UNIVERSITY OF CALICUT

M.Tech. DEGREE COURSE
COMPUTER SCIENCE AND ENGINEERING

Curricula, Scheme of Examinations and Syllabii
(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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Subject</th>
<th>Hours/week</th>
<th>Marks</th>
<th>Total marks</th>
<th>Sem-end exam duration - Hrs</th>
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#### 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

<table>
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<tr>
<th>Course Code</th>
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**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*
<table>
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<tr>
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**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
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<th>Sem–end exam</th>
<th>Total marks</th>
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NB: The student has to undertake the departmental work assigned by HOD
Semester I

MCS1010  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.


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

**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.

Module 1: (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**
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


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)

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

Module III: Optimization (13 hours)

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

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)

Module III (12 hours)

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
2. E. RICH, K.KNIGHT, Artificial Intelligence, 2/e, Tata McGraw Hill
3. WINSTON. P. H, LISP, Addison Wesley
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
Reference Books:

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
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 Cooperative and Non-Cooperative 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)

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
**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)
References

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
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)

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

**Text Books:**


**Reference Books:**


**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:** 43 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)**

**References**

**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**
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)

Module 2. Information Retrieval (14 hours)

Module 3. Generic Issues (13 hours)
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:

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

**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:** 43 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**

**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: 43 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)

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

Reference Books

**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 a 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)

Module 2. IPv6 and SAN (14 Hrs)

Module 4. Optical Network (13 Hrs)

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

References:
3. Andrew S. Tanenbaum, ”Modern operating system“, Pearson Education


**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)

Module 2. Search Engines and Data Visualization (12 Hrs)

Module 3. Statistics and Data Mining (12 Hrs)

Module 4. Pattern Matching (14 Hrs)
Text books:

References:

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
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)

Module 2. Fuzzy Sets And Fuzzy Logic (13 Hrs)

Module 3. Neuro-Fuzzy Modeling (14 Hrs)

Module 4. Machine Learning (14 Hrs)

Text Books:
**References:**


**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
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)**

<table>
<thead>
<tr>
<th>Component</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presentation + Discussion</td>
<td>60</td>
</tr>
<tr>
<td>Relevance + Literature</td>
<td>10</td>
</tr>
<tr>
<td>Report</td>
<td>20</td>
</tr>
<tr>
<td>Participation</td>
<td>10</td>
</tr>
</tbody>
</table>
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

3. Java Network Programming -4 Experiments

4. Java and XML- 4 Experiments

5. Multi Tier Applications -4 Experiments

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: 43 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)

Module 2. Image Enhancement (14 Hrs)

Module 3. Image Segmentation And Feature Analysis (14 Hrs)

Module 4. Applications of Image Processing (13 Hrs)

REFERENCES:
**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: 43 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

3. Pauline V Young, Scientific 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)

Module 2: Cellular Communication (12 hours)

Module 3: Spread spectrum and CDMA(14 hours)

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
2. Simon Haykin and Michael Moher, “ Modern Wireless Communications”, Person
Education.
Reference Books

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)

Module 2. TCP AND ATM CONGESTION CONTROL (14 Hrs)

Module 3. INTEGRATED AND DIFFERENTIATED SERVICES(12 Hrs)

Module 4. PROTOCOLS FOR QoS SUPPORT (12 Hrs)
Text Books:

References:

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:

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


**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
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:
<table>
<thead>
<tr>
<th>Guide</th>
<th>100 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation committee</td>
<td>100 marks</td>
</tr>
</tbody>
</table>

**End Semester Examination:**

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

**Total:** 600 marks