1.0 Objectives of the MCA course

The M.C.A. program prepares students to take up positions as systems analysts, systems designers, programmers, and managers in any field related to information technology. The program, therefore, aims at imparting comprehensive knowledge with equal emphasis on theory and practice. The M.C.A. students are encouraged to spend a full semester working in the industry/ in the institute giving them insight into the workings of the IT world. However, the course curriculum will have enough flexibility to enable a student to undertake advance studies in Computer Science later on.

2.0 Course Outline Semester Wise

<table>
<thead>
<tr>
<th>Semester-I</th>
<th>Subject Code</th>
<th>Subject</th>
<th>Contact Hrs.</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCC101</td>
<td>Programming in C</td>
<td>3-1-0</td>
<td>4</td>
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<tr>
<td>MCC102</td>
<td>Micro-processors and Assembly Language Programming</td>
<td>3-1-0</td>
<td>4</td>
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<tr>
<td>MCC103</td>
<td>Discrete Mathematics</td>
<td>3-1-0</td>
<td>4</td>
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<tr>
<td>MCC104</td>
<td>Engineering Economics and Costing</td>
<td>3-0-0</td>
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<tr>
<td>MCC105</td>
<td>Financial Accounting</td>
<td>3-0-0</td>
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<tr>
<td>MCC106</td>
<td>Communicative English</td>
<td>2-0-0</td>
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<tr>
<td>MCL107</td>
<td>Communicative English Lab-I</td>
<td>0-0-3</td>
<td>2</td>
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</tr>
<tr>
<td>MCL108</td>
<td>Lab – I (C Programming Lab)</td>
<td>0-0-6</td>
<td>4</td>
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<tr>
<td>MCL109</td>
<td>Lab – II (Assembly Language Programming Lab)</td>
<td>0-0-3</td>
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<thead>
<tr>
<th>Semester-II</th>
<th>Subject Code</th>
<th>Subject</th>
<th>Contact Hrs.</th>
<th>Credit</th>
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<tbody>
<tr>
<td>MCC201</td>
<td>Data Structures Using C</td>
<td>3-0-0</td>
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<tr>
<td>MCC202</td>
<td>Computer Organization and System architecture</td>
<td>3-1-0</td>
<td>4</td>
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<tr>
<td>MCC203</td>
<td>Object orientated Programming using C++</td>
<td>3-0-0</td>
<td>3</td>
<td></td>
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<tr>
<td>MCC204</td>
<td>Theory of Computation</td>
<td>3-0-0</td>
<td>3</td>
<td></td>
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<tr>
<td>MCC205</td>
<td>Computer Based Numerical Methods</td>
<td>3-0-0</td>
<td>3</td>
<td></td>
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<tr>
<td>MCC206</td>
<td>Business Communication in English</td>
<td>2-0-0</td>
<td>2</td>
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<tr>
<td>MCL207</td>
<td>Communicative Practice Lab-II</td>
<td>0-0-3</td>
<td>2</td>
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<tr>
<td>MCL208</td>
<td>Lab – III (Data Structure in C Lab)</td>
<td>0-0-6</td>
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<tr>
<td>MCL209</td>
<td>Lab – IV (C++ Programming Lab.)</td>
<td>0-0-3</td>
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<tr>
<td>MCS210</td>
<td>Seminar</td>
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<table>
<thead>
<tr>
<th>Semester-III</th>
<th>Subject Code</th>
<th>Subject</th>
<th>Contact Hrs.</th>
<th>Credit</th>
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<tbody>
<tr>
<td>MCC301</td>
<td>Analysis and Design of Algorithms</td>
<td>3-1-0</td>
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<tr>
<td>MCC302</td>
<td>Operating Systems</td>
<td>3-1-0</td>
<td>4</td>
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<tr>
<td>MCC303</td>
<td>Computer Networks</td>
<td>3-0-0</td>
<td>3</td>
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<tr>
<td>MCC304</td>
<td>Data Base Systems</td>
<td>3-1-0</td>
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<tr>
<td>MCC305</td>
<td>Probability and Statistics</td>
<td>3-0-0</td>
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<tr>
<td>MCC306</td>
<td>Management Information System</td>
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<tr>
<td>MCL307</td>
<td>Lab – V (Operating System &amp; Network Lab.)</td>
<td>0-0-6</td>
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<tr>
<td>MCL308</td>
<td>Lab – VI (Data base Lab)</td>
<td>0-0-3</td>
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<tr>
<td>MCL309</td>
<td>Communication and Interpersonal Skills for Corporate Readiness</td>
<td>0-0-2</td>
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### Semester – IV

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<tr>
<th>Course Code</th>
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<th>Credits</th>
<th>Elective</th>
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<tbody>
<tr>
<td>MCC401</td>
<td>Programming with Java</td>
<td>3-1-0</td>
<td>4</td>
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<tr>
<td>MCC402</td>
<td>Computer Graphics &amp; Multimedia</td>
<td>3-0-0</td>
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<tr>
<td>MCC403</td>
<td>Software Engineering</td>
<td>3-0-0</td>
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<tr>
<td>MCC404</td>
<td>Compiler Design</td>
<td>3-1-0</td>
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<td>MCC405</td>
<td>Quantitative Techniques-I (Operations Research)</td>
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<tr>
<td>MCC406</td>
<td>E-Commerce &amp; ERP</td>
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<tr>
<td>MCL407</td>
<td>Lab – VII (Programming with Java Lab.)</td>
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<tr>
<td>MCL408</td>
<td>Lab – VIII (Comp. Graphics &amp; Multimedia Lab.)</td>
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<tr>
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### Semester – V

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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>MCC501</td>
<td>Artificial Intelligence and Expert system</td>
<td>3-1-0</td>
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<tr>
<td>MCC502</td>
<td>Object Oriented Analysis and Design with UML</td>
<td>3-0-0</td>
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<tr>
<td>MCC503</td>
<td>Internet Technology and enterprise Java</td>
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<tr>
<td>MCC504</td>
<td>Quantitative Techniques-II (Modeling &amp; Simulation)</td>
<td>3-0-0</td>
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<tr>
<td><strong>Elective-I</strong></td>
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<tr>
<td><strong>Elective-II</strong></td>
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<td></td>
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<tr>
<td>MCE505</td>
<td>Distributed Systems</td>
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<tr>
<td>MCE506</td>
<td>Parallel Computing</td>
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<tr>
<td>MCE507</td>
<td>Image Processing</td>
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<tr>
<td>MCE508</td>
<td>Web Engineering</td>
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<tr>
<td><strong>Elective-I</strong></td>
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<tr>
<td><strong>Elective-II</strong></td>
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<tr>
<td>MCE509</td>
<td>Computer Security</td>
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<tr>
<td>MCE510</td>
<td>Software Design</td>
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<tr>
<td>MCE511</td>
<td>Bioinformatics</td>
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<tr>
<td>MCE512</td>
<td>Soft Computing</td>
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<tr>
<td>MCL513</td>
<td>Assignment *</td>
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<td>MCL514</td>
<td>Lab – X (Enterprise Web Computing Java Lab.)</td>
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<tr>
<td>MCV515</td>
<td>Comprehensive Viva-voce</td>
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### Semester – VI

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>MCP601</td>
<td>Project work for 16 weeks**</td>
<td>20</td>
</tr>
</tbody>
</table>

* There will be atleast 10 weekly assignments to be submitted by students on the subject "object oriented Analysis and design with UML". Weekly evaluation will be done by a group of teachers of the department of 10 marks each taking personal viva of the students for a total of 100 marks.

** There will be a 16 weeks project work to be undertaken by the students in any Industry / Institution. At the end of the project there will an evaluation of the project for 20 credits by a group of experts including one external expert and teachers of the department.
3rd SEMESTER

MCC 301 ANALYSIS AND DESIGN OF ALGORITHMS

Module-I (13 hours)
Introduction to analysis and design of algorithm, Growth of functions, Asymptotic notations, Recurrences, Solution of recurrences by substitution, Recurrence tree and the master method. Divide and conquer algorithms (Worst case analysis of merge sort, quick sort and heap sort algorithms), Priority queue, Data structure for disjoint sets (Disjoint set operations, linked list representation, disjoint set forests)

Module-II (13 hours)
Dynamic programming approach: Matrix chain multiplication, longest common subsequence. Greedy method: Activity solution problem, Greedy verses dynamic programming, Huffman codes. Concept of backtracking, branch & bound design techniques. Graph algorithms: Minimal spanning tree (Kruskal and Prim’s algorithms), Single source shortest paths (Bellman-Ford and Dijkstra’s algorithm), Floyd’s algorithm.

Module –III (14 hours)

Text book:

Chapters: 1, 2, 3, 4(excluding 4.4), 6, 7 (7.4.1), 15(15.2, 15.3, 15.4), 16(16.1, 16.2, 16.3), 21(21.1, 21.2, 21.3) 23, 24(24.1, 24.2, 24.3), 26(26.1, 26.2), 30(30.1, 30.2), 32(32.1, 32.2), 34, 35(35.2)

Reference books:
MCC 302: OPERATING SYSTEMS

Module-1  (16 hours)
Introduction — Evolution of Operating Systems, Types of operating systems, Operating System Structures, Hardware and software structures needed for an operating system.


Module-2  (14 hours)
Deadlock—Basic cause of deadlock, Conditions for deadlock, resource allocation graph, Wait for graph, Strategies for handling deadlocks, Starvation, Havender’s linear ordering principle, deadlock avoidance & detection, Safe state, Dijkstra’s Banker’s Algorithm.

Memory Management: Main Memory, Static & Dynamic Partition schemes, multiple partitions schemes, Fragmentation, Compaction, Buddy Systems, Partition selection algorithms, de-allocation strategy, Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation, Virtual Memory: Demand Paging, Copy-on-Write, Page Replacement Policies, Belady’s Anomaly, Thrashing, Working set model.

Module-3  (10 hrs)

Text books:

Reference Books:
MCC 303: COMPUTER NETWORKS

Module-I (12 hours)

Module-II (16 hours)

Module-III (12 hours)

Text Books:

Reference Books:
Module 1  (10 hours)

**Introduction:** Data & Information, Evolution of Database Systems, Overview of a DBMS, Database System Concepts & Architecture - Data models, schemas and instances, Data Abstraction, Data Independence, Database languages and interfaces.

**Database Characteristics:** Data modeling using Entity - Relationship (ER) Model: Entity sets, attributes and keys, Relationship types, sets, roles and structural constraints, Weak Entity types. Data Models: Relational, Network, Hierarchical and Object Oriented.

**The Relational model:** Relational data model concepts, Codd’s 12 rules, Relational model constraints and schemas, Relational Algebra and Relational calculus, Constraints on Relations, Relational database design by ER & EER to Relational Mapping, Database Language SQL & QBE. SQL Programming Techniques: Constraints and Triggers, Views and Indexes, SQL in Server Environment.

Module 2  (16 hours)

**Database Design:** Data dependency, Armstrong’s Axioms, Functional dependencies and Normalization of Relational Databases, First, Second and Third Normal forms, Boyce-Codd Normal form (BCNF), Relational Database design Algorithms and further dependencies, Denormalization

**Storage Strategies and file organizations:** Disc Storage, Basic File Structures and Hashing, Indexing structures for files, multi-level indexing using B-trees and B*-trees.

**Query Processing and Optimization:** Evaluation of Relational Algebra Expressions, Query Equivalence, Join strategies, Query Execution, Query Compiler, and Query Optimization Algorithms.

Module 3  (14 hrs)


**Outline of:** Information Integration, Data Mining, Data Warehousing and OLAP, Database Systems and the Internet, Search Engines, Semi-structured Data Model, XML and Web Databases, Object & Object Relational Databases, Distributed Databases, Deductive Databases, Mobile Databases, Multimedia Databases, GIS.

**Text Books:**

**Reference Books:**
Module 1  (13 hours)
Probability: Introduction, Probability of an event, additive rule & multiplication rule, conditional probability Bayes’ rule, random variable, discrete and continuous probability distribution, Joint probability distribution, Mathematical expectation, Variance and co-variance of random variables, Mean and co-variance of linear combination of random variables, Chebyshev theorem, Binomial & Multinomial, Hypo-geometric, Geometric, Poisson distribution.

Module 2  (13 hours)
Uniform, Normal, Exponential Distribution, Weibull’s Distribution, Chi-square distribution, Sampling Distribution: Sampling distribution of $S^2$, t- distribution, F-distribution

Module 3  (14 hours)
Test of hypothesis: one and two tailed test, test on a single mean when variance is known & variance is unknown. Test on two means, test on a single mean population and test on two populations. One and two sample test for variance. $\chi^2$ test for goodness of fit and test for independence.
Introduction to linear regression: Simple regression models, Method of least square, Properties of least square estimators, Inferences concerning the regression coefficients, Coefficients of determination and its application.

Statistical quality control (Simple idea only)

Text Book:

Reference Books:
MCC: 306 MANAGEMENT INFORMATION SYSTEMS

Module-I (12 hours)

Module-II (12 hours)
Information analysis and design tools: Decision tools, Decision Table, Structured Analysis, Dataflow Analysis, Tools for dataflow strategy, Developing dataflow diagrams, Leveling, Data dictionary, Structured flow chart, HIPO, Warnier/ORR diagram

Module-III (12 hours)

Text Books:


Reference Books:

MCL: 307 OPERATING SYSTEMS AND NETWORKS LAB

Topics
01. UNIX Structures, UNIX/Linux Commands, Common Commands practice session.
02. vi/vim editor basics, creating & managing files with vi/vim.
03. Working with sed and awk, programming with awk.
04. Shell scripting, shell variables, data types.
05. Shell programming-control structures, loops etc.
06. Creating processes- fork and join, pid, child process.
07. Implementing Threads, Thread programming.
08. Inter process communication-Producer & consumer.
09. Implementing readers and writers problem using c/c++.
10. Implementing sleeping barber problem using c/c++.
11. Implementing semaphores using c/c++.
12. Implementing deadlock mechanism using c/c++.
13. Implementing bankers algorithm using c/c++.
14. Simulation program for memory allocation & de-allocation.
15. Implementing file allocation problem using c/c++.
16. Socket programming in C: Client and server Sockets.
17. Connection establishment through TCP/IP Sockets.
18. Communicating with server w. r. t. clients via sockets.
19. Implementing a File copy program using Sockets.
20. Creating and Installing Server Software.

MCL: 308 DATABASE LABORATORY USING ORACLE

Topics
01. Installation of Oracle or MySQL.
02. Learning basic DDL and DML commands.
03. Learning basic DCL and TCL commands.
04. Insertion, Deletion, Updating to a table using SQL commands.
05. Working with dual table.
06. Data retrieval using Select & where clause.
07. Oracle inbuilt functions-Date, aggregate, group by etc.
08. Use of Joins and Sub queries.
09. Views, sequences and indexes.
10. Managing users, privileges and roles.
11. PL/SQL-Data types, control structures.
12. Creating procedures with PL/SQL.
13. Error handling in PL/SQL.
14. Cursor Management in PL/SQL.
15. Sub program design in PL/SQL.
16. Writing Program segments in embedded SQL using C/C++.
17. Writing Programs on Packages & triggers.
18. Implementing OO features in Oracle.
19. Report generation using SQL.
This course will focus on communication in professional (work-related) situations of the kind that
BPUT graduates may expect to encounter on entering the professional domain.
Some typical forms of work-related communication, oral or written, are listed below. Practice
activities for all four skills can be designed around these or similar situations.

1. Gaining entry into an organization
   i. Preparing job-applications and CVs
   ii. Facing an interview
   iii. Participating in group discussion (as part of the recruitment process)

2. In-house communication
   a. Superior/ Senior ➔ subordinate / junior (individual ➔ individual / group)
      i. Welcoming new entrants to the organization, introducing the workplace culture etc.
      ii. Briefing subordinates / juniors : explaining duties and responsibilities etc.
      iii. Motivating subordinates / juniors (‘pep talk’)
      iv. Expressing / recording appreciation, praising / rewarding a subordinate or junior
      v. Reprimanding / correcting / disciplining a subordinate/junior (for a lapse) ; asking
         for an explanation etc.
   b. Subordinate / Junior ➔ Superior / Senior
      i. Responding to the above
      ii. Reporting problems / difficulties / deficiencies
      iii. Offering suggestions

**************************
4\textsuperscript{TH} Semester

MCC 401: PROGRAMMING WITH JAVA

Module – 1 \hspace{1cm} (16 hours)
Introduction to Java Programming Language, Data Types and Operations, Structured Programming, Selection Statements, Loops, Methods, Method Abstraction and Stepwise Refinement, Arrays, Object-Oriented Programming: Classes and Objects, Constructors, Implementing & Designing Classes, Use of Keywords: static, final, this, Class Abstraction and Encapsulation, Strings and Text I/O, Inheritance and Polymorphism, use of super keyword, Overriding vs. Overloading, Object: The Cosmic Superclass, Abstract Classes and Interfaces, Packages, Object-Oriented Design and Patterns.

Module – 2 \hspace{1cm} (12 hours)

Module – 3 \hspace{1cm} (12 hours)
Multithreading, Networking, JDBC, Internationalization, Advanced GUI Programming: MVC, JavaBeans and Bean Events, Containers, Layout Managers, and Borders, Menus, Toolbars, Dialogs and Swing Models, JTable and JTree, New Features of Java.

Text Books:

   (Book Chapters: 1 to 24, 26, 29 to 37)

Reference Books:

Module – 1 (14 hours)


Geometric Transformations (both 2-D & 3-D): Basic Geometric Transformations, Matrix Representation and Homogeneous Coordinates, Composite Transformations, Inverse Transformations, Other Transformations (Reflection, shear), Transformation between coordinate systems, Affine Transformations.


Module – 2 (14 hours)

Three Dimensional Object Representations: Curved Surfaces, Quadratic Surfaces, Spline Representations, Bezier Spline Curves and Surfaces, B-Spline Curves and Surfaces, Octrees, BSP Trees, Fractal Geometry Methods, Shape Grammars.


Illumination Models: Basic Illumination Models, Displaying light Intensities, Halftone Patterns and Dithering techniques, Polygon-Rendering Methods (Gouroud Shading, Phong Shading), Ray-Tracing Methods (Basic Ray-Tracing Algorithm, Ray-Surface Intersection Calculations). Computer Animation, Hierarchical Modeling (introductory idea only).

Module – 3 (12 hours)


Multimedia Data Compression: Lossless Compression Algorithms (Basics of Information Theory, Run length coding, variable length coding, lossless image compression), Lossy Compression Algorithms (distortion measure, quantization, Discrete Cosine transform), Basic Image Compression standard-JPEG, Basic Video Compression standard-MPEG (MPEG-1&2).

Text Books:


Reference Books:

MCC 403 SOFTWARE ENGINEERING

Module-I  (12 hours)


Module-II  (14 hours)


Module-III  (14 hours)


Text Books:


Reference Books:

MCC 404 COMPILER DESIGN

Module 1

(12 hours)


Module 2

(12 hours)


Module 3

(16 hours)


Text Books:


References Books:

Module-I  

**Introduction to Linear Programming:** Problem formulation, graphical solution of LPP, Simplex algorithm, Big-O method, Two phase simplex method, Duality, Dual theorems, Transportation Problem, Assignment problem, Transshipment Problem.

Module-II  

**Queuing Theory:** Basic structure of queuing model, Role of exponential distribution, Birth and death process, Queuing models based on Birth-and-death process, Queueing models based on Non-exponential distributions

**Inventory Theory:** Components of inventory models, Deterministic Continuous-Review model, deterministic Periodic-Review model, Deterministic Multiechelon inventory models for supply chain management.

Module-III  

**Project management:** Visual display of a project, Scheduling a project with PERT/CPM, Dealing with uncertain activity, Time-cost trade-offs, Scheduling and controlling project costs, Evaluation of PERT/CPM

**Decision analysis:** Decision making without experimentations, Decision making without experimentations, Decision trees, Utility theory

**Text Book:**


**Reference Books:**

MCC: 406 E-COMMERCE AND ERP

Module-I (12 hours)

Introduction to e-commerce: Business models, revenue models and business processes, economic forces & e-commerce, identifying e-commerce opportunities, international nature of e-commerce, technology infrastructure-internet & WWW; Business strategies for e-commerce: Revenue models in transaction, revenue strategic issues, creating an effective web presence, website usability; Marketing on the web: Web marketing strategies, communicating with different market segments, customer behavior and relationship intensity, advertising on the web, e-mail marketing, technology enabled CRM, search engine positioning and domain names.

Module-II (14 hours)

Business to business strategies: (Overview strategic methods for Developing E-Commerce) Purchasing, logistics and supply activities, electronic data interchange (EDI), electronic data interchange on the internet, supply chain management using internet technologies, electronic market place & portals (Home shopping, E-marketing, Tele marketing), auctions, online auctions, virtual communicative & web portals; legal, ethical & tax issues in e-commerce — use and protection of intellectual property in online business, online crime, terrorism & warfare, ethical issues.

Four C’s (Convergence, Collaborative computing, Content management & Call centre)

Technologies for e-commerce: web server hardware & software, e-commerce software, e-commerce security — online security issues, security for client computers, communication channel security, security for server computers, organizations that promote computer security; Payment statements in e-commerce(Payment through card system, E-cheque, E-cash, E-payment threats and protection), planning for e-commerce— planning e-commerce initiatives, strategies for delivering e-commerce web sites, managing e-commerce Implementations.

Module-III (14 hours)

Enterprise resource planning: Business functions, processes & data requirements, development of ERP systems, marketing information systems & sales order process, production & supply chain management information systems, accounting in ERP systems, human resource processes with ERP, process modeling, process improvement and ERP implementations, Relationship between e-commerce and ERP.

Text Books


Reference Books:

### MCL: 407  PROGRAMMING WITH JAVA LABORATORY

<table>
<thead>
<tr>
<th>Topic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.</td>
<td>Introduction, Compiling &amp; executing a java program.</td>
</tr>
<tr>
<td>02.</td>
<td>Program with data types &amp; variables.</td>
</tr>
<tr>
<td>03.</td>
<td>Program with decision control structures: if, nested if etc.</td>
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<tr>
<td>04.</td>
<td>Program with loop control structures: do, while, for etc.</td>
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<tr>
<td>05.</td>
<td>Program with classes and objects.</td>
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<tr>
<td>06.</td>
<td>Implementing data abstraction &amp; data hiding.</td>
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<tr>
<td>07.</td>
<td>Implementing inheritance.</td>
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<tr>
<td>08.</td>
<td>Implementing and polymorphism.</td>
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<tr>
<td>09.</td>
<td>Implementing packages.</td>
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<tr>
<td>10.</td>
<td>Implementing generics.</td>
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<tr>
<td>11.</td>
<td>Program with modern features of java.</td>
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<tr>
<td>12.</td>
<td>Implementing interfaces and inner classes</td>
</tr>
<tr>
<td>13.</td>
<td>Implementing wrapper classes</td>
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<tr>
<td>15.</td>
<td>Implementing cloning.</td>
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<tr>
<td>16.</td>
<td>Implementing Reflections</td>
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<tr>
<td>17.</td>
<td>Working with files.</td>
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<td>18.</td>
<td>Implementing a Lexical Analyzer</td>
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<tr>
<td>19.</td>
<td>Implementing a parser</td>
</tr>
<tr>
<td>20.</td>
<td>Implementing a code generator</td>
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</tbody>
</table>

### MCL: 408  COMPUTER GRAPHICS AND MULTIMEDIA LAB

<table>
<thead>
<tr>
<th>Topic</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>01.</td>
<td>Introduction to OpenGL Programming.</td>
</tr>
<tr>
<td>02.</td>
<td>Implementing line drawing algorithms.</td>
</tr>
<tr>
<td>03.</td>
<td>Implementing circle drawing algorithms.</td>
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<tr>
<td>04.</td>
<td>Implementing ellipse drawing algorithms.</td>
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<tr>
<td>05.</td>
<td>Implementing Line Clipping Algorithms.</td>
</tr>
<tr>
<td>06.</td>
<td>Implementing Polygon Clipping Algorithms.</td>
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<tr>
<td>07.</td>
<td>Implementing 2-d Transformations.</td>
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<tr>
<td>08.</td>
<td>Implementing 3-d Transformations.</td>
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<tr>
<td>09.</td>
<td>Implementing scan fill, boundary fill algorithms.</td>
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<tr>
<td>10.</td>
<td>Implementing seed fill, flood fill algorithm.</td>
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<tr>
<td>11.</td>
<td>Writing program on B-Splines, Bezier Curves</td>
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<tr>
<td>13.</td>
<td>Writing program on Sierpinski gasket, Koch curve.</td>
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<td>14.</td>
<td>Writing program on Fractal trees &amp; forest.</td>
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<tr>
<td>15.</td>
<td>Writing program on wire frame model &amp; terrain generation.</td>
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<tr>
<td>17.</td>
<td>Writing program on Animation &amp; Morphing techniques.</td>
</tr>
</tbody>
</table>

### MCS409 – Seminar : (Each student must present a seminar & should attend seminar presentation of others student as per regulation prescribed by the University.)
Module-1 (15 hours)

Module-2 (13 hours)
Classical planning, Knowledge Representation; Uncertain Knowledge and Reasoning: Probabilistic Reasoning, Learning from Examples, Knowledge in Learning; Natural Language Processing: Language models, Text Classification, information retrieval, information extraction

Module-3 (12 hrs)

Text Books:
   Chapters: 1 and 6.

Reference Books:
MCC 502: **OBJECT ORIENTED ANALYSIS AND DESIGN WITH UML** (3-0-0)

**Module-I**  (15 hours)

**Module-II**  (13 hours)
Analysis and Design: Process overview, system Conception, Domain Analysis, System Design, Class design.

**Module-III**  (12 hours)
Implementation: Implementation Modeling, Object Oriented (OO) Languages, Databases, Programming Style.

**Text Books:**

**Reference Books:**
MCC 503: INTERNET TECHNOLOGY AND ENTERPRISE
JAVA (3-1-0)

Module-I (15 hours)
Internet and Web Technology: Introduction and overview, Internetworking concept and architectural model, classful internet addresses, classless and subnet address extensions (CIDR), Protocol Layering, Mobile IP, Client Server model, World wide web, Voice and Video over IP.

Module-II (15 hours)

Module-III (10 hours)

Recommended Books:

References:
Module-1 (12 hours)

Module-2 (12 hours)
Random numbers, Psedo random number generation, Using random numbers to evaluate integrals, Generation of discrete random variables: Inverse transform method, generating Poisson and Binomial random variables, the acceptance – rejection technique Generating continuous random variable: The inverse transform algorithm, the rejection method, the polar method for generating normal random variables, generating Poisson process.
Discrete event simulation approach: Simulation via discrete event, the single server queuing system, Queuing system with two servers in series and with two parallel servers, Inventory model.

Module-3 (12 hrs)
Variance reduction technique: Use of antithetic variable, use of control variates, variance reduction by conditioning, stratifies sampling, Importance sampling.
Statistical validation techniques: Goodness of fit tests, Chi-square goodness of fit test for discrete data, Kolmogorov- Smirnov test for continuous data, Goodness of fit test when some parameters are unspecified, two sample problem.

Text Books

Reference Books:
1. Hamdy A.Taha,”Operations research”, Pearson Education India, New Delhi
Module-I (12 hours)
Distributed systems: Definition, goals, types of Distributed Systems, Architectures, Key characteristics-resource sharing openness, concurrency, scalability, fault tolerance, transparency; Design issues, naming, communication, software structure, workload allocation, consistency maintenance; User requirement, functionality, Quality of service, reconfigurability; Interprocess communication, building blocks, client server communication; CORBA's Common Data Representation (CDR); Java object serialization; Extensible markup language (XML); Remote object references; Inter-process communication in UNIX; Remote procedure calling; Design issues, interface definition language exception handling; Implementation - interface processing, communication handling; Binding, Case study: sun RPC Vs. Java RMI.

Module-II (12 hours)
Distributed Operating systems: kernel, processes and threads, Naming and protection - Communication and Invocation, virtual memory, Distributed file services - design issues, interfaces, implementation techniques, Case study sun NFS, Name services: Name spaces; Name resolution, Domain Name System, SNS and DNS, Peer-to-Peer Systems. Coordination and Agreement: Time and Global States, Time and co-ordination, Synchronizing physical clocks- logical time and logical clocks, Distributed co-ordination, distributed mutual exclusion, elections, Replication, basic architectural model, consistency and request ordering.

Module-III (12 hours)
Distributed Transactions, Recovery and fault tolerances: Transaction recovery, logging - shadow versions, fault model for transaction; Fault tolerance: characteristics; Hierarchical and group masking of faults; Security, authentication and key distribution, logic of authentication, digital signatures; Web Services: SOAP, XML, CORBA, Distributed object based systems, Distributed file systems, Distributed web- based systems, Distributed co-ordination based systems.

Text Books:

Reference Texts:
Module-I (12 hours)


Module-II (12 hours)

Principles of Parallel Algorithm Design: Preliminaries, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Methods for containing interaction Overheads, parallel Algorithm Models. Analytical Modelling of Parallel Programs: Sources of Overhead in Parallel Programs, Performance metrics for parallel systems, the effect of Granularity on Performance, Scalability of Parallel Systems, minimum Execution time and minimum cost-optimal Execution Time, Asymptotic Analysis of Parallel Programs, other Scalability Metrics.

Module-III (12 hours)

Basic Communication Operations: One-to-All Broadcast and All-to-One Reduction, All-to-All Broadcast and Reduction, Scatter and Gather, All-to-All Personalized Communication, Circular Shift.

Introduction to MPI Principles of Message-Passing Programming, The Building Blocks (Send and Receive Operations), MPI (the Message Passing Interface), Collective Communication and Computation Operations, Examples of Matrix - Matrix multiplication, One dimensional Matrix Vector Multiplication using MPI.

Text Books:

Reference Books:
Module-I  (12 hours)

Introduction: The digitized image and its properties: Applications of image processing, image function, image representation, sampling, quantization, color images, metrics and topological properties of digital images, histograms, image quality, noise image.

Module-II  (12 hours)

Image preprocessing: Pixel brightness transformation, position dependent brightness correction, gray scale transformation; geometric transformation, local preprocessing- image smoothening, edge detectors, zero-crossing, scale in image processing, canny edge detection, parametric edge models, edges in multi spectral images, local preprocessing and adaptive neighborhood pre processing; image restoration.

Image Segmentation: Threshold detection methods, optimal thresholding, multispectral thresholding, thresholding in hierarchical data structures; edge based image segmentation-edge image thresholding, edge relaxation, border tracing, border detection.

Module-III  (12 hours)

Mathematical Morphology: Basic morphological concepts, four morphological principles, binary dilation, erosion, Hit or miss transformation, opening and closing; thinning and skeleton algorithms; Morphological segmentation -particles segmentation and watersheds, particles segmentation.

Image textures: Statistical texture description, methods based on spatial frequencies, co-occurrence matrices, edge frequency, and texture recognition method applications.

Image representation and description: Representation, boundary descriptors, regional descriptors

Text Books:

Reference Book:
Module-I (12 hours)

Module-II (12 hours)

Module-III (12 hours)

Text Books:

Reference Books:
Module-I (12 hours)

Module-II (12 hours)

Module-III (12 hours)


Textbooks:

Reference Books:
MCE 510: SOFTWARE DESIGN (3-0-0)

Module-I (12 hours)

Module-II (12 hours)

Module-III (12 hours)

Text Books:

Reference Books:
MCE 511: BIOINFORMATICS (3-0-0)

Module-I (12 hours)
Molecular Biology and Biological Chemistry: The Genetic Material, Gene structure and Information Content, Protein Structure and Function, The nature of Chemical bonds, Molecular Biology Tools, Genomic Information Content, Data Searches and Pairwise Alignments: Dot Plot, Simple Alignments, Gaps, Scoring Matrices, Needleman and Wunsch Algorithm, Global and local Alignments, Database searches, Multiple sequence Alignments, Substitution Patterns: Patterns of substitutions within Genes, Estimating Substitution numbers, Variations in evolutionary rates between Genes, Molecular clocks, evolution in Organelles.

Module-II (12 hours)
Distance based methods of Phylogenetics: History of Molecular Phylogenies, Phylogenetic trees, Distance matrix methods, Maximum likelihood approaches, Multiple sequence Alignments, Character Based methods of Phylogenetics: Parsimony, Inferred ancestral sequences, Strategies for Faster searches, Consensus trees, tree confidence, Comparison of Phylogenetic methods, Molecular Phylogenies.

Module-III (12 hours)

Text Books:

Reference Books:
Module-I (10 hours)

Module-II (10 hours)

Module-III (10 hours)

Text Books:

Reference Books:
CL 513: **SOFTWARE DESIGN USING UML LAB** (0-0-3)

**Prerequisite:** software engineering and Object Oriented Analysis & Design with UML.  
**Designing Tools:** Rational rose/ Open Source NetBean.

The students are advised to design the different case studies correlating to their Theory paper.

**Topic**

01. Developing the Building blocks of UML: things, relationships and diagrams.

02. Generating the Following through UML:  
   a) Class diagram  
   b) Object diagram  
   c) Use case diagram  
   d) Sequence diagram  
   e) Collaboration diagram  
   f) Activity diagram  
   g) Statechart diagram  
   h) Component diagram  
   i) Deployment diagram

03. Design the following systems through UML:  
   a) OnlineBookShop Management System  
   b) Bank Management System  
   c) Library Management System  
   d) University Management System  
   e) Railway Information System

MCL 514: **ENTERPRISE WEB COMPUTING WITH JAVA LAB** (0-0-6)

**Topics**

01. HTML & XHTML Programming: basic tags, text formatting tags, creating hyperlinks.  
02. HTML & XHTML Programming: tables, lists, frames, forms, maps, Creating CSS.  
03. JavaScript Programming: Data types, loops, functions.  
04. JavaScript Programming: DOM, arrays, forms, frame, GUI design.  
05. XML Programming: page creation, making a DTD, Parsing XML files.  
06. Creating, installation and running a web server (e.g. Apache Tomcat/ GlassFish).  
07. Creating, Compiling and Running a Servlet. Program (both http & generic servlet).  
08. Implementing session tracking mechanisms in servlets.  
09. Generating Dynamic web content using Servlet basing upon request response model.  
10. DHTML programming: GUI designs.  
11. Creating a JSF program showing framework based application development.  
12. Creating, Compiling and Running a JSP Program.  
13. Implementing Session tracking through JSP Program.  
15. Creating a simple Java Bean Application programs using BDK. Tools.  
16. Deploying of beans, implementing entity beans and session beans of EJB.  
17. Creating manifest file, jar file and Deploying a web application.  
18. Designing a simple Program using JDBC, beans and JSP implementing MVC Model.  
19. Creating a RMI Program showing Marshalling and Unmarshalling Processes.  
20. A Web based Capstone project university management system using JSP and Database.
MCP 601: Project Work (for 16 weeks) Credit 20

There will be a 16 weeks project work to be undertaken by the students in any Industry / Institution. At the end of the project there will be an evaluation of the project for 20 credits by a group of experts including one external expert, internal supervisor and teachers of the department.

Each student must have an internal supervisor who is a faculty of the department/Institution. Each student must submit the abstract of the project which will be approved by the department on the recommendation of the internal supervisor.

Guidelines: SUMMARY/ABSTRACT
All students must submit a summary/abstract of the project to be undertaken to the internal supervisor for approval, preferably, should be of about 3-4 pages. The content should be as brief as is sufficient enough to explain the objective and implementation of the project that the candidate is going to take up. The write up should include the followings-

1. Name / Title of the Project
2. Statement about the Problem
3. Why is the particular topic chosen?
4. Objective and scope of the Project
5. Methodology (including a summary of the project)
6. Hardware & Software to be used
7. Testing Technologies used
8. What contribution would the project make?

After the approval, the student is allowed to carry out the project in any organization/Institution. He/She must immediately inform the internal supervisor about the name and contact details of the external supervisor in the organization/Institution. Moreover, he must report to the internal supervisor about the progress of his/her work periodically. After the end of 16 weeks, the student is required to submit the project report in the department after getting approved by the internal and external supervisors.

Guidelines for preparation of the final project report
Good quality white executive bond paper of A4 size should be used for typing and duplication with the following specification

Left margin : 3.0cm
Right margin : 2.0cm
Top margin : 2.5cm
Bottom margin : 2.5cm

Page numbers: All text pages as well as the Program source code should be numbered in the bottom center of the pages.

Font size of the normal Text : 12pt Times New Roman
Font size of Paragraph Heading : 14pt Times New Roman
Font Size of chapter Heading : 18pt Times New Roman
Font size of Code : 10pt Courier New
Format of the Project report

Cover page
Certificate of the internal supervisor
Certificate of the external supervisor
Self certificate
Acknowledgement
List of abbreviations, figures, Tables
Synopsis of the project (3-4 pages)
Main Report
   Objective and scope of the project
   Theoretical background
   Definition of the problem
   System Analysis and design
   System planning
   Methodology adopted
   System implementation
   System maintenance and Evaluation
   Cost benefit Analysis
   Detail life cycle of the project
Test reports (print out of the reports)
Print out of the code
References
Every student has to submit the followings
   (a) One hard copy of the Project report
   (b) Soft copy of the project on CD (to be submitted to the University) on a cover mentioning the name of the project, name of the student, Regd No., name of the college, Year
   (c) Five copies of the synopsis of the project report

Evaluation of the Project
Evaluation of the project will be done by a jury of experts including one external expert, Head of the Department, internal supervisor, two teachers of the department. The evaluation will be done on the basis of the followings
Presentation : 30 Percentile
Viva-Voce : 20 Percentile
Project report : 50 Percentile

Number of students in a project should not be more than one. In some cases if the project completion needs more than 16 weeks, then two students may be allowed on the recommendation of the supervisors. However, they should handle different modules of the project.