Introduction

The MSc (IT) course is a two year, four semester full time course leading to the Master’s degree in Information Technology (M. Sc. Information Technology). It is affiliated to the Goa University.

- Purpose
  The purpose of this course is to empower students towards a career in Academic Research in Information Technology and towards a career in the IT industry.

- Prerequisites
  Admission to the two year, four semester, full time course leading to the degree of Master’s degree in Information Technology (M. Sc. Information Technology), is open to any candidate satisfying the following conditions:
  - B.Sc (Computer Science/Mathematics/Statistics)/BCA with 55% at Degree Level.

  The College admits students based on an entrance test conducted by the college. Students are admitted to M. Sc. (Information Technology) program once a year; candidates who have appeared for the degree examination and are awaiting results are also eligible to apply. In case such candidates are selected and their results are not available at the time of admission, these candidates will be given provisional admission and confirmed on submission of valid requirements within the last date prescribed by the university. The intake capacity for the first year admission for this course is 20.

- Credits (theory, tutorials, practicals)
There is an in-semester element and an end-semester element in the evaluation of the performance of the candidates. The in-semester evaluation is of 60 marks and end-semester evaluation is of 40 marks.

For a theory course the in-semester evaluation is a continuous assessment of 60 marks. At least 50 marks of the in-semester evaluation are assigned by conducting one or more class tests. The remaining 10 marks are evaluated through quizzes and assignments.

For a laboratory course, the assessment is continuous with 60 marks for the in-semester evaluation, consisting of laboratory experiments and assignments.

For a laboratory course, the end-semester examination is conducted by the Controller of Examinations, Goa University. Two examiners namely internal examiner and external examiner conduct the examination jointly. The Internal examiner is the one who has taught that course. The External examiner is appointed as per the ordinances of other M.Sc. courses of Goa University for this purpose. The end-semester laboratory examination is of 40 marks. The end-semester examination is assessed by on-line examination and viva-voce jointly conducted by internal and external examiner.

The fourth semester consists of a project for one full semester. The project is required to contain an implementation, which is demonstrable. Each project has an internal guide from that teaching institution. An internal and an external examiner jointly evaluate the project. The internal examiner is the internal guide of the project. An external examiner is appointed as per the ordinances for other M.Sc. courses of Goa University. The fourth semester project carries only qualitative evaluation such as excellent/very good/ good/pass/fail. A student getting a fail grade has to repeat the project. There is a Seminar paper that is to be presented at the end of the fourth semester.

The total number of credits for theory subjects is 54. The total number of credits for practical subjects is 24. The Seminar paper consists of 2 credits. The Project does not carry any credit. The total number of credits for the MSc (IT) course is 80.

- **Number of semesters, how the courses are distributed**

The MSc (IT) course consists of 4 semesters. The papers are distributed in the following manner:

<table>
<thead>
<tr>
<th>Semester –I</th>
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<tbody>
<tr>
<td>Paper</td>
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<tr>
<td>code</td>
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<tr>
<td>MIT 11</td>
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<td>MIT 16</td>
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<td>MIT 17</td>
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**Semester –II**

<table>
<thead>
<tr>
<th>code</th>
<th>Subject</th>
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<tbody>
<tr>
<td>MIT 21</td>
<td>Design and Analysis of Algorithms</td>
</tr>
<tr>
<td>MIT 22</td>
<td>Machine Learning</td>
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<tr>
<td>MIT 23</td>
<td>Speaking Skills course</td>
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<tr>
<td>MIT 24</td>
<td>Elective -I</td>
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<tr>
<td>MIT 25</td>
<td>Elective -II</td>
</tr>
<tr>
<td>MIT 26</td>
<td>Lab - Machine Learning</td>
</tr>
<tr>
<td>MIT 27</td>
<td>Lab - Statistical Computing using R</td>
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</table>

**Semester –III**
<table>
<thead>
<tr>
<th>Paper code</th>
<th>Paper name</th>
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<tbody>
<tr>
<td>MIT 31</td>
<td>System Security</td>
</tr>
<tr>
<td>MIT 32</td>
<td>Personality Enhancement + Presentation Skills</td>
</tr>
<tr>
<td>MIT 33</td>
<td>Elective-III</td>
</tr>
<tr>
<td>MIT 34</td>
<td>Elective -IV</td>
</tr>
<tr>
<td>MIT 35</td>
<td>Elective -V</td>
</tr>
<tr>
<td>MIT 36</td>
<td>Lab - Enterprise Java with Frameworks</td>
</tr>
<tr>
<td>MIT 37</td>
<td>Lab - System Security</td>
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</table>

**Semester –IV**

<table>
<thead>
<tr>
<th>Paper code</th>
<th>Paper name</th>
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<tbody>
<tr>
<td>MIT 41</td>
<td>Seminar</td>
</tr>
<tr>
<td>MIT 42</td>
<td>Project Work</td>
</tr>
</tbody>
</table>
M. Sc. (MSc-IT) List of Courses

In the following tables, L refers to lectures, T to tutorials and P to practicals. Description of a course appears on the page number listed in the tables.

## Compulsory Courses

<table>
<thead>
<tr>
<th>Course Number and Name</th>
<th>L-T-P (hours/week)</th>
<th>Credits</th>
<th>Page number</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIT 11 Advance Course in Theoretical Computer Science</td>
<td>3-1-0</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>MIT 12 Distributed Systems</td>
<td>3-1-0</td>
<td>4</td>
<td>8</td>
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<tr>
<td>MIT 13 Writing Skills course</td>
<td>1-1-0</td>
<td>2</td>
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<tr>
<td>MIT 14 Information Retrieval</td>
<td>3-1-0</td>
<td>4</td>
<td>11</td>
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<tr>
<td>MIT 15 Applied Probability and Statistics</td>
<td>3-1-0</td>
<td>4</td>
<td>13</td>
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<tr>
<td>MIT 16 Lab – Advanced Core Java</td>
<td>0-1-3</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>MIT 17 Lab – Information Retrieval</td>
<td>0-1-3</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>MIT 21 Design and Analysis of Algorithms</td>
<td>3-1-0</td>
<td>4</td>
<td>15</td>
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<tr>
<td>MIT 22 Machine Learning</td>
<td>3-1-0</td>
<td>4</td>
<td>16</td>
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<tr>
<td>MIT 23 Speaking Skills course</td>
<td>1-1-0</td>
<td>2</td>
<td>18</td>
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<tr>
<td>MIT 26 Lab – Machine Learning</td>
<td>0-1-3</td>
<td>4</td>
<td>18</td>
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<tr>
<td>MIT 27 Lab – Statistical Computing using R</td>
<td>0-1-3</td>
<td>4</td>
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<tr>
<td>MIT 31 System Security</td>
<td>3-1-0</td>
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</tr>
<tr>
<td>MIT 32 Personality Enhancement + Presentation Skills</td>
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<tr>
<td>MIT 36 Lab – Enterprise Java with Frameworks</td>
<td>0-1-3</td>
<td>4</td>
<td>22</td>
</tr>
<tr>
<td>MIT 37 Lab – System Security</td>
<td>0-1-3</td>
<td>4</td>
<td>22</td>
</tr>
<tr>
<td>MIT 41 Seminar</td>
<td>1-1-0</td>
<td>2</td>
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<tr>
<td>MIT 42 Project work</td>
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## Optional Courses

<table>
<thead>
<tr>
<th>Course Number and Name</th>
<th>L-T-P</th>
<th>Credits</th>
<th>Page Number</th>
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</thead>
<tbody>
<tr>
<td>1 Multimedia Systems</td>
<td>3-1-0</td>
<td>4</td>
<td>23</td>
</tr>
<tr>
<td>2 Software Metrics &amp; Project Management</td>
<td>3-1-0</td>
<td>4</td>
<td>25</td>
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<tr>
<td></td>
<td>Course Title</td>
<td>Credits</td>
<td>Lecture</td>
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<tr>
<td>3</td>
<td>Soft Computing</td>
<td>3-1-0</td>
<td>4</td>
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<tr>
<td>4</td>
<td>Database Management using PHP and MySQL</td>
<td>3-1-0</td>
<td>4</td>
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<tr>
<td>5</td>
<td>Web Technology with JavaScript and AJAX</td>
<td>3-1-0</td>
<td>4</td>
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<tr>
<td>6</td>
<td>Object-Oriented Analysis &amp; Design using UML</td>
<td>3-1-0</td>
<td>4</td>
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<tr>
<td>7</td>
<td>Mobile Computing</td>
<td>3-1-0</td>
<td>4</td>
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<tr>
<td>8</td>
<td>Introduction to Data Compression</td>
<td>3-1-0</td>
<td>4</td>
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<tr>
<td>9</td>
<td>Embedded Systems Design</td>
<td>3-1-0</td>
<td>4</td>
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<td>10</td>
<td>Compiler Design</td>
<td>3-1-0</td>
<td>4</td>
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<tr>
<td>11</td>
<td>Introduction to Computer Graphics</td>
<td>3-1-0</td>
<td>4</td>
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<tr>
<td>12</td>
<td>Network Design, Implementation and Administration</td>
<td>3-1-0</td>
<td>4</td>
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<tr>
<td>13</td>
<td>Operating System kernel and network programming</td>
<td>3-1-0</td>
<td>4</td>
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<tr>
<td>14</td>
<td>Optimization Techniques</td>
<td>3-1-0</td>
<td>4</td>
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<tr>
<td>15</td>
<td>Natural Language Processing</td>
<td>3-1-0</td>
<td>4</td>
</tr>
<tr>
<td>16</td>
<td>Component based Software development</td>
<td>3-1-0</td>
<td>4</td>
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<tr>
<td>17</td>
<td>Image Processing</td>
<td>3-1-0</td>
<td>4</td>
</tr>
<tr>
<td>18</td>
<td>Data mining and Data warehousing</td>
<td>3-1-0</td>
<td>4</td>
</tr>
</tbody>
</table>
Syllabus of the M. Sc. IT Curriculum

Compulsory Courses

MIT11- Advanced Course in Theoretical Computer Science

Automata Theory
Definition, Description, Transition systems, Acceptability of a string by finite automaton, NDFA, equivalence of DFA & NDFA, Conversion of NDFA to DFA, Mealy and Moore Machines, Minimization of Finite Automata

Formal Languages
Basic Definitions, Chomsky Classification of Languages, Languages and their relation, recursive and recursively enumerable sets, operations on languages, languages and automata

Regular Sets and Regular Grammars
Regular expressions, finite automata and regular expressions, pumping lemma for regular sets, application of pumping lemma, closure properties of regular sets, regular sets and regular grammars

Context-free languages
Context-free languages and derivation trees, ambiguity in CFG, Simplification of CFG, Normal forms for CFG, Pumping lemma for context free languages

Pushdown Automata, Turing Machines and Linear Bounded Automata
Basic definitions, Acceptance by PDA, Turing machine model and its representation, language acceptability by TM, Design of TM, Variants of Turing Machines

Computability theory
Church-Turing Thesis, Decidability, Halting problem, Reducibility, recursion theorem

Complexity Theory
Time and space measures, complexity classes P,NP,L,NL and PSPACE, complete problems, provably hard problems, interactive proof systems

List of Books
MIT 12-Distributed Systems

1. Introduction to Distributed System:
   Goals, Hardware concepts, Software concepts and Client-Server model. Examples
   of distributed systems- The Internet; Intranets; Mobile and ubiquitous computing.

   Challenges: Heterogeneity; Openness; Security; Scalability; Failure handling;
   Concurrency; Transparency, Types of distributed systems.

2. Communication:
   Layered protocols, Message-oriented communication, Stream-oriented
   communication. Client-server communication, Group communication - External
   data representation and marshalling, Communication between distributed objects,
   Remote procedures call, Events and notification, RMI.


4. Naming: Naming entities, Locating mobile entities, Removing un-referenced entities.
   Names, Identifiers and Addresses, Flat Naming, Structures Naming, Attribute Based Naming.

5. Synchronization: Clock synchronization, Logical clocks, Global state, Election algorithms, Mutual exclusion.

6. Transactions and Concurrency Control: Introduction, Transactions, Nested transactions, Locks, Optimistic concurrency control, Timestamp ordering

7. Distributed Transactions: Introduction, Flat and nested distributed transactions, Atomic commit protocols, Concurrency control in distributed transactions,
1. **Consistency and Replication:** Introduction, Data centric consistency models, Client centric consistency models, Distribution protocols, Consistency protocols.

2. **P2P systems**

10. **Case Study:** J2EE, .NET framework

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**List of Books**


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**MIT13-Writing Skills Course**

This course focuses on development of essential writing skills by raising awareness of the need for writing abilities and enhancing it with focused approach. It then proceeds to enable students to practice and reflect upon the conventions of written texts. In addition, the course will help the students become familiar with, and enhance skills related to critique, argumentation and research-based writing and technical writing. Students will acquire an awareness of and ability to use effectively the discourse patterns of Academic, Business and Technical English. This will improve critical reading and thinking skills, and give candidates an opportunity to develop their writing process through generating ideas, drafting, and its improvement. They will learn to take into consideration the expectations of their readership with regard to their writing. Upon completion of the course the students will be familiar with the conventions of writing reports or research papers, proposals, project reports, assignments and so on in the chosen field of study.

**Objectives:**

- To understand the essential elements of Business & Technical Writing
- To understand common business document formats
- To learn how to make one's writing better, faster and more successful
Contents:

Introduction & theory of Written Communication

The Writing process

Academic Writing

Introduction to academic writing
Features of academic writing
Development of thesis
Avoiding plagiarism

Business Writing

Writing proposals
Writing long reports

Writing short reports including analysis and presentation of data
Documentation and document design

Technical Writing

Defining technical writing, including genre understanding and structure
Rhetorical & stylistic elements necessary for successful scientific and technical communication
Communication of knowledge and information through various means to audiences ranging from experts to laypersons
Critical thought & writing

Defining critical thinking

Various activities involved in critical thought

The development of critical thinking

Critical thought as a genre of life

MIT14-Information Retrieval


Index construction. Postings size estimation, sort-based indexing, dynamic indexing, positional indexes, n-gram indexes, distributed indexing, real-world issues.


Computing scores in a complete search system: Components of an IR system. Efficient vector space scoring. Nearest neighbor techniques, reduced dimensionality approximations, random projection.


K Nearest Neighbors, Decision boundaries, Vector space classification using centroids. Comparative results.


**List of Books**


Managing Gigabytes, by I. Witten, A. Moffat, and T. Bell.


Finding Out About, by R. Belew.

Mining the Web, by S. Chakrabarti.
Mit15- Applied Probability and Statistics

Introduction
Probability models, sample space events, algebra of events, graphical methods of representing events, probability axioms, combinational problems, conditional probability, independence of events, Baye's rule, Bernoulli trials.

Discrete random variables
Introduction, random variables and their spaces, the probability mass function, distribution functions, special discrete distributions, analysis of program, the probability generating function, Discrete Random Vectors, independent random variables.

Continuous random variables
Introduction, the exponential distribution, some important distribution, functions of a random variable, jointly distributed random variables, distributions of sums, functions of normal random variables.

Expectation
Introduction moments, expectation of functions of more than one random variable, moments and transforms of some important distributions, computations of mean time to failure, inequalities and limits theorems.

Conditional Distribution and Conditional Expectation
Conditional Expectation,

Statistical Inference
Introduction, Parameter Estimation, Hypothesis testing: z, t, chi square, F test, Regression, correlation and analysis of variance: Introduction, least squares curve fitting, the coefficient of Determination, confidence Intervals in linear Regression, correlation analysis, simple nonlinear regression, Higher dimensional least-squares fit, Analysis of variance;
Non parametric tests: sign test, u test, Rank test, Median test

Statistical Quality Control
Control charts, Mean chart, R chart, sigma chart, C chart.

List of Books
2. Sheldon M. Ross, *Probability*,

**MIT16 Lab – Advanced Core Java**

1. Review of elementary OO concepts using Java
2. Exception Handling
3. Assertions
4. Collection and Generics Framework
5. I/O and N IO
6. Serialization
7. Reflection
8. Threading
9. Swing
10. RMI

**MIT17 Lab – Information Retrieval**

Utilization of HADOOP or any similar platform to implement:

- A data collection system for managing large distributed systems.
- A scalable, distributed database that supports structured data storage for large tables.
- A data warehouse infrastructure that provides data summarization and ad hoc querying.
- A software framework for distributed processing of large data sets on compute clusters.
- A high-level data-flow language and execution framework for parallel computation.
- A high-performance coordination service for distributed applications.
MIT21-Design and Analysis of Algorithms

Introduction
The Role of Algorithm in computing, Framework for design and analysis of algorithms, Growth of functions: asymptotic notation; Recurrences: substitution method, recursion-tree method, master method; Probabilistic analysis and randomized algorithms, indicator random variables.

Advanced Design and Analysis Techniques
Dynamic programming: assembly line scheduling, matrix-chain multiplication, elements of DP, longest common subsequence;
Greedy algorithms: activity-selection problem, elements of greedy strategy, Huffman codes;
Amortized analysis: aggregate analysis, accounting method, potential method, dynamic tables

Graph Algorithms
Elementary graph algorithms; Minimum spanning tree: growing a spanning tree, Kruskal and Prim algorithm; Single-source shortest paths: Bellman-ford algorithm, Dijkstra’s algorithm. All pairs shortest paths: shortest paths and matrix multiplication, floyd-warshall algorithm.

Number theoretic algorithms:
GCD, Modular arithmetic, Chinese remainder theorem, RSA, Primality testing

String matching:
Naïve algorithm, Rabin-Karp algorithm

Computational geometry:
Line segment properties, intersection, finding convex hull, finding closest pair of points

NP-Completeness:
Polynomial time, polynomial time verification, NP-completeness and reducibility
Approximation algorithms:
The vertex cover problem, Traveling salesman problem, the set-covering problem

Main Reading

List of Books:
3) Richard Gilberg & Behrouz Forouzan, Data Structure: a Pseudo code Approach,

MIT22-Machine Learning

Problems, Problem Spaces and Search: Defining the problem as a State space search, Production systems, Problem characteristics, Production system characteristics, Issues in the design of search problems

Heuristic search techniques: Generate and test, Hill climbing, Best First search, Problem definition, Constraint satisfaction, Means-ends analysis

Knowledge representation using predicate logic: Representing simple facts in logic, Representing instants and is a relationship, Computable functions and predicates, Resolution, Natural deduction.

Representing knowledge using rules: procedural versus declarative knowledge, logic programming, forward versus backward programming, Matching, Control knowledge.
Symbolic reasoning under uncertainty: Introduction to non monotonic reasoning, logics for non monotonic reaasoning, augmenting a problem solver, implementing using depth first search and breadth first search

Statistical reasoning: Probablility and Bayes theorem, certainty factors and rule based system, Bayesian networks, Dempster Shafer theory, Fuzzy logic.


Decision tree learning: Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithms, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning

Artificial neural networks: Neural networks representation, appropriate problems for neural network learning, Perceptrons, Multilayer networks and the back propagation algorithms, remarks on the back propagation rule, an illustrative example: Face recognition


List of Books:

1. Stuart Russell and Peter Norvig, Artificial Intelligence – A modern Approach, Pearson Education
3. Elaine Rich and Kevin Knight, Artificial Intelligence, TMH
4. P.N. Tan, M. Steinbach and V.Kumar, Introduction to Data mining, Pearson India, 2007
5. Machine Learning Applications in Software Engineering by Du Zhang & Jeffrey J P Tsai
MIT23-Speaking Skills Course

**Objectives:**
To increase personal confidence in delivering speeches to small & large audiences
To understand and gain non-verbal skills essential to effective speaking.
To develop the abilities required to present, inform, negotiate & persuade.
Various facets of speaking skills will be taught, from public speaking to conducting a discussion.

**Contents:**
Introduction & theory of verbal communication
Features of verbal communication
Listening skills

**Public speaking**
Preparation for public speaking
Delivery of speech

**Meetings / group activity**
Team work
Leadership skills
Conducting a discussion

**MIT26-Lab – Machine Learning**
Models for static and dynamic problems, for either classification, regression or density estimation
Building an online learning community
Machine Learning in software metrics – characterizing software as faulty or not, detecting faults in software
MIT27-Lab-Statistical Computing using R


List of Books:

1. Statistical computing with R, Maria L. Rizzo, Bowling Green State University, Ohio, Series: Chapman & Hall/CRC Computer Science & Data Analysis

2. Data Manipulation with R ~ Phil Spector
**Introduction**
Basic concepts: threats, vulnerabilities, controls; risk; confidentiality, integrity, availability; security policies, security mechanisms; assurance; prevention, detection, deterrence

**Basic cryptography**
Basic cryptographic terms, Historical background, Symmetric crypto primitives, Modes of operation, Cryptographic hash functions, Asymmetric crypto primitives

**Program security**
Flaws, Malicious code: viruses, Trojan horses, worms, Program flaws: buffer overflows, time-of-check to time-of-use flaws, incomplete mediation
Defenses: Software development controls, Testing techniques

**Intruders**
Intrusion detection, Password Management

**Network security**
Network threats: eavesdropping, spoofing, modification, denial of service attacks
Introduction to network security techniques: firewalls, virtual private networks, intrusion detection

**Management of security**
Security policies
Risk analysis
Physical threats and controls

**Security in conventional operating system**
Memory, time, file, object protection requirements and techniques
Protection in contemporary operating systems
Identification and authentication
Identification goals
Authentication requirements
Human authentication
Machine authentication

**Database management systems security**
Database integrity
Database secrecy
Inference control
Multilevel databases

Miscellaneous
Legal aspects of security
Privacy and ethics

List of Books:


MIT 32 - Personality Enhancement & Presentation Skills

Personality Development- Introduction to Personality and Self development
Identify different types of personalities.
Discover one’s personality type.

Attitude-Understanding attitude formation and correction.
Recognise and classify the types of attitude.

Inter Personal Relations- Empathy, Relationship building

Personal Grooming- Personal Hygiene
Dress Codes
Appearance and Poise

Social graces, etiquette- Deportment and Proper Social Conduct
Courtesy and manners
Conventions in social behaviour and expected behaviour patterns
Protocol-
Conventions of official interaction, collective, personal and written.

Dining and Table Etiquette- Restaurant Etiquette, Party Etiquette, etc. 
Culminating in complete 5 course Sit Down Meal.

Presentation skills – 1 Preparation and planning, structure of an Oral Presentation

Presentation skills – 2 Visuals, body language, voice and pronunciation

Presentation skills – 3 Creating interest and establishing a relationship with the audience.

**MIT-36 Lab – Enterprise Java with Frameworks**

**Struts Syllabus**


**List of Books:**
1. Struts: The Complete Reference by James Homes

    2. Students will solve at least 1 Programming problem on each of these topics. They are expected to implement a mini-project in teams.

**MIT – 37 Lab - System Security**

Implementing Cryptography Algorithms using Linux
Exposure to Network Programming
Web security assignments (creating a database and program and hacking through)
Operating system Security (Linux and Windows)
Optional Courses

1. Multimedia Systems

Introduction
Defining the scope of multimedia, Hypertext and Collaborative research, Multimedia and personalised computing, Multimedia on the map, Emerging applications, The challenges

The convergence of computers, Communications, and entertainment products
The technology trends, Multimedia appliances, Hybrid Devices, Designers perspective, industry perspective of the future, Key challenges ahead, Technical, regulatory, Social.

Architectures and issues for Distributed Multimedia systems
Distributed Multimedia systems, Synchronization, and QOS Architecture, The role of Standards, A frame work for Multimedia systems

Digital Audio Representation and processing

Video Technology

Digital Video and Image Compression

Operating System Support for Continuous Media Applications
Limitation of Workstation Operating system, New OS support, Experiments Using Real Time Mach.

Middleware System Services Architecture
Goals of Multimedia System services, Multimedia system services Architecture, Media stream protocol.

Multimedia Devices, Presentation Services, and the User Interface
Client control of continuous multimedia, Device control, Temporal coordination and composition, toolkits, hyper applications.

Multimedia File systems and Information Models
The case for multimedia information systems, The file system support for continuous Media, Data models for multimedia and Hypermedia information, Content- based Retrieval of Unstructured Data.

Multimedia presentation and Authoring
Design paradigms and User interface, barriers to wide spread use, research trends.

Multimedia Services over the Public Networks
Requirements, Architecture, and protocols, Network services, applications.

Multimedia Interchange
Quick time Movie File Format, QMFI, MHEG (Multimedia and Hypermedia Information Encoding Expert Group), Format Function and representation, Track model and Object model,Real Time Interchange.

Multimedia conferencing
Teleconferencing Systems, Requirements of Multimedia Communications, Shared Application Architecture and embedded Distributed objects, Multimedia Conferencing Architecture

List of Books:
1. Multimedia Systems by John F. Koegel Buford- Pearson Education
2. **Software Metrics & Project Management**

1. What is Project? What is Project management? Project phases and project life cycle, organizational structure, Qualities of Project Manager.

2. Project Management Components.
   Project Integration Management—Project plan development and execution, change controls, configuration management.

3. Scope Management—Strategic planning, scope planning, definition, verification and control.

4. Time management—Activity planning, schedule development and control.


11. Software Metrics—The scope of software metrics, software metrics data collection, analyzing software data, measuring size, structure, external attributes.

12. Software Reliability—Measurement and prediction, resource measurement, productivity, teams and tools.

13. Planning a measurement program.
What is metrics plan?: Developing goals, questions and metrics. Where and When: Mapping measures to activities.
How: Measurement tools.
Who: Measurers, analyst, tools revision plans.

14. Quality Standards – CMM, PSP/TSP

**List of Books:**

1. Information Technology Project Management By - Kathy Schwalbe.
2. Software Metrics A rigorous and practical approach By – Norman Fenton, Shari Lawrence Pfleeger.
3: Software Engineering By- Roger Presman.

**3.Soft Computing**

1. **Introduction**
   Soft computing paradigms-Neural network-Fuzzy logic-derivation free optimization methods of Genetics algo.-soft computing characteristics.

2. **Fuzzy logic**
   sets-properties-arithmetics-member functions- fuzzy relations-relation equations-fuzzy measures-types of uncertainty-members of uncertaintiesmeasures of fuzziness-probabilitiesVs possibilities-measures of fuzzy events.

3. **Neural computing**
   neuron modelling- learning in simple neuron-perception earning curve-proof limitations of perception.

4. **Neural networks**

5. **Genetic algorithms**
   Introduction- Biological terminology-search space and fitness landscapes elements of genetic algorithms -Genetic algorithm in problem solving.

**List of Books:**
2. Simon Haykin "Neural networks - A comprehensive foundation" PHI

4. Database Management using PHP and MySQL

Introduction to PHP
Incorporating PHP Within HTML
This Book’s Examples
The Structure of PHP

Expressions and Control Flow in PHP
Expressions
Operators
Conditionals
Looping
Implicit and Explicit Casting
PHP Dynamic Linking

PHP Functions and Objects
PHP Functions
Including and Requiring Files
PHP Version Compatibility
PHP Objects

PHP Arrays
Basic Access
The foreach...as Loop
Multidimensional Arrays
Using Array Functions

Practical PHP
Using printf
Date and Time Functions
File Handling
System Calls
XHTML

**Introduction to MySQL**
- MySQL Basics
- Summary of Database Terms
- Accessing MySQL via the Command Line
- Indexes
- MySQL Functions
- Accessing MySQL via phpMyAdmin

**Mastering MySQL**
- Database Design
- Normalization
- Relationships
- Transactions
- Using EXPLAIN
- Backing Up and Restoring

**Accessing MySQL Using PHP**
- Querying a MySQL Database with PHP
- A Practical Example
- Practical MySQL

**Form Handling**
- Building Forms
- Retrieving Submitted Data
- An Example Program

**Templating with Smarty**
- Why Smarty?
- Installation
- Creating Scripts
- Creating Templates
- A Practical Example
Cookies, Sessions, and Authentication

Using Cookies in PHP
HTTP Authentication
Using Sessions

List of Books:
MySQL The Complete Reference –by Vikram Vaswani, TMH
PHP 5 and MYSQL Bible - Converse, Tim and others
Smarty PHP Template Programming And Applications - Hasin Hayder , J. P. Maia , Lucian Gheorghe

5. Web Technology with JavaScript and AJAX

Exploring JavaScript
JavaScript and HTML Text
Using Comments
Semicolons
Variables
Operators
Variable Typing
Functions
Global Variables
The Document Object Model

Expressions and Control Flow in JavaScript
Expressions
Operators
The with Statement
Using onError
Using try...catch
Conditionals
Looping
Explicit Casting

JavaScript Functions, Objects, and Arrays
JavaScript Functions
JavaScript Objects
JavaScript Arrays

JavaScript and PHP Validation and Error Handling
Validating User Input with JavaScript
Regular Expressions
Redisplaying a Form After PHP Validation

Introduction to AJAX
• How AJAX is different from classical web pages
• Its impact on the user experience
• What kinds of applications can benefit
• Who is using it now, and why
• Why AJAX totally changes Web application development
• How AJAX can be integrated with conventional web applications

Basic AJAX technologies
• Using HTML/XHTML for document structure
• Using CSS to define look and feel
• Understanding Javascript
• Understand the DOM
• Use Javascript to create, remove, move and stylize content

Using AJAX effectively
• Impacts on User Experience
• Impacts on the Development Process

Further AJAX technologies
• Managing AJAX communication
• Managing Data with XML and JSON
• Object-oriented Javascript
• Components

Specific AJAX techniques
• Building an application using a single page
• Auto-completion
• Validation
• Dynamic Lists
• Dynamic Generation of Linked Lists
Design Patterns for AJAX
• What is a Design Pattern
• Refactoring
• The Overall UI Pattern
• Using the MVC Pattern
• Implementing Patterns

JavaScript libraries for AJAX
• Why Javascript Libraries
• Prototype Library
• Scriptaculous Library
• RICO Library
• Dojo Library

AJAX Tools
• Overview of AJAX Tools
• Google Web Toolkit
• Ruby on Rails
• Adobe Flex

6. Object Oriented Analysis and Design using UML

Introduction
Role of analysis and design in software development, purpose of analysis models, design models, introduction to O0 analysis and design approach, comparison of OOAD and SSAD approaches, overview of O0 analysis and design activities, overview of popular GOAD methodologies - common features and differences.

Introduction to UML
What is UML? Overview of various UML models.
Use case modeling
Concepts of use case model, actors, association of actors to use cases, use case description, structuring use cases with «uses» and «extend» relationships, purpose of
use case modeling, guidelines for use case modeling, finding actors, finding use cases, use case realization

Structural Modeling
UML class diagram concepts - object, classes, class properties - attributes, operations, relationships between classes - association, aggregation, composition, inheritance, dependency, basic association adornments - multiplicity, role names; concept of package, grouping of classes into Packages.

Behavioral Modeling
Modeling object interaction using UML interaction diagrams - Sequence diagrams, collaboration diagrams; modeling the behavior of reactive objects using UML state chart diagrams; modeling systems workflows or operations using UML activity diagram.

Introduction to the Unified Software Development Process
Key features of the Unified Software Development Process - iterative model, use-case driven, architecture-centric, phases, iterations and workflows.

Software Architectural Design, Architecture modeling in UML
Software architectural design issues, organization into subsystems, handling concurrency, allocation of subsystems to processors, choosing strategy for implementing persistent data stores, choosing strategy to control access
global resources, choosing strategy for software control implementation, overview of common architectural styles. Architecture modeling in UML - modeling active objects, deployment diagram.

Class design
Class design activities, guidelines for - designing algorithms, design optimization, implementing state chart of class, adjustment of class hierarchies to increase reuse; design options for implementing associations, refinement of classes with attributes details and operations details, determining visibility between objects, physical packaging of classes into software modules, UML implementation diagram - Component diagram.

OO Design Patterns
Introduction to OO design patterns, a template for describing designs patterns, a classification scheme for 00 design patterns, uses of design patterns, patterns v/s frameworks, and illustration of some OO design patterns.

Implementation Guidelines
Mapping a design class diagram for implementation in 00 language such C++ or Java. Overview of code generation and reverse engineering features of an OO case tool.

List of Books:
1. Craig Larman, Applying UML and Patterns: An Introduction to Object Oriented
2. Analysis and Design; Pearson Low price edition
3. Martin Folwer and Kendall Scott; UML Distilled; Addison- Wesley
4. James Rumbaugh, Michael Blaha, William Premerlani, Frederick Eddy and William Lorensen; Object-Oriented Modeling and Design; Prentice-Hall
5. Grady Booch; Object-Oriented Analysis and Design with Applications,2nd Edition; Addison- Wesley
6. Jacobson, Booch and Rumbaugh; Unified Software Development Process; Addison- Wesley
7. Hans-Erik Eriksson and Magnus Penker; UML Toolkit; Wiley publishing
8. Rebecca Wirfs-Brock, Brian Wilkerson and Lauren Wiener; Designing Object-Oriented Software; Prentice Hall India
7. MOBILE COMPUTING

1. Introduction to Mobile Computing
   i. Introduction and need for Mobile computing
   ii. Mobility and portability
   iii. Mobile and Wireless devices
   iv. Applications
   v. Brief History of wireless communication

2. Wireless Transmission
   i. General Concepts of multiplexing and modulation
   ii. Spread Spectrum
   iii. Cellular Systems
   iv. Cellular Phone Array
   v. Mobile Phone Technologies (1G, 2G, 2.5G, 3G)

3. Medium Access Control Layer
   i. Why specialized MAC? - hidden and exposed terminals - near and far terminals
   ii. General Concepts and comparison of SDMA, FDMA, TDMA, CDMA

   i. Mobile Services (Bearer, Tele-and-supplementary services)
   ii. System Architecture - Radio subsystem - Network and switching subsystem - Operation subsystem
   iii. Protocols - Localization and calling - Handover
   v. GPRS

5. Mobile IP
   i. Goals, assumptions and requirements
   ii. Entities and terminologies
   iii. Agent Discovery
iv. Registration
v. Tunneling and encapsulation
vi. Reverse Tunneling
vii. IPv6
viii. IP micro-mobility support – Cellular IP, Hawaii, Hierarchical mobile IPv6

6. Mobile TCP
i. Traditional TCP - Congestion Control, Slow start, Fast retransmit / Fast recovery - Implications on mobility
ii. Classical TCP improvements Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit / Fast recovery, Transmission / Timeout freezing, Selective Retransmission, Transaction oriented TCP
iii. TCP over 2.5/3G wireless networks

7. Wireless Application Protocol
i. Architecture
ii. Wireless datagram protocol
iii. Wireless transport layer security
iv. Wireless transaction protocol
v. Wireless session protocol
vi. Wireless application environment
vii. WML
viii. WML Scripts
ix. Push Architecture
x. Push – Pull Services

8. Platform/Operating Systems
i. Palm OS
ii. Windows CE
iii. Embedded Linux
iv. J2ME (Introduction)
v. Symbian (Introduction)
vi. File Systems (Book1)

9. Java for Wireless Devices
i. Setting up the development environment
ii. Basic Data types, Libraries (CLDC, MIDP)

10. UI Controls
i. Displayable and Display
   - Image
   - Events and Event Handling
   - List and choice
   - Text box
   - Alerts

11. Persistent Storage
   i. Record Stores
   ii. Records
   iii. Record Enumeration

12. Network MIDlets
   i. The Connection Framework
   ii. Connection Interface
   iii. Making a connection using HTTP
   iv. Using datagram connection

13. Wireless Messaging
   i. Architecture for Messaging application
   ii. Messaging API
   iii. Types of applications
   iv. Pros and cons of messaging

References: http://java.sun.com/products/wma
http://forum.nokia.com

List of Books:
2. Pervasive Computing Technology and Architecture of Mobile Internet Applications
   Jochen Burkhardt, Dr. Horst Henn, Steffen Hepper, Klaus Rintdorff, Thomas Schack, Pearson Education
4. Complete Reference J2ME
8. Introduction to Data Compression

1. **Introduction**: Compression techniques, Modeling and Coding

2. **Huffman Coding**: Huffman Coding algorithm, Adaptive Huffman Coding, Golomb Codes, Rice Codes, Tunstall Codes, Applications of Huffman Coding

3. **Arithmetic Coding**: Coding a sequence, Generating a binary code, Comparison of Huffman and Arithmetic Coding, Adaptive Arithmetic Coding, Applications


5. **Context based Compression**: Prediction with partial match, the Burrows- Wheeler Transform, Associative code of Buyanovsky, Dynamic Markov Compression

6. **Lossless Image Compression**: The old JPEG standard, CALIC, JPEG – LS, Multi resolution approaches, FACSIMILE Encoding, MRC – T.44

7. **Scalar Quantization**: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non Uniform Quantization, Entropy coded Quantization


**List of Books:**
Khalid Sayood, Introduction to Data Compression, Morgan Kauffmann
9. Embedded Systems Design

Introduction to embedded system:
A First Look at Embedded systems- Examples of Embedded systems-applications area-categories of embedded system – recent trends in embedded system:

Design challenge –
optimizing design metrics Common design metrics- Processor technology-General-purpose processors –
software - Single-purpose processors – hardware- Application-specific processor- IC technology

Architecture of embedded system:
hardware architecture – software architecture - Programming for embedded system.

The process of embedded system development
Interrupts-Microprocessor-Architecture-Interrupt Basics-The Shared-Data Problem-Interrupt Latency shared
data problems- survey of software architecture -Round-Robin-Round-Robin with Interrupts-
Interrupt Latency –RTOS.

RTOS
architecture of kernel – task and task scheduler-interrupt service routines- semaphores-message queues
boxes-pipes – events-timer – memory management – interrupt routines in RTOS Environment overview
of embedded / real time operating system .

Embedded Software Development Tools
-Host and Target Machines-Linker/Locators for Embedded Software-Getting Embedded Software into the Target System.

Debugging Techniques Testing on Your Host Machine-Instruction Set Simulators-The assert Macro-Using Laboratory Tools

An Example System-
What the Program Does-Environment in which the Program Operates

Task Image creation –
operating system software – target image creation for windows XP embedded-
porting RTOS on a microcontroller based development board.

Representative embedded systems programming
in Linux-programming in RTLinux-Development of Navigation System – Development of
protocol converter-mobile Java applications.

State machine and concurrent process models –
Introduction- Models vs. languages, text vs. graphics- Models vs. languages-
Textual languages versus
graphical languages-An introductory example- A basic state machine model:
finite-state machines (FSM)-
Finite-state machines with data path model: FSMD- Using state machines-
Describing a system as a state
machine-Comparing the state machine and sequential program model-
Capturing a state machine model in
a sequential programming language-Hierarchical/Concurrent state machine
model (HCFSM) and the State
charts language

**Program-state machine model (PSM)** –
The role of an appropriate model and language

**Concurrent process model**-
Use of Esteral language for embedded software development

**List of Books:**
1. Embedded software primer by David Simon – Pearson
2. Art of embedded system by Jack Ganssle
3. Embedded systems Architecture by Tammy Noergaard – Elsevier publications
4. Embedded /Real time systems – by DR.K.V.K.K.Prasad. – Dreamtech
5. Esterel language by Gerard Berry (web site reference)
6. Embedded system design by Arnold S.Berger
7. model checking by Edmund M.clark
8. Embedded Systems Building Blocks by Jean LaBrosse
9. Embedded Systems Design by Arnold Berger
10. The Art of Programming Embedded Systems by Jack Ganssle

*10.Complier Design*

Introduction to Compilers,

**Context Free Grammar,**

**Syntax directed translation :**
Syntax directed translation schemes, Implementation of syntax directed translation schemes, Intermediate codes, Post fix notation parse trees & syntax trees, three address codes, quadruples, triples, Translation of assignment statements, Boolean expression, statements that after flow of control, Post fix translation, Translation with Up down parsing.

**Error detection & recovery:**
Errors, lexical phase errors, Syntactic phase errors, semantic errors.

**Code Optimization :** Loop optimization, DAG representation of basic block, value numbers & algebraic laws, Global data flow analysis, Dominators, Reducible flow graph, Depth first search, Loop invariant computation, Induction variable elimination.

**Data flow Analysis :**
Reaching definition, Available Expression, copy propagation, Backward flow problems, Very busy expression & code hoisting code.

**Code Generation :**
A simple code generation, code generation from DAG & labeled trees.

**Register allocation :**
coloring by implication, coalescing, graph coloring implementation, Register allocation for Trees.

**List of Books:**
3. Andrew W. Appel, “ Modern Compilers Implementation in Java”.
4. Dhamdhere “ Compiler Principles”.
11. Introduction to Computer Graphics

Prerequisite: Algorithms & Data structures

Introduction:
Tour of computer graphics applications, Fundamentals of Raster graphics workstation, representation of points, line and an image.

Basic raster graphics algorithms:
DDA and Bresenham algorithm for lines and circles, 2D line clipping (sutherland Cohen), Scam converting a 2D polygon, area-fill algorithms, solid 2D polygon clipping (Sutherland-Hodgman)

2D-3D Geometric Transformations:
Translation, Scaling, Rotation, homogenious representation, Viewing transformation (window to view port to physical device), two-dimensional modeling transformations three-dimensional modeling transformations, 3 D viewing transformations including 3D to: 2D projections and camera transformation.

Modelling:
Parametric curves and surfaces: Hermite, Bezier, B-Spline, Solid models: Boundary, weep, CSG, fractals and procedural modeling.

Rendering:
Visible, surface algorithms (back-face cull, Z-buffer), basic physics, of light and reflection, rendering equation, global illumination models, simple local illumination model (Phong model), general theory of ray tracing (primary rays, secondary reflection rays, shadow rays, transmitted rays, concepts of ray tree), ray-sphere intersection, ray-plane intersection, ray-box intersection, texture and bump mapping including 2D to 3D (using bitmaps) and 3 D to 3D (procedural textures and a noise function), anti-aliasing (Nyquist theorem)

List of Books:


12. Network Design, Implementation and administration

- Overview of Network Service Design:
  Introduction, Strategy for Network Service Implementation, Issues in Network design

- TCP/IP:
  Introduction to TCP/IP, Benefits of using TCP/IP, IP addressing, IP Network and Host addressing, Classes of IP addresses, Subnet mask, Subnetting and super netting
  IP configuration, TCP/IP & security, IP sec, protecting IP traffic, QOS and QOS connections
  Optimizing Network design

- DHCP Dynamic Host Control Protocol:
  DHCP function and Protocol, Installation of DHCP server and clients, Features of DHCP server 7 information, Monitoring and troubleshooting, Using DHCP and non routed and routed Network, Securing DHCP services, Optimizing DHCP performance

- DNS Domain Name Service:
  Overview of DNS protocol, DNS Namespace, Zone of authority and name resolutions, Installation of DNS server, Configuring DNS server and clients, Features of DNS server Reverse lookup, DNS and intranet, Placement of DNS server, Using BNIP, DNS dynamic update protocol, Securing dynamically updated DNS service Replication Resolving Query resolution time and impact, On Network traffic due to replication, Optimizing DNS performance

- Network Security:
  Public key infrastructure concepts, Public key encryption (Basic cryptographic concepts)
  Ipsec services, Configuring TCP/IP secure services, Monitoring and troubleshooting

- Routing:
  Overview of TCP/IP routine, Static V/s Dynamic routes, Adding and deleting static routes
  Demand on dial routing, Routing protocol, Installing and configuring RIP, Installing and configuring OSPF, Installing and configuring IGP, Secure IP

- Network administration:
  SNMP & RMON - Overview and features, MIB Management Information base
  Installing SNMP Servers, SNMP communities, Authentication and securing Monitoring and analysis and troubleshooting, Overview and installation configuration: fire wall, NAT, E-mail (Send mail), Radius, Remote access servers, proxy servers.
- Securing above services
- Information logging and monitoring and troubleshooting

**List of Books:**

1. OS documentation of Linux/ Unix or WIN 2000

**13. Operating system kernel and network programming**

Signals, Signal concept, Reliable and unreliable signals, Signal sets, Signal related system calls.
Terminal I/O multiplexing, Memory mapped I/O, related system calls
Interprocess Communication, Pipes, Message queues, Semaphores and shared memory.
Advanced interprocess communication, stream pipes, open server.


Transport layer: introduction to TCP and UDP protocols, TCP port numbers and concurrent servers, protocol usage by common internet applications Berkely Sockets: Socket address structures, socket functions for TCP Client/server, Day time client/server example.

I/O multiplexing: Basic I/O model, asynchronous and synchronous I/O model.
Socket options: Generic, IPv4, IPv6 and TCP.
Elementary UDP socket programming: Name and address conversions.

**List of Books:**
3. Ralph Davis, Win 32 network programming, Addison Wesley

**14. Optimization Techniques:**


Integer Programming: Gomory cutting plane methods, Branch and Bound method.

Queuing Theory: characteristics of queuing systems—steady state M/M/I, M/M/K and M/M/C queuing models.

Replacement Theory: Replacement of items that deteriorate, Replacement of items that fail, Group replacement and individual replacement.

Inventory theory: inventory problems, single item deterministic models, economics lot size models without shortages and with shortages having production rate infinite and finite.

PERT and CPM Arrow networks—time estimates—earliest expected time, latest allowable occurrence time, critical path—probability of meeting scheduled date of completion of project—calculations on CPM network—various floats for activities—Critical path—updating project-operation time cost trade off curve—project time cost trade off curves—selection of schedule based on cost analysis.


**List of Books:**
2. Gross D. and Harris, C.M. “Fundamentals of Queuing Theory”, John Wiley
and Sons, New Yourk,1980.

15. Natural Languages Processing

Introduction
Ambiguity, Models and algorithm, Language, thought and understanding.

Regular Expressions and Automata
Regular Expressions, Basic Regular Expression Patterns, Disjunction, Grouping, and Precedence,
Advanced Operators, Regular Expression substitution, Memory, and ELIZA

Finite-State Automata
Using an FSA for Recognition, Formal Languages, Non-Deterministic FSAs, Using an NFSA to Accept Strings, Recognition as Search

Morphology and Finite-State Transducers
English Morphology, Inflectional Morphology, Derivational Morphology, Finite-State Morphological Parsing, The Lexicon and Morphotactics, Morphological Parsing with Finite-State Transducers,
Orthographic Rules and Finite-state Transducers, Combining FST Lexicon and Rules, Lexicon-free FSTs:
The Porter Stemmer

N-grams
Counting Words, Simple N-grams, Smoothing, Backoff, Deleted Interpolation, N-grams for Spellings,
Entropy.

Word Classes and Part-of-Speech Tagging
English classes, tagsets POS tagging, Rule based POS tagging, Stochastic POS tagging, HMM tagging,
Transformation based tagging, Multiple tags and multiple words, unknown words,

**Context-Free Grammars for English**
Context Free rules and trees, Sentence level construction, Noun Phrase, coordination, Agreement, Verb phrase, Auxiliaries, Grammar Equivalence and normal form.

**Parsing with Context-Free Grammars.**

**Features and Unification.**
Feature structures, Unification of feature structures, Feature structures in grammar, Implementing unification, Parsing with unification constraints, Types and inheritances.

**Lexicalized and Probabilistic Parsing.**
Probabilistic Context free grammars. Problems with PCFGs, Probabilistic Lexicalized CFGs, Dependency Grammars, Human Parsing.

**Representing Meaning.**
Computational Desiderata for representation, Meaning Structure of Language, Some Linguistically relevant concepts: Categories, Events, Representing time, Aspects, Representing beliefs, Pitfalls. Alternative approaches to meaning.

**Semantic Analysis**

**Lexical Semantics**

**Word Sense Disambiguation and Information Retrieval**
Selectional restriction based disambiguation. Robust word sense disambiguation. Information Retrieval concepts.

**Discourse**
Reference Resolution, Text Coherence, Psycholinguistic studies of reference and coherence.
Natural Languages Generation
An architect for generation, Surface realization, Discourse planning, Microplanning, Lexical Selection, Evaluating generation system.

Machine Translation

List of Books:
1. Natural Language processing by Daniel Jurafsky, James H Martin, Pearson Education Asia

16. Component based Software Development

Description: Understand the concepts and technology behind component based software development. Building software components using existing standard technologies COM. Building software components using existing standard technologies COM, or Java Beans and CORBA. The course should cover either of these technologies.

Prerequisite: Familiar with using C++, Win 32 API programming or java programming.

Introduction to general philosophy of Component based software development

Introduction to general philosophy of Component based software development

Introduction to COM components, creating COM components, component reuse, local and remote components, Automation ATL, COM threading model, structured storage, Persistent Objects, Connection points, OLE documents, Active X controls, introduction to MTS, COM+, .NET

OR

Introduction to javabeans, javabeans properties, sterilization, introspection (reflection), persistence (JAR files), elementary multi threading in java EJB

History of origin of CORBA, Overview of CORBA common services, simple programs using CORBA, OMA Components, CORBA IDL, Static and dynamic invocation interfaces, interfaces repository.
List of Books:

1. Dale Rogerson; Inside COM, Microsoft Press
2. JavaBeans Unleashed: Techmedia; SAM publications
4. David Chappell, Understanding ActiveX and OLE, Microsoft Press
5. Guy Eddon, Henry Eddon, Inside Distributed Com, Microsoft Press

17. Image Processing

Introduction
Image formation model, representation, spatial and Gray Level resolution, Colour models-RGB, CMY and HIS models

Image Enhancement In Spatial Domain
Piecewise linear transformation, Histogram equalization, Histogram specification, image averaging, spatial filters – smoothing and sharpening, Laplacian filter, sobel operator, Canny edge detector.

Image Enhancement In Frequency Domain
2D Discrete Fourier transform and its inverse, filtering in frequency domain, Ideal and Gaussian Low pass filters, high pass filtering, separability property of 2D Fourier transform, Fast Fourier Transform.

Image Segmentation
Line detection, Edge detection, Edge linking and boundary detection, Hough Transform, Thresholding.
Region based segmentation

Morphological Image Processing
Logic operations involving binary images, Dilation and Erosion, Opening and closing, Applications to Boundary extraction, region filling, connected component extraction.

Image Compression

**Image Representation**
Boundary description, Shape numbers, Fourier descriptors, Texture, principal Components based description.

**3D Vision**
Projective geometry, single perspective camera, stereopsis, the fundamental matrix – its estimation from image point correspondences, applications of epipolar geometry in vision, correlation based and feature based stereo correspondence, shape from motion, optical flow.

**List of Books:**

**18. Data Mining and Data Warehousing**

**Introduction and Background**
Introduction to the multidisciplinary field of data mining,. Discussion on the evolution of database technology that has led to the need for data warehousing and data mining. Stress on importance of its application potential. Introduction to the different key words and techniques.

**Data Warehousing And OLAP**
Insight of data warehouse and on-line analytical processing, Aggregation Operations, models for data Warehousing, star schema, fact and dimension tables Conceptualization of data warehouse and multidimensional databases. Life cycle of data warehouse development. Relationship between data warehouse and data mining.

**Data Mining Primitives**
Data preprocessing including data cleaning, data integration, data transformation. Definition and Specification of a generic data mining task. Description of Data mining query language with few example queries.

**Association Analysis**

Different methods(algorithms) for mining association rules in transaction based data bases. Illustration of confidence and support. Multidimensional and multilevel association rules. Classification of association rules. Discussion on few association rule algorithms e.g. Apriori, frequent pattern growth etc.

**Classification and Predictions**

Different Classification algorithm, including C4.5, CART etc., use of genie index, decision tree induction, Bayesian classification, neural network technique of back propagation, fuzzy set theory and genetic algorithms.

**Clustering**

Partition based clustering, Hierarchical clustering, model based clustering for continuous and discrete data. Discussion on scalability of clustering algorithms

Web Mining: web usage mining, web content mining, web log attributes, use of web mining in efficient surfing and personalization.

Mining Complex type of data: Data mining issues in object oriented databases, spatial databases and multimedia data bases, time-series data bases, and text data bases.

**Applications of Data Warehousing And Data Mining.**

Exploration of web sites on data ware housing and data mining applications including bibliography data bases, Corporate Houses and Research labs.

**List of Books:**

2. Vipin Kumar
5. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, Pearson Education.