCS10 301 (B) Research Methodology

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

Objective:

Gives students an insight into the steps to be followed in doing a research, provide an idea about technical report writing etc.

Module 1 - Research Methodologies (12 Hrs)
Introduction, Research and Scientific methods, Objectives and Motivation of Research, Criteria of Good Research, research Approaches, Significance of research, Type of Researches, Research methods VS Methodology, Research problems, Defining a research problem, Research Design, Sampling Design

Module 2 – Data Collection and Analysis (13 Hrs)
Collection of Primary Data, Observation method, Interview Method, Collection of data through Questionnaires and Schedules, Secondary Data, Processing operations, Statistics in research, Measures of central Tendency, Other methods of data collection, Collection of secondary data, Processing operations, Types of analysis, statistics in research, Dispersion, Asymmetry, relationship, Simple regression analysis, Partial correlation

Module-3 –Testing (14 Hrs)
Hypothesis-I - Introduction, Testing of Hypothesis, Procedure for hypothesis testing, Flow diagram for hypothesis testing, Measuring the power of hypothesis test, Tests of Hypothesis, Hypothesis testing of Means, Proportions, Correlation Coefficients, Chi-square test, Phi Coefficient, Hypothesis-II - Introduction, Nonparametric, Distribution-free Tests, Sign tests, Fisher-Irwin test, Spearman's Rank Correlation, Kendall's Coefficient of concordance

Module-4 – Report (14 Hrs)
Report writing – Introduction and Significant, Interpretation – Meaning, Techniques, and Precautions, Layout of research reports, Types of report, Mechanics and precautions of writing a research report, Computer role in research, computers and computer technology, computer system, Characteristics

Text Books

1. CR Kothari, "Research Methodologies – Methods and Techniques", Second Edition, New Age International

2. John W Best and James V Kahn, “ Research in Education”, Fifth Edition, PHI, New Delhi
3. Pauline V Young, Scienctific Social Surveys and Research, Third Editions, PHI New York

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module I

Question 1 : 20 marks

Question 2 : 20 marks

Module II

Question 3 : 20 marks

Question 4: 20 marks

Module III

Question 5 : 20 marks

Question 6: 20 marks

Module IV

Question 7 : 20 marks

Question 8: 20 marks

MCS10 301 (C) Wireless Communication Technologies

Prerequisite: Digital Communication Techniques

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

Objective:

To provide the students with the concepts of wireless communication technologies like cellular communication, spread spectrum and CDMA.

Module 1: Fading and Diversity (13 hours)
Wireless Channel Models- path loss and shadowing models- statistical fading models- Narrow band and wideband Fading models- Review of performance of digital modulation schemes over wireless channels- Diversity- Repetition coding and Time Diversity- Frequency and Space Diversity- Receive Diversity- Concept of diversity branches and signal paths- Combining methods- Selective diversity combining - Switched combining- maximal ratio combining- Equal gain combining- performance analysis for Rayleigh fading channels.

Module 2: Cellular Communication (12 hours)
Cellular Networks- Multiple Access: FDM/TDM/FDMA/TDMA- Spatial reuse- Co-channel interference Analysis- Hand over Analysis- Erlang Capacity Analysis- Spectral efficiency and Grade of Service- Improving capacity - Cell splitting and sectorization.

Module 3: Spread spectrum and CDMA(14 hours)
Motivation- Direct sequence spread spectrum- Frequency Hopping systems- Time Hopping.- Anti-jamming- Pseudo Random (PN) sequence- Maximal length sequences- Gold sequences- Generation of PN sequences.- Diversity in DS-SS systems- Rake Receiver- Performance analysis. Spread Spectrum Multiple Access- CDMA Systems- Interference Analysis for Broadcast and Multiple Access Channels- Capacity of cellular CDMA networks- Reverse link power control- Hard and Soft hand off strategies.

Module 4: Fading Channel Capacity(14 hours)
Capacity of Wireless Channels- Capacity of flat and frequency selective fading channels- Multiple Input Multiple output (MIMO) systems- Narrow band multiple antenna system model- Parallel Decomposition of MIMO Channels- Capacity of MIMO Channels. Cellular Wireless Communication Standards (5 hours) Second generation cellular systems: GSM specifications and Air Interface - specifications, IS 95 CDMA- 3G systems: UMTS & CDMA 2000 standards and specifications

Text Books

1. Andrea Goldsmith, “Wireless Communications”, Cambridge University press.
2. Simon Haykin and Michael Moher, “ Modern Wireless Communications”, Person

Education.

Reference Books

1. T.S. Rappaport, “Wireless Communication, principles & practice”, PHI, 2001.
2. G.L Stuber, “Principles of Mobile Communications”, 2nd edition, Kluwer Academic Publishers.
3. Kamilo Feher, 'Wireless digital communication', PHI, 1995.
4. R.L Peterson, R.E. Ziemer and David E. Borth, “Introduction to Spread Spectrum Communication”, Pearson Education.
5. A.J.Viterbi, “CDMA- Principles of Spread Spectrum”, Addison Wesley, 1995.

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module I

Question 1 : 20 marks

Question 2 : 20 marks

Module II

Question 3 : 20 marks

Question 4: 20 marks

Module III

Question 5 : 20 marks

Question 6: 20 marks

Module IV

Question 7 : 20 marks

Question 8: 20 marks

Elective V

MCS10 302 (A) High Speed Networks

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

Objective:

To familiarize the students with the concepts of high speed networks like frame relays, ATMs etc. Gives details about congestion control in high speed networks, discusses integrated and differentiated services etc.

Module 1. HIGH SPEED NETWORKS (13 Hrs)
Frame Relay Networks – Asynchronous transfer mode – ATM Protocol Architecture, ATM logical Connection, ATM Cell – ATM Service Categories – AAL. High Speed LAN's: Fast Ethernet, Gigabit Ethernet, Fibre Channel – Wireless LAN's. Queuing Analysis- Queuing Models – Single Server Queues – Effects of Congestion – Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks – Frame Relay Congestion Control.

Module 2. TCP AND ATM CONGESTION CONTROL (14 Hrs)
TCP Flow control – TCP Congestion Control – Retransmission – Timer Management – Exponential RTO backoff – KARN's Algorithm – Window management – Performance of TCP over ATM. Traffic and Congestion control in ATM – Requirements – Attributes – Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR rate control, RM cell formats, ABR Capacity allocations – GFR traffic management.

Module 3. INTEGRATED AND DIFFERENTIATED SERVICES(12 Hrs)
Integrated Services Architecture – Approach, Components, Services- Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ – Random Early Detection, Differentiated Services.

Module 4. PROTOCOLS FOR QoS SUPPORT (12 Hrs)
RSVP – Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms – Multiprotocol Label Switching – Operations, Label Stacking, Protocol details – RTP – Protocol Architecture, Data Transfer Protocol, RTCP.

Text Books:

1. William Stallings, “HIGH SPEED NETWORKS AND INTERNET”, Pearson Education, Second Edition, 2002.

References:

1. Warland & Pravin Varaiya, “HIGH PERFORMANCE COMMUNICATION NETWORKS”, Jean Harcourt Asia Pvt. Ltd., II Edition, 2001.
2. Irvan Pepelnjk, Jim Guichard and Jeff Apcar, “MPLS and VPN architecture”, Cisco Press, Volume 1 and 2, 2003.

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module I

Question 1 : 20 marks

Question 2 : 20 marks

Module II

Question 3 : 20 marks

Question 4: 20 marks

Module III

Question 5 : 20 marks

Question 6: 20 marks

Module IV

Question 7 : 20 marks

Question 8: 20 marks

MCS10 302 (B) Information Theory And Coding

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

Objective:

To provide the students with the concepts of information theory and coding such as noiseless coding, noisy coding, BCH codes, concatenated codes etc.

Module I: (14 hrs)
Introduction to probability, information, noiseless coding, noisy coding, cyclic redundancy checks,

Module II: (13 hrs)
Permutation of sets, finite fields, linear codes, bounds for codes.

Module III: (13 hrs)
Primitive polynomials, RS and BCH codes.

Module IV: (13 hrs)
Concatenated codes, curves and codes.

References:

1. P. Garrett, *The Mathematics of Coding Theory: Information, Compression, Error Correction and Finite Fields*, Pearson Education, 2004.
2. Shu Lin, Daniel J Costello, *Error Control Coding - Fundamentals and Applications*, Prentice Hall Inc. Englewood Cliffs.
3. San Ling, *Coding Theory – A First Course*. Cambridge Press, 2004.

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module I

Question 1 : 20 marks

Question 2 : 20 marks

Module II

Question 3 : 20 marks

Question 4: 20 marks

Module III

Question 5 : 20 marks

Question 6: 20 marks

Module IV

Question 7 : 20 marks

Question 8: 20 marks

MCS10 302 (C) Internet Models

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

Objective:

To provide the students with the concepts of mathematical models for the internet. The course gives an overview of characteristics of internet models, modeling a self managed internet etc.

Module I: (12 hours)
Definition and characteristics of mathematical models.

Module II: (13 hours)
Modeling the network - queuing systems, modeling the QoS for improvement. Mathematical models of fairness and stability**.**

Module III:**((13 hours)**
Modeling a self-managed internet. Moving away from the end to end concept. Modeling required in an untrustworthy world.

Module IV: (14 hours)
Modeling of an internet based application.

References

1. Harold Tipton, Micki Krause, *Information Security Management Handbook*, 5th Edition, Auerbach / CRC Press 2004

2. Seymour Bosworth, M E Kabay .*Computer Security Handbook*, 4th Edition. John Wiley, 2002.

3. Theo Dimitrakos, Fabio Martinelli, (Editors). *Formal Aspects in Security and Trust:* Proceedings of IFIP Workshop on Formal Aspects in Security and Trust (FAST) 2004, Springer 2005

4. Ali E Abdallah, Peter Ryan, Steve Schneider (Editors). *Formal Aspects of Security:* Proceedings of First International Conference, FASec 2002. LNCS 2629, Springer 2003

5. Markus Schumacher. *Security Engineering with patterns: origins, theoretical model, and new applications.* LNCS 2754, Springer.

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module I

Question 1 : 20 marks

Question 2 : 20 marks

Module II

Question 3 : 20 marks

Question 4: 20 marks

Module III

Question 5 : 20 marks

Question 6: 20 marks

Module IV

Question 7 : 20 marks

Question 8: 20 marks

MCS 10 303(P): Industrial Training

Teaching scheme: 1 hour per week
Credits: 1

The students have to undergo an industrial training of minimum two weeks in an industry during the semester break after second semester and complete within 15 calendar days from the start of third semester. The students have to submit a report of the training undergone and present the contents of the report before the evaluation committee constituted by the department. An internal evaluation will be conducted for examining the quality and authenticity of contents of the report and award the marks at the end of the semester.

Internal continuous assessment: Marks 50

MCS 10 304(P): MASTERS RESEARCH PROJECT (PHASE – I)

Teaching scheme: 22 hours per week
Credits: 6

Objective:

To improve the professional competency and research aptitude by touching the areas which otherwise not covered by theory or laboratory classes. The project work aims to develop the work practice in students to apply theoretical and practical tools/techniques to solve real life problems related to industry and current research.

The project work should be a project in computer science & engineering stream. The project work is allotted individually on different topics. The students shall be encouraged to do their project work in the parent institute itself. If found essential, they may be permitted to do their project outside the parent institute subject to the conditions in clause 10 of M.Tech regulations. Department will constitute an Evaluation Committee to review the project work. The Evaluation committee consists of at least three faculty members of which internal guide and another expert in the specified area of the project shall be two essential members.

The student is required to undertake the masters research project phase-I during the third semester and the same is continued in the 4th semester.(Phase-II). Phase-I consists of preliminary thesis work, two reviews of the work and the submission of preliminary report. First review would highlight the topic, objectives, methodology and expected results. Second review evaluates the progress of the work, preliminary report and scope of the work which is to be completed in the 4th semester.

Internal Continuous assessment:

First Review:

Guide	50 marks
Evaluation Committee	50 marks

Second review:

Guide	100 marks

Evaluation Committee	100 marks
Total	**300 marks**

SEMESTER 4

MCS10 401(P) : MASTERS RESEARCH PROJECT PHASE 2

Teaching scheme: 30 hours per week
Credits: 12

Objectives:
To improve the professional competency and research aptitude by touching the areas which otherwise not covered by theory or laboratory classes. The project work aims to develop the work practice in students to apply theoretical and practical tools/techniques to solve real life problems related to industry and current research.

Masters Research project phase-II is a continuation of project phase-I started in the third semester. Before the end of the fourth semester, there will be two reviews, one at middle of the fourth semester and other towards the end. In the first review, progress of the project work done is to be assessed. In the second review, the complete assessment (quality, quantum and authenticity) of the Thesis is to be evaluated. Both the reviews should be conducted by guide and Evaluation committee. This would be a pre qualifying exercise for the students for getting approval for the submission of the thesis. At least one technical paper is to be prepared for possible publication in journal or conferences. The technical paper is to be submitted along with the thesis. The final evaluation of the project will be external evaluation.

Internal Continuous assessment:

First review:

Guide	50 marks
Evaluation committee	50 marks

Second review:

Guide	100 marks
Evaluation committee	100 marks

End Semester Examination:

Project Evaluation by external examiner: 150 marks
Viva Voce by external / internal examiner: 150 marks(75 each)

Total:600 marks