Course Curriculum (w.e.f. Session 2016-17)
Master of Computer Applications (MCA)

COURSE CURRICULUM
(UPDATED AFTER 10TH BOS)

DEPARTMENT OF COMPUTER ENGINEERING & APPLICATIONS
GLA UNIVERSITY, MATHURA (U.P.) INDIA
COURSE STRUCTURE
MCA
Course Curriculum (w.e.f. Session 2016-17)
Master of Computer Applications (MCA)

DEPARTMENT OF COMPUTER ENGINEERING & APPLICATIONS, Institute of Engineering & Technology

### First Semester

<table>
<thead>
<tr>
<th>S. NO.</th>
<th>CODE</th>
<th>SUBJECT</th>
<th>TEACHING SCHEME</th>
<th>CREDITS</th>
<th>CONTACT HR/WK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MCA1001</td>
<td>Computer Concept &amp; Programming</td>
<td>4 0 0</td>
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<tr>
<td>2.</td>
<td>MCA1002</td>
<td>Computer Organization &amp; Architecture</td>
<td>3 1 0</td>
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<tr>
<td>3.</td>
<td>MCA1003</td>
<td>Fundamentals of Computers</td>
<td>3 0 0</td>
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<td>4.</td>
<td>MCA1004</td>
<td>Discrete Mathematics</td>
<td>3 1 0</td>
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<td>5.</td>
<td>MBA1008</td>
<td>Managerial and Organizational Behaviour</td>
<td>3 0 0</td>
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<td>6.</td>
<td>AHS1002</td>
<td>Environmental Science</td>
<td>2 0 0</td>
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</tbody>
</table>

**PRACTICALS**

| 7.     | MCA1081 | Computer Programming Lab       | 0 0 4           | 2       | 4             |
| 8.     | MCA1082 | Computer Organization & Architecture Lab | 0 0 2  | 1       | 2             |
| 9.     | MCA1083 | Computer Lab                   | 0 0 2           | 1       | 2             |
| 10.    | AHE1082 | Professional Communication Lab-I | 0 0 2     | 1       | 2             |
| 11.    | MCA1099 | General Proficiency            | 0 0 0           | 1       | 0             |

**Total**

|       | 18   | 2    | 10   | 26   | 30   |

### Second Semester

<table>
<thead>
<tr>
<th>S. NO.</th>
<th>CODE</th>
<th>SUBJECT</th>
<th>TEACHING SCHEME</th>
<th>CREDITS</th>
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<tbody>
<tr>
<td>1.</td>
<td>MCA2001</td>
<td>Theory of Automata &amp; Formal Language</td>
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<td>2.</td>
<td>MCA2002</td>
<td>Computer Graphics &amp; Multi Media</td>
<td>4 0 0</td>
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<td>3.</td>
<td>MCA2003</td>
<td>Introduction to Microprocessors</td>
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<td>4.</td>
<td>MCA2004</td>
<td>Optimization Technique</td>
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<td>5.</td>
<td>MBA2008</td>
<td>Accounting &amp; Financial Management</td>
<td>2 1 0</td>
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</table>

**PRACTICALS**

| 6.     | MCA2081 | Computer Graphics & Multi Media Lab | 0 0 4 | 2       | 4             |
| 7.     | MCA2082 | Microprocessors Lab               | 0 0 2 | 1       | 2             |
| 8.     | MCA2083 | Mini Project I                    | 0 0 4 | 2       | 4             |
| 9.     | AHE 2082| Professional Communication Lab-II | 0 0 2 | 1       | 2             |
| 10.    | MCA2099 | General Proficiency               | 0 0 0 | 1       | 0             |

**Total**

|       | 15   | 4    | 12   | 26   | 31   |
# Course Curriculum (w.e.f. Session 2016-17)

## Master of Computer Applications (MCA)

### Third Semester

<table>
<thead>
<tr>
<th>S. NO.</th>
<th>CODE</th>
<th>SUBJECT</th>
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<tbody>
<tr>
<td>1.</td>
<td>MCA3001</td>
<td>Object Oriented Programming</td>
<td>3 0 0</td>
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<td>2.</td>
<td>MCA3002</td>
<td>Data Structures</td>
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<td>3.</td>
<td>MCA3003</td>
<td>Database Management System</td>
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<td>Software Engineering</td>
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<td>Operating System</td>
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<thead>
<tr>
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<tbody>
<tr>
<td>7. MCA3081</td>
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<td>8. MCA3082</td>
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<td>9. MCA3083</td>
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<td>10. AHE3081</td>
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</table>

**Total** | 18 | 1 | 14 | 27 | 33 |

### Fourth Semester

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<tbody>
<tr>
<td>1.</td>
<td>MCA4001</td>
<td>Unix &amp; Shell Programming</td>
<td>3 0 0</td>
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<td>Design &amp; Analysis of Algorithm</td>
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<td>6.</td>
<td>Elective II</td>
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<td>9. MCA4083</td>
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<td>11. AHE4081</td>
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<td>12. MCA4099</td>
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**Total** | 18 | 2 | 12 | 27 | 32 |
## Fifth Semester

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<tbody>
<tr>
<td>1.</td>
<td>MCA5001</td>
<td>Web Technology</td>
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<td>MCA5002</td>
<td>Distributed Systems</td>
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<td>.Net framework using C#</td>
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<td>4.</td>
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<tr>
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<td>6.</td>
<td>AHE5001</td>
<td>Technical Writing</td>
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### PRACTICALS

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<tr>
<td>7.</td>
<td>MCA5081</td>
<td>Web Technology Lab</td>
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<td>8.</td>
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<td>.Net framework Lab</td>
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<td>9.</td>
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<td>Mini Project III</td>
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<td>10.</td>
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**Total**: 18 0 14 26 32

## Sixth Semester

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<tbody>
<tr>
<td>1.</td>
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## ELECTIVE I

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<th>S. No.</th>
<th>CODE</th>
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<th>TEACHING SCHEME</th>
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<th>CONTACT WEEK</th>
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<tbody>
<tr>
<td>1.</td>
<td>MCA4021</td>
<td>Information Retrieval Systems</td>
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<td>2.</td>
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<td>Soft Computing</td>
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<td>3.</td>
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<td>Digital Image Processing</td>
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<td>4.</td>
<td>MCA4024</td>
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## ELECTIVE II

<table>
<thead>
<tr>
<th>S. NO.</th>
<th>CODE</th>
<th>SUBJECT</th>
<th>TEACHING SCHEME</th>
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<th>CONTACT WEEK</th>
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<tbody>
<tr>
<td>1.</td>
<td>MCA4041</td>
<td>Data Compression</td>
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<td>2.</td>
<td>MCA4042</td>
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<td>3.</td>
<td>MCA4043</td>
<td>Service Oriented Architecture</td>
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<td>4.</td>
<td>MCA4044</td>
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## ELECTIVE III

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<tbody>
<tr>
<td>1.</td>
<td>MCA5021</td>
<td>Data Mining &amp; Warehousing</td>
<td>3 0 0</td>
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<td>MCA5022</td>
<td>Cloud Computing</td>
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<td>3.</td>
<td>MCA5023</td>
<td>Mobile Computing</td>
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<td>4.</td>
<td>MCA5024</td>
<td>Agile Software Development</td>
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## ELECTIVE IV

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<th>CONTACT HR/WK</th>
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<tbody>
<tr>
<td>1.</td>
<td>MCA5041</td>
<td>Cryptography &amp; Network Security</td>
<td>3 0 0</td>
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<td>2.</td>
<td>MCA5042</td>
<td>Software Project Management</td>
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<td>3.</td>
<td>MCA5043</td>
<td>Artificial Intelligence</td>
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<td>4.</td>
<td>MCA5044</td>
<td>Business Intelligence</td>
<td>3 0 0</td>
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</table>
MCA1001: COMPUTER CONCEPT & PROGRAMMING

Objective: To use efficient implementations of algorithms and data structures.

Credits: 04

<table>
<thead>
<tr>
<th>Module No. Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning the Computer Program: Purpose of Program Planning, Algorithm, Flowcharts.</td>
</tr>
<tr>
<td>Introduction to C Programming Language: Structure of a C Program, Standard I/O in C, Fundamental Data Types- Character, Integer, Single and Double-Precision Floating Point, Data type modifiers: Short, Long, Unsigned.</td>
</tr>
<tr>
<td>Making Decisions, Loops and Iteration: Conditional Program Execution, Applying if and switch Statements, Nesting if and else, Restrictions on switch Values, Use of break and default with switch, Program Loops and Iteration, Uses of while, do while and for loops, Multiple Loop Variables, Assignment Operators, Using break and continue.</td>
</tr>
<tr>
<td>Storage Classes: Auto, Extern, Register and Static Variables.</td>
</tr>
<tr>
<td>Structure and Union: Declaration and Initialization of Structures, Structure as Function Parameters, Unions.</td>
</tr>
<tr>
<td>Pointers: Pointer Variable and its Importance, Pointer Arithmetic and Scale Factor, Compatibility, Dereferencing, L-value and R-value, Pointers and Arrays, Pointer and Character Strings, Pointers and Functions, Array of Pointers, Pointer to Pointer, Structure Pointer.</td>
</tr>
<tr>
<td>Dynamic Memory Allocation: Malloc, Calloc, Free.</td>
</tr>
<tr>
<td>The Pre-Processor Directives, Command Line Arguments, Macros.</td>
</tr>
<tr>
<td>File Management: Opening a File, Closing a File, Input/Output Operations in Files, Random Access to Files.</td>
</tr>
</tbody>
</table>

Teaching Hours: 18

Text Book:

Reference Books:

Outcome: After completion of this course students
- will be equipped with problem solving skills with C language and will be able:
  - To provide a comprehensive study of the C programming language.
  - To acquire art of computer programming.
Objective: To learn the instructions at micro level, data flow, timing analysis, hardware cost and execution cycle and memory hierarchy.

Credits: 04

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
</table>

Text Book:

Reference Books:

Outcome: After completion of this course students
- will have an idea about the functionality, behavior of the major subsystems of computer and architecture of a modern computer with its various processing units and
- will be able to learn the performance measurement of the computer system.
MCA1003: FUNDAMENTALS OF COMPUTERS

Objective: To acquire the basic knowledge of digital logic levels.

Credits: 03 Semester I L–T–P: 3–0–0

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td><strong>Information concept and Processing</strong>: Definition of Information, Need for Information, Quality of Information, Value of Information, Categories and Levels of information in Business Organization, Data concepts and Data Processing, data representation – Number system. <strong>Computer Appreciation</strong>: Definition of an Electronic Digital Computer, history, Generations, Characteristics and applications of Computers, classification of Computers. <strong>Elements of Computers Processing System</strong>: Hardware CPU, Peripherals, Storage Media, Software Definition, Role and Categories, Firmware and Humanware.</td>
<td>14</td>
</tr>
<tr>
<td>II</td>
<td><strong>Communication</strong>: Need for communication, Data Transmission, Baud, Bandwidth, Data transmission rate, Channel Capacity, transmission impairments, Signal noise ratio. Transmission media (twisted cables, Microwave and radio wave, Optical fiber and satellite) and communication through these media. A/D and D/A, Modulation, Multiplexing-FDM, TDM. <strong>Communication techniques</strong>: Circuit switching, message switching and packet switching and their advantages and disadvantages.</td>
<td>13</td>
</tr>
</tbody>
</table>

Text Book:

Reference Books:

Outcome: After completion of this course students
- will have an idea about the use of Information Technology.
- The student will be able to understand state-of-the-art in network protocols, architectures, and applications and
- to understand the number system in computer.
MCA1004: DISCRETE MATHEMATICS

Objective: A course designed to prepare math, computer science, and engineering majors for a background in abstraction, notation, and critical thinking for the mathematics most directly related to computer science. Topics include: logic, relations, functions, basic set theory, countability and counting arguments, proof techniques, mathematical induction, combinatorics, discrete probability, recursion, sequence and recurrence, elementary number theory, graph theory, and mathematical proof techniques. Students will learn core ideas in graph theory.

Credits: 04

Module No. | Content | Teaching Hours
--- | --- | ---
I | **Sets, Functions and Relations**: Definition of Sets, Countable and Uncountable Sets, Venn Diagrams, Proofs of Some General Identities on Sets, Functions – Definition and Types; Relations – Definition and Types. **Theorem Proving Techniques**: Mathematical Induction (Simple and Strong), Pigeonhole Principle, Proof by Contradiction. | 13
III | **Propositional Logic**: Proposition, First order Logic, Basic Logical Operation, Truth Tables, Tautologies, Contradictions, Algebra of Proposition, Logical Implications, Logical Equivalence, Predicates, Universal and Existential Quantifiers. **Graph Theory**: Simple Graph, Multi Graph, Connected Component in a Graph, Euler Graphs, Hamiltonian Path and Circuits, Graph Coloring, Chromatic Number, Isomorphism and Homomorphism of Graphs, Planar Graph, Weighted Graph, Travelling Salesman Problem. | 13

Text Book:

Reference Books:

Outcome:
Upon successful completion of this course, students will:
- Construct mathematical arguments using logical connectives and quantifiers.
- Verify the correctness of an argument using propositional and predicate logic and truth tables.
- Demonstrate the ability to solve problems using counting techniques and combinatorics in the context of discrete probability.
- Solve problems involving recurrence relations and generating functions.
• Use graphs and trees as tools to visualize and simplify situations.
• Perform operations on discrete structures such as sets, functions, relations, and sequences.
• Construct proofs using direct proof, proof by contraposition, proof by contradiction, proof by cases, and mathematical induction.
• Apply algorithms and use definitions to solve problems to prove statements in elementary number theory.
• Students will understand the language of graphs and trees.
• Students will understand the use of graphs as models.
• Students will understand various types of trees and methods for traversing trees.
MBA1008: MANAGERIAL AND ORGANIZATIONAL BEHAVIOR

Objective: To understand the roles of managers in firms and to analyze the demand and supply conditions and assess the position of a company.

Credits: 03

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
</table>

Text Book:

Reference Books:

Outcome: After completion of this course students
- will able to understand the internal and external decisions to be made by managers.
- will able to analyze real-world business problems with a systematic theoretical framework.
- will be make optimal business decisions by integrating the concepts of economics, mathematics and statistics.
AHS1002: Environmental Science

Objective: To create awareness towards various environmental issues like global warming, urbanization, pollutions, ozone layer depletion etc; their causes and remedial steps for protecting impacted society.

Credits: 02 Semester I L–T–P: 2–0–0

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
</table>

Text Book:

Reference Books:
Course Curriculum (w.e.f. Session 2016-17)
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Outcome:

- Students will be able to understand the environmental issues pertaining to day-to-day living; gain awareness for the need of environmental education vis-à-vis education for sustainable development.
- Students will acquire knowledge in ecological perspective and value of environment, biotic components, ecosystem process: energy, food chain, water cycle etc.
- Students will be able to understand water quality standards and parameters, assessment of water quality, air pollution, pollutants, acid rain, global climate change and green house gases.
- Students will learn to understand variety of social issues associated with environmental deterioration involving human components such as population, ethics and urban settlements.
## MCA1081: COMPUTER PROGRAMMING LAB

**Objective:** To implement the algorithms of data structure and various programs.

### Credits: 02

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Lab Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>Execution of Simple ’C’ Programs</td>
<td></td>
</tr>
<tr>
<td>(a)</td>
<td>WAP to Calculate Simple Interest.</td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td>WAP to Swap Two Numbers with and without using Third Variable.</td>
<td></td>
</tr>
<tr>
<td>(c)</td>
<td>WAP to Input the Distance of a City in [KM] and Print the Distance to Meter and Centimeter.</td>
<td></td>
</tr>
<tr>
<td>(d)</td>
<td>WAP to Calculate the Gross Salary of an Employee where DA=50% of Basic, HRA=35% of Basic Salary.</td>
<td></td>
</tr>
<tr>
<td>(2)</td>
<td>Expression and Evaluation</td>
<td></td>
</tr>
<tr>
<td>(a)</td>
<td>WAP to Calculate the Average of Three numbers.</td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td>WAP to convert temperature from Celsius to Fahrenheit and vice-versa.</td>
<td></td>
</tr>
<tr>
<td>(c)</td>
<td>Check the Behavior of the Operators.</td>
<td></td>
</tr>
<tr>
<td>(3)</td>
<td>Conditional and Branching</td>
<td></td>
</tr>
<tr>
<td>(a)</td>
<td>WAP to Find Whether Given Number is Even or Odd.</td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td>WAP to Find Greater among Three Numbers.</td>
<td></td>
</tr>
<tr>
<td>(c)</td>
<td>WAP to Input the Basic Salary and Year of Experience of an Employee. Calculate the Gross Salary where DA=90% of basic, HRA=35% of basic. If the experience of an employee is greater than equal to 5 years and gross salary is less than Rs.10000 then show the net updated salary with the increment 5000 in gross salary.</td>
<td></td>
</tr>
<tr>
<td>(d)</td>
<td>WAP to calculate percentage and grade of a student of five subjects.</td>
<td></td>
</tr>
<tr>
<td>(e)</td>
<td>WAP to find whether a given year is leap year or not.</td>
<td></td>
</tr>
<tr>
<td>(4)</td>
<td>Iteration</td>
<td>48</td>
</tr>
<tr>
<td>(a)</td>
<td>WAP to even numbers between 5 to 5000</td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td>WAP to print Fibonacci series up to the desired term.</td>
<td></td>
</tr>
<tr>
<td>(c)</td>
<td>WAP to calculate factorial of a given number.</td>
<td></td>
</tr>
<tr>
<td>(d)</td>
<td>WAP to generate table of a given number in proper format.</td>
<td></td>
</tr>
<tr>
<td>(e)</td>
<td>WAP to check whether an input number is prime or not.</td>
<td></td>
</tr>
<tr>
<td>(f)</td>
<td>WAP to input a number and print the reverse of that number with multiplication of digits.</td>
<td></td>
</tr>
<tr>
<td>(g)</td>
<td>WAP to input a number and print the sum of first and last digit of that number.</td>
<td></td>
</tr>
<tr>
<td>(h)</td>
<td>WAP to check whether an input number is palindrome or not.</td>
<td></td>
</tr>
<tr>
<td>(i)</td>
<td>WAP to print the Armstrong numbers between 2 to 500.</td>
<td></td>
</tr>
<tr>
<td>(5)</td>
<td>Functions</td>
<td></td>
</tr>
<tr>
<td>(a)</td>
<td>WAP to perform arithmetic operations using functions and switch case.</td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td>WAP to calculate the factorial of a number by using function.</td>
<td></td>
</tr>
<tr>
<td>(c)</td>
<td>WAP to calculate the binomial coefficient.</td>
<td></td>
</tr>
<tr>
<td>(d)</td>
<td>WAP to print the series and sum of the series:</td>
<td></td>
</tr>
<tr>
<td>(i)</td>
<td>$1+1/2!+1/3!+$.................</td>
<td></td>
</tr>
<tr>
<td>(ii)</td>
<td>$1+x/2!+x/3!+$.....................</td>
<td></td>
</tr>
<tr>
<td>(iii)</td>
<td>$X\cdot X/3! + X/5! - X/7! + X/9! -$......................</td>
<td></td>
</tr>
<tr>
<td>(iv)</td>
<td>$X + X \cdot X/3! + X/5! + X/7! + X/9! -$......................</td>
<td></td>
</tr>
<tr>
<td>(e)</td>
<td>WAP to demonstrate the call by value and call by reference.</td>
<td></td>
</tr>
<tr>
<td>(6)</td>
<td>Recursion</td>
<td></td>
</tr>
<tr>
<td>(a)</td>
<td>WAP to calculate factorial of a number.</td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td>WAP to generate table of any number.</td>
<td></td>
</tr>
</tbody>
</table>
(c) WAP to find GCD of two numbers.
(d) WAP to calculate nth term of Fibonacci Series 1,1,2,3,5,8.....................

| (7) Array | (a) WAP to perform addition and subtraction and transpose of two matrixes.
| (b) WAP to perform matrix multiplication of two matrixes.
| (c) WAP to check whether given text is palindrome or not.
| (d) WAP to calculate total number of consonants, vowels and other characters in a given line of the text.
| (e) WAP to print the length of a string.
| (f) WAP to search an element in an array. |

| (8) Structures | (a) WAP to demonstrate use of structure.
| (b) WAP to enter 10 records of student information. Structure fields are Name, Roll no, Marks. Calculate the average of their marks.
| (c) WAP to demonstrate, how structure is passed to a function.
| (d) WAP to demonstrate, how structure is passed to a function. |

**Outcome:** After completion of this course Students will be able:

- To be equipped with problem solving skills with C language.
- To provide with the means of writing efficient, maintainable, and portable code.
- To write, compile and debug programs in C language.
Objective: To analyze performance issues in processor and to understand the memory design.

Credits: 02

Semester I

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Lab Hours</th>
</tr>
</thead>
</table>
| I          | • Introduction of Computer Organization.  
            • To study and implement various AND GATE using universal gates NAND.  
            • To study and implement various AND GATE using universal gates NOR.  
            • To study and implement various NOT GATE using universal gates NOR.  
            • To study the operation of Demultiplexer.  
            • To study the operation of decimal to BCD encoder.  
            • To study the operation of BCD decoder to decimal.  
            • To study the half adder and full adder using NAND and NOR gates.  
            • To study the half subtractor & full subtractor using NAND & XOR gates.  
            • To study the operation of segment decoder.  
            • To study the operation of Flip –Flop (JK, D, T).  
            • To study the BCD counter.  
            • To study the Ring counter and Johnson counter. | 24 |

Outcome:

• After completion of this course students will have an idea about the functionality and behavior of the major subsystems of computer.
**Course Curriculum (w.e.f. Session 2016-17)**

**Master of Computer Applications (MCA)**

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### MCA1083: COMPUTER LAB

**Objective:** To understand the basic knowledge of computer and its applications.

**Credits:** 01

**Semester I**

**L–T–P: 0–0–2**

#### LIST OF PRACTICALS

- Identify and familiarity with functionality of various components of computer. 1
- Installation of Windows, Linux operating system and other s/w and packages. 1
- Working on Operating System: To check some elementary functions of Operating System: 1
  - Booting/Shut Down.
  - Change Desktop Settings
  - Change Date and Time
  - Check system properties.
- Introduction to computer network i.e. LAN 1
- Basic Command of Operating System (Dos/Windows) 1
- **Working on Microsoft Office** 4
  - Word Processing (MS Word)
    - A document is required to be created for testing the following areas:
      - Editing and formatting text and paragraph
      - Page and paragraph setup
      - Inserting symbols and pictures
  - Presentation (Power Point Presentation)
    - A presentation is required to be created with 4 slides for testing the following areas:
      - Editing and formatting slides
      - Inserting pictures and sounds
      - Animating pictures and text with sound effects
  - **MS Excel**
    - A spreadsheet is required to be created for testing the following areas:
      - Formatting cells and data
      - Functions & formulae (Relative, absolute and Mixed reference)
      - Charts
  - Working on Internet and Email and Web Search 1
    - **Use of Internet**
      - Web Browser Types and usage
      - Website browsing, Web Portal Types
      - Working on Search Engine
      - Working on Google Drive for sharing information
    - **Use of Email**
      - Create an email account
      - Sending mail, multiple mails, use of CC and BCC, Mail attachments.
      - Chatting Applications
  - **Social Networking**
    - Create and account on social networking portal
    - Add and delete friends
    - Reading and sending messages

**Outcome:** The student will be familiar with the hardware, software installation, office packages and networking. He will be able to understand about browser and its types and email creation.
AHE 1082: PROFESSIONAL COMMUNICATION LAB-I

Objectives:
- To help learners gain confidence in spoken English and overcome inhibitions.
- To equip learners with effective listening and train them to acquire standard pronunciation, accent, stress patterns and intonation. To enrich their vocabulary.

Credit: 01

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Hurdles of the Path and Route Map, Language Drills: Singular &amp; Plural, countable &amp; uncountable, Parts of speech, Tense-shift, Routine Expressions: Greetings, Introducing yourself and others, Query—formal/informal, Replies-Positive, Neutral and Negative, Expressing surprise, regret, apology, seeking information, Tenses through simple presentations: Present: Introduction, Routine, My City, My Value System etc. Past: Describing events—marriage party, picnic, conference etc. Experience, Process, Movie Future: Goal of my life, India of my dreams etc. We will have to return to our roots, Cloning will make us immortal, Technological Advancement: Man is on the verge of becoming Machine/God.</td>
<td>10</td>
</tr>
<tr>
<td>II</td>
<td>Virtual Speaking, Extempore: 1 minute description of objects in the room, Picture Description: Flow of the idea, organization of the message, Crowded Pictures, Abstract Pictures (modern art etc.), Open ended-relationship based: Mother (in Business suit) rushing outside while child is crying, goods in home are scattered, Sibling Fight joint family—having fun, Cook a Story: ways of developing in prose, Jumbled Pictures, One person-one sentence, Tie-up the loose threads</td>
<td>10</td>
</tr>
<tr>
<td>III</td>
<td>Rapid Vocabulary &amp; its Usage: Roots &amp; word formation, commonly misused words, words with shades of meaning, Phrasal Verbs, Terms used as Noun &amp; Verb, Noun &amp; Adjectives, Speak Well: Ambiguity in conversation/comment, Reason &amp; ways to root it out, commonly mispronounced words Phonetic symbols/ Pronunciation Drills Comprehension and Conversation, Listening: Active &amp; Passive listening, listening with Empathy, Listening Comprehension, Reading Comprehension (pre-discussion and Post discussion), Telephonic Conversation: Greetings, putting the phone on hold, inquiry about the caller. Simple Role Play.</td>
<td>10</td>
</tr>
</tbody>
</table>

References:

Outcome: After completion of this course Students will be able to:
- Understand the sounds of RP and apply them to transcribe words.
- Write paragraphs, stories etc. using short and crisp sentences.
- Listen, speak, read & write the sounds of English using correct stress, tone and rhythm.
MCA2001: THEORY OF AUTOMATA & FORMAL LANGUAGE

Objective: Introduce concepts in automata theory and theory of computation. Identify different formal language classes and their relationships also design grammars and recognizers for different formal languages.

Credits: 04

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td><strong>Introduction, Alphabets, Strings and Languages</strong>&lt;br&gt;Automata and Grammars,&lt;br&gt;Deterministic Finite Automata (DFA)-Formal Definition, Simplified Notation-State Transition Graph, Transition Table, Language of DFA, Nondeterministic Finite Automata (NFA), NFA with Epsilon Transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing One String from other, Myhill-Nerode Theorem; FA with Output, Moore and Mealy Machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA. Regular Expression (RE) , Definition, Algebraic Laws for Regular Expressions, Kleen's Theorem, Regular Expression to FA, DFA to Regular Expression, Arden Theorem, Non Regular Languages, Pumping Lemma for Regular Languages, Application of Pumping Lemma, Closure Properties of Regular Languages, Decision Properties of Regular Languages.</td>
<td>13</td>
</tr>
<tr>
<td>II</td>
<td><strong>Context Free Grammar (CFG) and Context Free Languages (CFL):</strong>&lt;br&gt;Definition, Examples, Derivation , Derivation Trees, Ambiguity in Grammar, Inherent Ambiguity, Ambiguous to Unambiguous CFG, Useless Symbols, Simplification of CFGs, Normal Forms for CFGs- CNF and GNF; Closure Properties of CFLs, Decision Properties of CFLs, Emptiness, Finiteness and Membership, Pumping Lemma for CFLs. <strong>Push Down Automata (PDA):</strong> Description and Definition, Instantaneous Description, Language of PDA, Acceptance by Final State, Acceptance by Empty Stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two Stack PDA.</td>
<td>14</td>
</tr>
<tr>
<td>III</td>
<td><strong>Turing Machines (TM):</strong> Basic Model, Definition and Representation, Instantaneous Description, Language Acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church’s Thesis, Recursive and recursively Enumerable Languages, Halting Problem, Introduction to Undecidability, Undecidable Problems about TMs. Post Correspondence Problem (PCP), Modified PCP, Computational Complexity Theory, Intractable Problems.</td>
<td>13</td>
</tr>
</tbody>
</table>

Text Book:

Reference Books:

Outcome:
- Acquire a primary understanding of the core concepts in automata theory and formal languages.
- Acquire a fundamental understanding of core concepts relating to the theory of computation and computational models including decidability and intractability.
- The students should be able to distinguish between the different mathematical models and be able to use these models in solving different types of problems.
MCA2002: COMPUTER GRAPHICS & MULTIMEDIA

Objective: To provide a comprehensive introduction to computer graphics and its applications.

Credits: 04

Semester II

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td><strong>Graphics Systems:</strong> Refresh CRT, Raster-Scan Displays, DVST, Plasma Displays, LCD, Input. &lt;br&gt;<strong>Devices:</strong> Functions Provided by Input Devices, Basic Working of these Input Devices. &lt;br&gt;<strong>Output Primitives:</strong> Lines DDA, Bresenham &amp; Circle Drawing Algorithms, Filled Area Primitives, Scan Line Polygon Fill Algorithm, Inside Outside Tests, Boundary Fill &amp; Flood Fill Algorithm. &lt;br&gt;<strong>Line Clipping Algorithms:</strong> Cohen Sutherland Line Clipping Algorithm, Liang Barsky Algorithms, Polygon Clipping Algorithms- Sutherland Hodgeman, Weiler Atherton Algorithms.</td>
<td>18</td>
</tr>
<tr>
<td>II</td>
<td><strong>Transformation:</strong> Translation, Rotation, Scaling, Mirror Images, Transformation about an Arbitrary Point, 3D - Transformation, Rotation about an Arbitrary Axis. &lt;br&gt;<strong>Projection:</strong> Orthogonal Projections, Multiple Views, Isometric Projection, Perspective Projections (One, Two and Three Vanishing Points). Quadric Surfaces, Spline Representation, Spline Specification, Bezier Curves and Surfaces, B-Splines and Surfaces, Displaying Spline Curves and Surfaces.</td>
<td>17</td>
</tr>
<tr>
<td>III</td>
<td><strong>Hidden Line and Surface Removal Algorithms:</strong> Back Face Detection, Depth-Buffer and A-buffer Methods, Introduction to Shading. &lt;br&gt;<strong>Graphics Standards:</strong> GKS/PHIGS. &lt;br&gt;<strong>Multimedia:</strong> Multimedia Architecture, Multimedia File Formats, Compression, Image Compression, Video Compression, Audio Compression. &lt;br&gt;<strong>DVI Technology:</strong> Video &amp; Audio Codecs, Virtual Reality, GUI Design, Playback, Hypermedia Linking and Embedding.</td>
<td>17</td>
</tr>
</tbody>
</table>

Text Book:

Reference Books:

Outcome: At the end of this course, the students
- should be able to understand development and advancement of computer graphics technology.
- He should be able to understand how computer graphics techniques, focusing on 3D modeling, image synthesis, and rendering.
**MCA2003: INTRODUCTION TO MICROPROCESSORS**

**Objective:** To provide a theoretical introduction to microcontrollers and microprocessors and assembly language programming techniques.

**Credits:** 04  
**Semester II**  
**L-T-P:** 3–1–0

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
</table>
| I          | **Introduction:** Microprocessors Evolution and Types, Overview of 4004, 8080, 8085, 8086, 80286, 80386, 80486 and Pentium Micro Processor, Micro Processor Application.  
**8-Bit Microprocessor:** 8085 Microprocessor and its Architecture, The 8085 Programming Model, Addressing Modes, Instruction Classification, Instruction Format, Overview of Instruction Set-Data Transfer Operation, Arithmetic Operation, Logic Operations and Branch Operations. Introduction to Assembly Language Program. | 13 |
| II         | **Programming Technique with Additional Instruction:** Looping, Counting, Indexing, Additional Data Transfer and 16-bit Arithmetic Instruction, Counters and Time Delays, Stack and Subroutine.  
**16 Bit Microprocessor:** Architecture of 8086 – Register Organization, Execution Unit, Bus Interface Unit, Signal Description, Physical Memory Organization, Mode of Operation, I/O Addressing Capabilities. | 14 |
| III        | **Peripheral Interfacing:** I/O Programming: Programmed I/O, Interrupt Driven I/O, DMA I/O, Memory-Mapped I/Os.  
**Peripheral Devices:** 8237 DMA Controller, 8255 Programmable Peripheral Interface, 8253/8254 Programmable Timer/Counter, 8259 Programmable Interrupt Controller. | 13 |

**Text Book:**

**Reference Books:**

**Outcome:**
At the end of the course, students will be able to
- Identify the basic element and functions of microprocessor.
- Describe the architecture of microprocessor and its peripheral devices.
MCA2004: OPTIMIZATION TECHNIQUE

Objective: To understand the knowledge of Mathematics with problem solving approach in algorithms.

Credits: 04

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
</table>

Text Book:

Reference Books:

Outcome: At the end of this course, the students
- should be able to understand how real time problem can be solved using optimization technique.
MBA2008: ACCOUNTING & FINANCIAL MANAGEMENT

Objective: To understand the issues and framework of corporate finance and analyze the effect of corporate decision of the value of a firm.

Credits: 03

Module No. | Content | Teaching Hours
--- | --- | ---
I | **Overview:** Meaning of Accounting, Characteristics, Functions, Importance, Concepts, Conventions, Brief Introduction to Accounting Standards and IFRS. Double Entry System-Journalizing of Transaction, Posting in Ledger. | 13
II | **Mechanics of Accounting:** Preparation of Final Accounts-Trial Balance, Trading Account, Profit & Loss Account, and Balance Sheet, Concept of Copyright, Trademark, Patents and Goodwill. **Analysis of Financial Statement:** Ratio Analysis- Solvency Ratios, Profitability Ratios, Activity Ratios, Liquidity Ratios. Concept of Comparative Balance Sheet and Trend Analysis. | 14

Text Book:

Reference Books:

Outcome: At the end of this course, the students will able to:
- Analyze a firm’s performance to determine its strengths and weaknesses, and be able to use financial analysis to improve performance.
- Design a firm’s financial needs and interpret its effect on the value of the firm.
- Make optimal financial decisions by integrating the concepts of leverage, working capital and dividend
MCA2081: COMPUTER GRAPHICS & MULTI MEDIA LAB

Objective: To implement various algorithms of computer graphics and to create interactive graphics.

Credits: 02 Semester II

L–T–P : 0–0–4

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Lab Hours</th>
</tr>
</thead>
</table>
| I          | • Design a program for moving of Text from Left to right on the screen.  
  • Design a program for moving of Text from Left to right by changing color of the text.  
  • Implementation of DDA Line Algorithm  
  • Implementation of mid point Circle Algorithm.  
  • Implementation of Bresenham's Algorithm – Line, Circle.  
  • Program for drawing polygon.  
  • Program for filling polygon by using Boundary fill and flood fill Algorithms.  
  • Two Dimensional transformations - Translation, Rotation, Scaling, Reflection.  
  • Composite 2D Transformations  
  • Implement Cohen Sutherland 2D line clipping algorithm.  
  • Implement Liang Barsky 2D line clipping algorithm.  
  • Three dimensional transformations - Translation, Rotation, Scaling  
  • Composite 3D transformations  
  • Implementation of Visible Surface Detection Algorithms. | 48 |

Outcome:

After completing the lab student will be able:

• To write programs that demonstrates computer graphics animation.
• To create interactive graphics applications using one or more graphics application programming interfaces.
MCA2082: MICROPROCESSORS LAB

Objective: To design of hardware interfacing circuits and practical introduction to microcontrollers and microprocessors.

Credits: 01

Semester II

L–T–P: 0–0–2

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Lab Hours</th>
</tr>
</thead>
</table>
| I          | • To study 8085 microprocessor System.  
• To study 8086 microprocessor System.  
• To develop and run a program to find out largest and smallest number.  
• To develop and run a program for converting temperature from °F to °C.  
• To develop and run a program to compute square root of a given number.  
• To develop and run a program for computing ascending/ descending order of the numbers.  
• To perform interfacing of RAM chip to 8085/8086.  
• To perform interfacing of keyboard controller.  
• To perform interfacing of DMA controller.  
• To perform interfacing of UART/USART. | 24 |

Outcome:

At the end of the course, students will be able to

• Identify the basic element and functions of microprocessor.
• Understand how basic assembly language program can be written.
MCA2083: MINI PROJECT I

Objective: To implement a computer language to build a software system to reduce the paper work.

Credits: 02 Semester II

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Lab Hours</th>
</tr>
</thead>
</table>
| I          | Students are required to develop a real time application project comprising of minimum 1000 LOC on any platform in a modular structure. The development of the project must consist of the following:  
Project Planning – Schedule and Activity Estimation using MS Project 2000  
SRS in IEEE 830-1998 format  
Process Framework for development  
Software Design Document as per IEEE-1016  
Interfaces Detail and Component Level Design  
Test Cases development as per the stated Software requirement, which is further to be tested on any CASE tool.  
In order to obtain creativity, it is required that, the software must have minimal use of library/ library functions of respective language/ package | 48        |

Outcome:
- After completing the project, the students should gain an insight into the development process of real projects and
- understand the concepts of software products and software processes.
# AHE 2082: PROFESSIONAL COMMUNICATION LAB-II

## Objectives:
- To help learners gain confidence in spoken English and overcome inhibitions.
- To equip learners with effective listening and train them to acquire standard pronunciation, accent, stress patterns and intonation.
- To enrich their vocabulary.

## Credits: 01  
Semester II  
L–T–P : 0–0–2

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Lab Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>Reading &amp; Writing Skills- a) Reading comprehension, letter writing: Inquiries and their replies, placing and cancelling orders, adjustment letters, accepting and rejecting offers, resume &amp; CV writing, business report writing, application, Précis writing, E-mail writing Vocabulary- Extension methods, synonyms, antonyms, one word substitution, words often confused idioms &amp; phrases.</td>
<td>10</td>
</tr>
<tr>
<td>III</td>
<td>Group Strategies &amp; Group Discussion: GD vs Debate, Practice of Abstract topics. Interviews: What is an interview? Types of Interviews, Preparing for Interviews, Drills required for Interviews, potential interview questions, Mock Interview activities. Case Study: Requirement &amp; Significance in professional and personal spheres of life, Important tips for preparing a case study.</td>
<td>08</td>
</tr>
</tbody>
</table>

## References:
- Sharma, S.D., Text of professional Communication Skills and ESP for Engineers and Professionals, Sarup & Sons, Delhi
- Murphy, Raymond, Intermediate English Grammar. Cambridge University Press.

## Outcome:
After completion of this course Students will be able to:
- Understand the sounds of RP and apply them to transcribe words.
- Write paragraphs, stories etc. using short and crisp sentences.
- Listen, speak, read & write the sounds of English using correct stress, tone and rhythm.
MCA3001: OBJECT ORIENTED PROGRAMMING

Objective: To be familiar with the basic concepts of object oriented programming and algorithms.

Credits: 03

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
</table>
**Classes and Objects**: Introduction, Class Specification, Class Objects, Accessing Class Members, Defining Member Functions, Outside Member Functions as Inline, Accessing Member Functions within a Class, Data Hiding, Access Boundary of Objects Revisited, Empty Classes, Pointers within a Class, Passing Objects as Arguments, Returning Objects from Functions, Friend Functions and Friend Classes, Constant Parameters and Member Functions, Static Data and Member Functions. Constructors and its Type, Destructor, Constructor Overloading, Order of Construction and Destruction, Nameless Objects, Dynamic Initialization through Constructors, Constructors with Dynamic Operations.  
**Polymorphism**: Function Overloading, Operator Overloading- Unary, Binary, Comparison, Arithmetic Assignment, New and Delete; Data Conversion, Conversion between Basic Data Types, Conversion between Objects and Basic Types, Conversion between Objects of Different Classes. | 13 |
| II         | **Inheritance**: Introduction, Class Revised, Derived Class Declaration, Forms of Inheritance, Inheritance and Member Accessibility, Constructors in Derived Classes, Constructors in Derived Classes, Constructors Invocation and Data Members Initialization, Overloaded Member Functions, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Multipath Inheritance and Virtual Base Classes, Hybrid Inheritance.  
**Virtual Functions**: Introduction, Need for Virtual Functions, Pointer to Derived Class Objects, Definition of Virtual Functions, Array of Pointers to Base Class Objects, Pure Virtual Functions, Abstract Classes, Virtual Destructors.  
**Exception Handling**: Introduction, Error Handling, Exception Handling Model, Exception Handling Constructs, Handler Throwing the Same Exception again, List of Exceptions, Catch all Exceptions, Exceptions in Constructors and Destructors, Handling Uncaught Exceptions, Exceptions in Operator Overloaded Functions.  
**Generic Programming with Templates**: Introduction, Function Templates, Overloaded Function Templates, Nesting of Function Calls, Multiple Argument Function Templates, User Defined Template Arguments, Class Templates, Inheritance of Class Template, Class Template Containment, Class template with Overloaded Operators. | 14 |
| III        | **Object Modeling**: Objects and Classes, Links and Association, Generalization and Inheritance, Aggregation, Abstract Class, Multiple Inheritance, Meta Data, Candidate Keys, Constraints.  
**Functional Modeling**: Data Flow Diagram, Specifying Operations, Constraints, A Sample Functional Model, OMT (Object modeling techniques) methodologies. | 13 |

Text Books:

Reference Books:
- D Samantha (2009)"Object oriented Programming in C++ and Java", PHI.

Outcome: At the end of the course, students
- will get the knowledge of object oriented programming in C++ with modeling concept.
- He will be able to describe the object oriented software development process.
### MCA3002: DATA STRUCTURES

**Objective:** To be familiar with the basic concepts of programming and algorithm designing.

<table>
<thead>
<tr>
<th>Credits: 04</th>
<th>Semester III</th>
<th>L–T–P: 3–1–0</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Module No.</strong></th>
<th><strong>Content</strong></th>
<th><strong>Teaching Hours</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Introduction to Data Structure, Types, Data Structure Operations, Algorithm Complexity and Time-Space trade-off. <strong>Array:</strong> Representation of Single and Multidimensional Arrays, Address Calculation, Operations on Arrays, and Application of Arrays: Matrix Multiplication, Sparse Polynomial Representation and Addition, Character String Operation. <strong>Stacks:</strong> Array Representation and Implementation of Stack, Operations on Stacks: Push &amp; Pop. <strong>Queues:</strong> Array Representation and Implementation of Queues, Operations on Queue- Create, Add, Delete, Full and Empty, Types of Queues: Circular Queue, D-Queue and Priority Queue. <strong>Application of Stack:</strong> Conversion of Infix to Prefix and Postfix Expressions, Evaluation of Postfix Expression using Stack. <strong>Recursion:</strong> Recursive Definition and Processes, Recursion in C.</td>
<td>13</td>
</tr>
<tr>
<td>II</td>
<td><strong>Linked Lists:</strong> Representation and Implementation of Singly Linked Lists, Operations on Linked Lists - Insertion and Deletion to/from Linked Lists, Linked Stacks and Queues, Overflow and Underflow Conditions, Polynomial Representation and Addition and Multiplication of Polynomials, Doubly Linked List, Circular linked list. <strong>Trees:</strong> Introduction, Binary Trees and their Representation, Algebraic Expressions, Complete Binary Tree. Extended Binary Trees, Array and Linked Representation of Binary Trees, Traversing Binary Trees, Path Length, Huffman Algorithm. <strong>Binary Search Trees:</strong> Binary Search Tree (BST), Insertion and Deletion in BST. <strong>Types of Trees:</strong> Threaded Binary trees, AVL Trees, Introduction to Multi-way Search trees, B-tree.</td>
<td>14</td>
</tr>
<tr>
<td>III</td>
<td><strong>Searching and Hashing:</strong> Sequential Search, Binary Search, Comparison and Analysis, Hashing Functions, Hash Tables and Collision Resolution Techniques. <strong>Sorting:</strong> Bubble Sort, Selection Sort, Insertion Sort, Merge Sort, Quick Sort, Heap Sort, Radix Sort, Shell Sort. <strong>Graphs:</strong> Terminologies and Representation, Path Matrix, Graph Traversals - DFS and BFS, Shortest Path Problems, Minimum Cost Spanning Trees, Topological Sort.</td>
<td>13</td>
</tr>
</tbody>
</table>

**Text Book:**
- Lipschutz (2006)’’Data Structures Schaum’s Outline Series’’, TMH 12th Reprint.

**Reference Books:**

**Outcome:** At the end of the course, students
- will get the knowledge of various and appropriate data structure to store the data and solving the computational problems.
MCA3003: DATABASE MANAGEMENT SYSTEM

Objective: To acquire the knowledge of database design, data models and database languages, and to study the physical and logical database designs, database modeling, relational, hierarchical, and network models.

Credits: 04

Module No. | Content | Teaching Hours
---|---|---
I | **Introduction:** An Overview of Database Management System, Database System vs File System, Data Models Schema and Instances, Data Independence and Database Language and Interfaces, Database Users, Data Definitions Language, DML, Overall Database Structure. **Data Modeling using the Entity Relationship Model:** ER Model Concepts, Notation for ER diagram, Mapping Constraints, Keys, Concepts of Super Key, Candidate key, Primary key, Reduction of an ER Diagrams to Tables, Extended ER Model. **Relational Database Model and Language:** Relational Database Concepts, Integrity Constraints- Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints. **Basic Structure of Oracle System:** Introduction to SQL, Data Types and Literals, Types of SQL Commands - DDL and DML Command. | 13
II | **Relational Model Concepts:** Basic Relational Algebra Operation, Additional Relational, Algebra Operation, Relational Calculus. **Data Base Design & Normalization:** Functional Dependencies, Different Normal Forms, BCNF, Loss Less Join Decompositions, MVD, and JEs, Alternative Approaches to Database Design; Restricting and Sorting Data, Tables, Views and Indexes, Queries and Sub Queries, Aggregating Data using Group Functions, SQL Function. **PL/SQL:** Cursors in SQL, Procedures, Functions and Triggers. | 14

Text Book:

Reference Books:
- Majumdar and Bhattacharya (2002)"Database Management System", TMH.
**Outcome:** Upon successful completion of the course, the student will be able to:

- Differentiate database systems from file systems by enumerating the features provided by database systems and describe each in both function and benefit.
- Define the terminology, features, classifications, and characteristics embodied in database systems.
- Transform an information model into a relational database schema and to use a data definition language and/or utilities to implement the schema using a DBMS.
- Formulate, using SQL, solutions to a broad range of query and data update problems.
- Use an SQL interface of a multi-user relational DBMS package to create, secure, populate, maintain, and query a database.
- Use a desktop database package to create, populate, maintain, and query a database.
- Demonstrate a rudimentary understanding of programmatic interfaces to a database and be able to use the basic functions of one such interface.
# MCA3004: SOFTWARE ENGINEERING

**Objective:** To be familiar with the basic concepts of Programming principle and Concept of various type of software.

## Credits: 03

<table>
<thead>
<tr>
<th>Semester III</th>
<th>L–T–P: 3–0–0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Module No.</strong></td>
<td><strong>Content</strong></td>
</tr>
<tr>
<td>II</td>
<td>Function-Oriented Design: Problem Partitioning, Abstraction, Top Down and Bottom Up Design.</td>
</tr>
<tr>
<td></td>
<td>Software Configuration Management: Version Control and Change Management.</td>
</tr>
<tr>
<td></td>
<td>Risk Management: Risk Mitigation, Monitoring, and Management.</td>
</tr>
<tr>
<td>III</td>
<td>Coding: Coding Process, Verification - Code Inspections, Static Analysis, Proving Correctness, Metrics- Size Measures and Complexity Metrics.</td>
</tr>
<tr>
<td></td>
<td>Testing Fundamentals Test case design - Black Box Testing and White box testing, Levels of testing.</td>
</tr>
</tbody>
</table>

**Text Book:**

**Reference Books:**

**Outcome:** At the end of the course, students
- will be able to design experiment with software prototype and to select and use software metric.
- He will be able to understand theories, methods, and technologies applied for professional software development.
MCA3005: OPERATING SYSTEM

Objective: To provide the understanding of principals and techniques in operating system and processing of program execution.

Credits: 03

Semester III

L–T–P: 3–0–0

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
</table>

Text Book:

Reference Books:

Outcome: At the end of the course, students
- will be able to understand the concept of process management and synchronization.
- He will be able to understand the underlying principles, techniques and approaches which constitute a coherent body of knowledge in operating systems.
AHE3001: ETHICS & VALUES

Objective: To understand the basic issues and challenges that Indian society is facing today and analyze the impact of technology on individuals, groups and societies.

Credits: 02 Semester III L–T–P: 2–0–0

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Conceptual Foundations: Foundations of Morality, Professional Ethics, Professional Standards In Engineering Practice, Major Theories Of Ethics and Different Ethical Approaches, Normativity of Science and Technology. Professions And Moral Dilemmas: Contemporary Ethical Issues, Conflict Of Interests, Contracts, Rights And Violations, Consent And Dissent; Privacy And Confidentiality, Consultancy, Allocation Of Burdens And Benefits, Direct And Indirect Responsibility, Patents, Piracy and Clones.</td>
<td>14</td>
</tr>
</tbody>
</table>

References:

Outcome: At the end of the course, students will be able to:
- Define business in ethical context and identify challenges in ethical decision making.
- Know corporate social responsibility in Indian context and will be able to discuss the issues arising there from.
- Understand the basics of important laws such as factory act, Consumer protection act, IT act, RTI act.
# Objective
*To implement the basic concepts of object oriented programming design in algorithms.*

## Credits: 02

### Semester III

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Lab Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Programs Based on the Concepts of: Class and Object, Reference Variable, Use of Scope Resolution Operator, Default Arguments, Inline Function.</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>Programs Based on the Concepts of: Constructors, Destructors, Friend Function, Object as Parameter, Object as an Arguments and Keyword Static.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Programs Based on the Concepts of: Function Overloading, Operator Overloading and Type Conversion.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Programs Based on the Concepts of: Inheritance, Virtual Function, Abstract Class, This Pointer.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Programs Based on the Concepts of: File Handling, Exception Handling, Template.</td>
<td></td>
</tr>
</tbody>
</table>

## Outcome
*At the end of the course,*

- Students will get the all concepts of object oriented with their implementation.
- He will be able to implement the object oriented software development process.
MCA3082: DATA STRUCTURES LAB

Objective: To implement the various data structures and to demonstrate the various algorithms of data structure.

Credits: 02

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Lab Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Write a program to insert the element at given position in an array and display that array.</td>
<td>48</td>
</tr>
<tr>
<td>I</td>
<td>Write a program to delete the element from given position in an array and display that array.</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Write a program to demonstrate various operations (length, copy, append, compare) on strings.</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Write a program to demonstrate various operations (reverse, extracting a substring from left, extracting a substring from right, extracting a substring from middle) on strings.</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Write a program to demonstrate various operations (create, push, pop, overflow, underflow, peek, display) of STACK using array implementation.</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Write a program to demonstrate various operations (create, enqueue, dequeue, overflow, underflow, peek, display) of QUEUE using array implementation.</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Write a program to demonstrate various operations (create, enqueue, dequeue, overflow, underflow, peek, display) of CIRCULAR QUEUE using array implementation.</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Write a program to solve the problem of Tower of Hanoi by using recursion.</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Write a program to demonstrate various operations (create, Traversing, searching, inserting an element at beginning, at end, after a given element, deleting an element from beginning, from end, after a given element) of a linked list.</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Write a program to demonstrate various operations (create, Traversing, searching, inserting an element at beginning, at end, after a given element, deleting an element from beginning, from end, after a given element) of a doubly linked list.</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Write a program to demonstrate various operations (create, push, pop, overflow, underflow, peek, display) of STACK using linked list.</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Write a program to demonstrate various operations (create, enqueue, dequeue, overflow, underflow, peek, display) of QUEUE using linked list.</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Write a program for addition of polynomials.</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Write a program to demonstrate various operations (create, insert a new node, search, find smallest element, find largest element, height, number of elements, number of internal nodes, number of external nodes, delete a node) on binary search tree.</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Write a program for Preorder Traversal, In-order Traversal and Post-order traversal of a BST.</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Write a program for Linear search.</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Write a program for Binary search.</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Write a program for Bubble sort.</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Write a program for Merge sort.</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Write a program for Insertion sort.</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Write a program for Selection sort.</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Write a program for Quick sort.</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Write a program to illustrate traversal of a graph using Breadth- first search.</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Write a program to illustrate traversal of a graph using Depth- first search.</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Write a program for Minimum Spanning Tree.</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Write a program to find shortest path for given source and destination.</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Write a program to find shortest path among all pair of vertices.</td>
<td></td>
</tr>
</tbody>
</table>

Outcome: At the end of the course,

- students will get the knowledge of various and appropriate data structure to store the data and solving the computational problems.
MCA3083: DATABASE MANAGEMENT SYSTEM LAB

Objective: To implement the concept of entity relationship approach and database languages.

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Lab Hours</th>
</tr>
</thead>
</table>
| 1          | - Introduction of Data Definition Language (DDL) and its commands (Create, Alter, Drop, Rename).  
- Introduction of Data Manipulation Language (DML) and its Commands (Insert, Update, Delete).  
- Introduction of Transaction Control Language (T.C.L) & Data Control Language (D.C.L)  
- Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.  
- Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.  
- Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)  
- To implement concept of Joins in SQL.  
- To implement the concept of sub-queries.  
- Introduction to PL/SQL.  
  (i) Programs related to Conditional Statements in PL/SQL  
  (ii) Programs related to Cursors.  
  (iii) Programs related to stored Procedures and Functions  
  (iv) Programs related to Triggers. | 48 |

Outcome:

- After completion of the course students will have a solid foundation in the design and implementation of database applications on a variety of today’s most commonly used platforms (e.g. MS SQL, Oracle, and DB2).
AHE3081: SOFT SKILLS -I

After having undergone two courses on spoken English namely Spoken English-1 & 2, this course focuses more on the use of English, specifically in business situations. The course is based on diverse range of business themes which helps them visualize the expectations out of an engineer.

Course Objective:

Soft Skills-I program will ensure that the students have a clear understanding of what is expected and not expected from them. Build confidence and belief in what they are doing and do not overly doubt themselves. Being aware about learning what they need both in and out of the classroom.

Credit: 01

Semester III

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Lab Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Who Am I and Why Am I Here, Change is the Only Constant, Learning to Learn, Technology Know–How for a Fresher, Knowledge on Tools, Application Orientation, Career Management (Journey and Options).</td>
<td>10</td>
</tr>
<tr>
<td>II</td>
<td>Business Communication, Service Mindset, Customer Mindset, Myths about Business, Values in Business, Business Etiquette, Email Etiquette, Telephone Etiquette, Team Building, Role of a Manager.</td>
<td>10</td>
</tr>
<tr>
<td>III</td>
<td>Attitude for Success, Role Models, Handling Peer Competition, Building Relationships, Branding Yourself.</td>
<td>10</td>
</tr>
</tbody>
</table>

L–T–P: 0–0–2

Reference Books / Text Books / Cases:

- Cook, S. "The Effective Manager( e-book)", IT Governance Publishing.

Outcome: At the end of the course, students will be able to:

- Understand language Skills- Grammar Exercises, Jumbled Sentences & correcting errors.
- Understand Writing- Paragraph & Précis Writing.
- Understand Role-Play- enacting ideas, themes.
# MCA4001: UNIX & SHELL PROGRAMMING

**Objective:** To acquire the knowledge of basic concepts of UNIX commands and shell programming.

<table>
<thead>
<tr>
<th>Credits: 03</th>
<th>Semester IV</th>
<th>L–T–P: 3–0–0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module No.</td>
<td>Content</td>
<td>Teaching Hours</td>
</tr>
<tr>
<td>I</td>
<td><strong>Introduction:</strong> Unix System Organization (The Kernel and the Shell), Files and Directories, Basic Unix Commands, Editors (Vi and Ed). <strong>Unix System Administration:</strong> File System, Internal Representation of Files, Mounting and Unmounting of File System, System Booting, Shutting Down, Handling User Account, Backup, Recovery, Security, Creating Files, Storage of Files, Disk Related Commands.</td>
<td>13</td>
</tr>
<tr>
<td>II</td>
<td><strong>Unix Shell programming:</strong> Types of Shells, Shell Metacharacters, Shell Variables, Shell Scripts, Shell Commands, The Environment, Integer Arithmetic and String Manipulation, Special Command Line Characters, Decision Making and Loop Control, Controlling Arrays. Functions</td>
<td>14</td>
</tr>
<tr>
<td>III</td>
<td><strong>System call for the file system:</strong> creat, open, read, write, lseek, change directory and change root, change owner and change mode, stat and fstat, pipe, dup, mounting and unmounting file system, link, unlink, file system abstractions and maintenance. <strong>Inter Process Communication:</strong> Process tracing, system V IPC, network communication, sockets.</td>
<td>13</td>
</tr>
</tbody>
</table>

**Text Book:**

- Sumitabha Das (2007), "UNIX Concepts and Applications", TMH.

**Reference Books:**


**Outcome:** After completion of this course

- Student will get knowledge about multi user operating system with shell programming and system call with IPC concept.
- He will be able to make practical instruction on the origins and features of UNIX Shell Programming.
MCA4002: DESIGN & ANALYSIS OF ALGORITHM

Objective: To analyze and design the algorithms, use of various computational models and techniques.

Credits: 04  Semester IV  L-T-P: 3–1–0

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
</table>
Growth of functions: Asymptotic Notations, Recurrence Relations and their Solution Methods.  
Sorting and Order Statistics: Counting, Radix, Bucket sort.  
Advanced Data Structures: Augmenting Data Structures; B – trees, Binominal Heaps, Fibonacci Heaps; Data Structure for Disjoint Sets. | 13 |
| II         | Divide and Conquer: Quick Sort, Merge Sort.  
Greedy Method: Knapsack Problem, Job Sequencing with Deadlines, Activity Selection Problem, Huffman Codes.  
Dynamic Programming: Chained Matrix Multiplications, Longest Common Subsequence (LCS), 0/1 Knapsack.  
Backtracking: 8 – Queens Problem, Graph Coloring.  
Branch & Bound: TSP Problem.  
Approximation Algorithms: Vertex & Set Cover Problem. | 14 |
| III        | Graph Algorithms: Minimum Spanning Trees; Depth First Search, Breadth First Search; Maximum Flow.  
NP-Completeness: Basic Concepts, Nondeterministic Algorithms, NP-Completeness, Examples of NP Complete Problems. | 13 |

Text Book:

Reference Books:

Outcome:
- After completion of this course the student will get knowledge complexity of algorithm, behavior analysis of algorithm.
- He will be able to apply important algorithmic design paradigms and methods of analysis.
MCA4003: COMPUTER NETWORKS

Objective: To be familiar with the fundamental concepts of computer networking and familiarize the student with the basic taxonomy and terminology of the computer networking area

Credits: 04

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Network Edge - Internet - ISPs and Internet Backbones, Use of Computer Networks, Type of Networks, Reference Models- The OSI Reference Model. <strong>Physical Layer:</strong> Direction of Data Flow, Types of Connections, Topologies, Transmission Media-Guided and Unguided, Modulation, Multiplexing, Circuit Switching. <strong>Data Link Layer</strong>: Error Detection and Correction, Parity - LRC, CRC; Hamming code, Flow Control and Error Control, Stop and Wait, Go Back-N ARQ, Selective Repeat ARQ, Sliding Window, LAN - Ethernet IEEE 802.3 - IEEE 802.4 - IEEE 802.5 - IEEE 802.6.</td>
<td>15</td>
</tr>
</tbody>
</table>

Text Book:

Reference Books:

Outcome:
- Identify the different types of network topologies and protocols.
- After completion of this course the student will get knowledge to understand the terminology and concept of OSI reference model and TCP/IP model.
**Course Curriculum (w.e.f. Session 2016-17)**  
**Master of Computer Applications (MCA)**

**MCA4004: INTERNET & JAVA PROGRAMMING**  
**Objective:** To understand internet technologies and java concepts to make programs using internet technologies.

**Credits: 03**  
**Semester IV**  
**L–T–P: 3–0–0**

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
</table>
**Java Fundamentals:** Introduction to Java, Features, Objects, Methods & Classes, Constructors, Abstract Classes, Polymorphism. | 15 |
| II         | **Object Implementation:** Inheritance, Packages and Interfaces, Exception Handling, Multithreaded Architecture and Thread Control Methods, I/O, String Handling, Introduction to Wrapper Classes & Generic Class, Collection Framework.  
**GUI Programming:** Java Applet, Graphics & Animations, Controlling Animations Through Threads, Introduction to AWT Programming, Basic UI Components, Layout and Component Managers, Event Handling, Swing Components –Creating a Swing Applet and Application. | 14 |
| III        | **JDBC:** Types of Drivers, The Connectivity Model, JDBC/ODBC Bridge Communicating with Database.  
**Multimedia Experience:** Processing Image Using Java, Java Cryptography-Java Security API; Introduction to Java Web Services-Composite Computing Model.  
**Remote Method Invocation:** RMI Architecture - Creating RMI Client/Server Application, Java Beans & Introduction to Enterprise Java Beans, Java Servlets- Servlet Basics, Servlet API. | 13 |

**Text Book:**

Naughton, Schildt,(2002) "The Complete Reference JAVA2", TMH.

**Reference Books:**

- Cay Horstmann ,(1997)" Big Java”, Wiley India Edition.
- Bhave & Patekar, (2008)" Programming with Java” Pearson.

**Outcome:**

- After completion of this course the student will get knowledge about object oriented concepts used in java along with the concepts of Threading, GUI development, Distributed computing.
- He will understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
Objecive: This course aims to give students an understanding of the fundamental techniques for hypermedia architectures, design and usability, document management and retrieval, metadata management, and searching the web.

Credits: 03

Semester IV

L–T–P: 3–0–0

Module No. | Content | Teaching Hours
--- | --- | ---

II | **Retrieving User Behavior from the Web:** Uncovering Patterns in Web Content & Structure Pattern Mining, Web Usage Mining Architecture- Preprocessing Tasks, Data Cleaning, Transaction Identification, Discovery Techniques on Web Transactions -Path Analysis, Association Rules, Sequential Patterns, Web Usage Mining Components, Integrating Content and Usage Profiles for Personalization, Practical Web Mining Issues and Applications. **Parallel &Distributed IR:** Parallel & Distributed IR Architecture, Collection partitioning & Clustering- Flat Clustering and Hierarchical Clustering, Multimedia IR Models & languages. | 14


Text Book:

Reference Books:
- Jiawei Han, Micheline Kamber (2000) "Data mining: concepts and techniques" Morgan Kaufman Publishers.

Outcome: After completion of this course the student will able to:
• use different information retrieval techniques in various application areas
• apply IR principles to locate relevant information large collections of data
• analyse performance of retrieval systems when dealing with unmanaged data sources
• implement retrieval systems for web search tasks.
MCA4022: SOFT COMPUTING  
(Elective-I)

**Objective:** To introduce students to soft computing concepts and techniques and foster their abilities in designing and implementing soft computing based solutions for real-world and engineering problems.

**Credits: 03**

**Semester IV**

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
</table>

**Text Book:**


**Reference Books:**


**Outcome:** By the end of the course a student is expected to:

- Learn about soft computing techniques and their applications
- Analyze various neural network architectures
- Define the fuzzy systems.
MCA4023: DIGITAL IMAGE PROCESSING
(Elective I)

Objective: To understand the techniques like image enhancement, transform, restoration, and compression.

Credits: 03  
Semester IV  
L–T–P: 3–0–0

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>III</td>
<td><strong>Image Segmentation:</strong> Introduction, Point, Detection of Isolated Points, Line Detection, Edge Models, Basic Edge Detection, Cannay Edge Detection, Edge Linking and Boundary Detection (Hough Transform), Thresholding, Region-Based Segmentation. <strong>Representation and Description:</strong> Representation- Boundary (Border) Following, Chain Codes, Polygonal Approximations Using Minimum-Perimeter Polygons, Signatures, Boundary Descriptors, Regional Descriptors.</td>
<td>13</td>
</tr>
</tbody>
</table>

Text Book:

Reference Books:

Outcome:
- Sound understanding of digital image processing concepts viz-a-viz image acquisition, perception, transformations, enhancement, analysis etc. and
- he will be able to understand image analysis algorithms
MCA4024: MANAGEMENT INFORMATION SYSTEM  
(Elective I)

Objective: Explores current Information Systems concepts and technologies. Students learn how information systems give a business or organizations a competitive edge by providing technologies that help managers plan, control, and make decisions.

Credits: 03

L-T-P: 3-0-0

Semester IV

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
</table>

Text Books:

Reference Books:

Outcome: Upon successful completion of the course, a student will be able to:
- Understand the critical concepts and terminologies in information systems.
- Understand the role of IT managers in information systems planning, systems development, and hardware and software selection.
- Define problems and the current environment for existing business systems in the areas of accounting, finance, marketing, and manufacturing.
- Know the important business functions provided by typical business software such as Customer Relationship Management (CRM) and Enterprise Resource Planning (ERP).
MCA4041: DATA COMPRESSION
(Elective II)

Objective: The use of fundamentals of computer system for data compression and security techniques.

Credits: 03

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
</table>
| I          | **Introduction:** Need For Data Compression, Lossy/ Lossless Compression, Symmetrical Compression And Compression Ratio, Run Length Encoding (RLE) for Text and Image Compression, Relative Encoding and Its Applications in Facsimile Data- Compression and Telemetry, Scalar Quantization.  
**Statistical Methods:** Statistical Modeling of Information Source, Coding Redundancy, Variable Size Codes Prefix Codes, Shannon-Fano Coding, Huffman Coding, Adaptive Huffman Coding, Arithmetic Coding a Adaptive Arithmetic Coding, Text Compression Using PPM Method.  
**Dictionary Methods:** String Compression, Sliding Window Compression, LZ77, LZ78 and LZW Algorithms and Applications in Text Compression, Zip and Gzip, ARC and Redundancy Code. | 13 |
**Audio Compression:** Digital Audio, Lossy Sound Compression, Mu-Law and A-Law Compounding, DPCM And ADPCM Audio Compression, MPEG Audio Standard, Frequency Domain Coding, Format of Compressed Data. | 14 |
| Iii        | **Conventional Encryption:** Security of Information, Security Attacks, Classical Techniques, Caesar Cipher, Block Cipher Principles, Data Encryption Standard, Key Generation for DES, Block Cipher Principle, Design and Modes of Operation, S-Box Design, Triple Des With Two Three Keys, Introduction to International Data Encryption Algorithm, Key Distribution.  
**Number Theory And Public Encryption:** Modular Arithmetic, Fermat’s and Euler’s Theorems, Chinese Remainder Theorem, Discrete Logarithm, Principles of Public Key Cryptosystems, RSA Algorithm, Key Management, Diffie-Hellman Key Exchange, Elliptic Curve Cryptography.  

Text Book:

Reference Books:

Outcome:
- By the end of the course a student is expected to Understand about compression technique and information security.
MCA4042: E COMMERCE
(Elective II)

Objective: The objectives of the course are to introduce the concept of electronic commerce, and to understand how electronic commerce is affecting business enterprises, governments, consumers and people in general.

Credits: 03  Semester: IV  L–T–P: 3–0–0

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
</table>

Text Book:

Reference Books:
- Bajaj and Nag,(2005) "E-Commerce the Cutting Edge of Business", TMH.

Outcome:
- Explain the components and roles of the Electronic Commerce environment.
- Explain how businesses sell products and services on the Web.
- Describe the qualities of an effective Web business presence.
- Describe E-Commerce payment systems.
- Explain how to meet the needs of Web site visitors.
- Identify and reach customers on the Web.
- Understand Web marketing approaches and elements of branding.
- Explain the client/server infrastructure that supports electronic commerce.
MCA4043: SERVICE ORIENTED ARCHITECTURE  
(Elective II)

Objective: The use of fundamental understanding of operating system, distributed system and web technologies in service oriented technologies.

Credits: 03  Semester IV  L–T–P: 3–0–0

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
</table>

Text Book:

Reference Books:

Outcome:
- To solve and develop program logic for Web Service systems.
- Understanding of how SOA systems differ from traditional non-distributed systems.
- Understand how distributed systems are evolving and how that may change the way business is conducted in the future.
- Understand the impact of SOA on software quality, efficiency, security, performance and flexibility.
Course Curriculum (w.e.f. Session 2016-17)
Master of Computer Applications (MCA)

MCA4044: MOBILE APPLICATION DEVELOPMENT
(Elective II)

Objective: To gain a basic understanding of mobile platforms, emulators and mobile design principles.

Credits: 03

<table>
<thead>
<tr>
<th>Semester III</th>
<th>L–T–P : 3–0–0</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Preliminaries - Introduction &amp; need for Mobile Apps development, Example, Mobility concept, Mobile structure and characteristics. Getting started with Mobility - Mobility landscape, Mobile platforms, Mobile apps development, Overview of Android platform, setting up the mobile app development environment along with an emulator, a case study on Mobile app development Building blocks of mobile apps - App user interface designing - mobile UI resources (Layout, UI elements, Draw-able, Menu), Activity- states and life cycle, interaction amongst activities.</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>II App functionality beyond user interface - Threads, Async task, Services - states and life cycle, Notifications, Broadcast receivers, Telephony and SMS APIs Native data handling - on-device file I/O, shared preferences, mobile databases such as SQLite, and enterprise data access (via Internet/Intranet) Taking apps to Market - Versioning, signing and packaging mobile apps, distributing apps on mobile market place.</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>III Sprucing up mobile apps - Graphics and animation - custom views, canvas, animation APIs, multimedia – audio/video playback and record, location awareness, and native hardware access (sensors such as accelerometer and gyroscope) Testing mobile apps - Debugging mobile apps, White box testing, Black box testing, and test automation of mobile apps, JUnit for Android, Robotium, MonkeyTalk Current trends in Mobile Apps development.</td>
<td>13</td>
<td></td>
</tr>
</tbody>
</table>

References:
- Barry Burd, Android Application Development All in one for Dummies, Edition: I
- Teach Yourself Android Application Development In 24 Hours, Edition: I, Publication: SAMS

Outcome:
At the end of this course, student shall be able to:
- Understand different mobile application models/architectures and patterns.
- Describe the components and structure of a mobile development framework
- Apply a mobile development framework to the development of a mobile application.
- Deploy applications to the Android OS
**MCA4081: UNIX & SHELL PROGRAMMING LAB**

**Objective:** This lab will give students knowledge of UNIX commands, file systems, processes, and shell scripting.

**Credits:** 01  
**Semester IV**  
**L-T-P:** 0-0-2

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Objective</th>
<th>Content</th>
<th>Lab Hours</th>
</tr>
</thead>
</table>
| I          | **Objective:** To teach students various unix/linux utilities and shell scripting.  
**Commands**  
- Unix/linux basic commands.  
- vi editor commands  
**Shell Scripts**  
- Write a shell script that print out the date information in the following order, time, date of week, day, month, year.  
- Write a shell script that tells you its name and its PID.  
- Write a shell script that takes three command line arguments. The first argument is the name of the destination file and other two arguments are the names of files to be placed in the destination file.  
- Write a shell script that takes the command line argument and report whether it is a directory or a file or something else.  
- Write a shell script that accept the file name on the command line if the file is readable than count the no. of lines, words and characters in this file.  
- Write a shell script to find all login users on your system whose user-id is greater than 200.  
- Write a shell script to calculate the following series without multiplication.  
- Write a shell program which displays the number of occurrences of string 2 in string 1.  
- Write a shell script to find out the length of the input string.  
- Write a shell script to compare two strings input by the user, System Calls In C | 24 |

**Reference Books:**  

**Outcome:**  
After completing this lab the student will be able to  
- Understand Linux or Unix Operating system.  
- Understand Logging in the system and Create and modify files and use basic file permissions. Perform basic process and job control.  
- Understand vi text editor.  
- Understand Shell Programming and system programming.
# MCA4082: DESIGN & ANALYSIS OF ALGORITHMS LAB

**Objective:** To implement and analysis of various techniques of algorithm designing.

## Credits: 01

### Semester IV

L–T–P: 0–0–2

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Lab Hours</th>
</tr>
</thead>
</table>
| 1          | **Sorting Technique:**  
✓ Implementation of Insertion sort.  
✓ Implementation of Merge sort  
✓ Implementation of Heap sort.  
✓ Implementation of Counting Sort.  

**Divide and Conquer Approach:**  
✓ Implementation of Quick sort.  
✓ Implementation of merge sort.

**Greedy algorithms:**  
✓ Implementation of Prim’s algorithms for minimum spanning tree  
✓ Implementation of Kruskal algorithms for minimum spanning tree  
✓ Implementation of single source shortest path problem using Dijkstra’s Algorithms & Bellman Ford algorithms

**Dynamic programming:**  
✓ Implementation of 0/1 Knapsack problem

**Back Tracking Approach:**  
✓ Implementation of 8 queen problem.

### Outcome:

After completing this lab the student will be able to
- Understand sorting and searching technique and algorithm concepts.
- Understand how and why to design the algorithms.
- Design a better algorithm to achieve the best result in less time.
Objective: To implement various object oriented concepts and programming in java.

Outcome:
- After completion of this course students will have an idea about Java programming for Application
- and Applet along with developing GUI in java and communicating it with databases.

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Lab Hours</th>
</tr>
</thead>
</table>
MCA4084: MINI PROJECT –II

Objective: To implement a computer language to build a software system to reduce the paper work.

Credits: 01

Semester IV

L–T–P : 0–0–2

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Lab Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Students are required to develop a real time application project comprising of minimum 3000 LOC on any platform in a modular structure. The project must be based on any of the subject studied till previous semesters and should have a interactive GUI. The development of the project must consist of the following: Project Planning – Schedule and Activity Estimation using MS Project 2000 SRS in IEEE 830-1998 format Process Framework for development Software Design Document as per IEEE-1016 Interfaces Detail and Component Level Design Test Cases development as per the stated Software requirement, which is further to be tested on any CASE tool. In order to obtain creativity, it is required that, the software must have minimal use of library/ library functions of respective language/ package</td>
<td>48</td>
</tr>
</tbody>
</table>

Outcome:

*After completing the project, the students should gain an insight into the development process of real projects and to understand the concepts of software products and software processes.*
AHE4081: SOFT SKILLS –II

Objectives:

- To make the students aware of the primary skills and sub skills involved in using English effectively at the contemporary corporate workplace with a global presence.
- To provide practice and guidance to enhance skills to the proficiency level expected by any organization.

Credit-01 Semester IV L-T-P: 0-0-2

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
</table>
| I          | 1. Introduction to English and Grammar.  
2. Speaking face to face vs. over the phone.  
3. Auxiliary and Modal verbs.  
4. 4 Techniques of reading - Skim, Scan, Intensive, Extensive.  
5. ABC of writing, The KISS concept.  
6. Presenting ideas, information and opinions with clarity.  
7. Listening for information and making inferences.  
8. Intonation, Word stress, Pacing, Sound clarity | 10             |
| II         | 1. Second level of reading to interpret information  
2. Subject Verb Agreement  
3. Understanding ideas and making inferences  
4. Indianism, Question Tags, Phrasal verbs  
5. Prepositions, Active and Passive voice  
6. Third level reading and data interpretation  
7. Sentence stress, connected speech  
8. Tenses | 10             |
| III        | 1. Adverbs, Adjectives, Modifiers, Collocation  
2. Discussing data and coming to conclusions  
3. Link expressions, Compound nouns  
4. Negotiation skills  
5. Business quiz, idioms and phrases  
6. Individual presentation on speaking and writing  
7. Feedback and Poster creation | 10             |

References:

- Hornby, A.S., An Advanced Learners' Dictionary of Current English, OUP.
- Infosys modules on English lab.
- PPT slides & videos provided by Infosys.

Material:

Audio-Video Material available in the language Lab.

Outcome: At the end of the course, students will be able to:

- Understand language Skills- Grammar Exercises, Jumbled Sentences & correcting errors.
- Understand Writing- Paragraph & Précis Writing.
- Understand Role-Play- enacting ideas, themes.
MCA5001: WEB TECHNOLOGY

Objective: To understand various steps in designing a creative and dynamic website.

Credits: 03  Semester V  L–T–P: 3–0–0

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>XML: Domain Languages, Comparison with HTML, DTD, CSS, XSL, Content Creation — Entities, Attributes, XML Schema, XML Parsing Techniques; XML and Data Binding-JAXB, Integrating XML with other Applications, XLINK, XPOINTER. Introduction to AJAX and Applications. <strong>Distributed Object Computing:</strong> ActiveX, COM, &amp; DCOM.</td>
<td>14</td>
</tr>
</tbody>
</table>

Text Book:

Reference Books:

Outcome:
- Web based applications development and deployment on web server. Operational knowledge of middleware technologies and security issues related to web.
- The student will be able to learn html, xml and to know about various application servers such as CORBA.
# MCA5002: DISTRIBUTED SYSTEMS

**Objective:** To understand the knowledge in parallel and distributed computing.

**Credits:** 04

### Module No. | Content | Teaching Hours
---|---|---
**Distributed Mutual Exclusion:** Classification, Requirements, Performance Measurement, Non-Token Based Algorithm & Token Based Algorithm and their Performance.  
II | **Distributed Deadlock:** Distributed Deadlock Handling Strategies in Distributed System, Issues in Deadlock Detection, Centralized Deadlock Detection- Ho Ramamurthy Algorithm, Distributed Deadlock Detection- Path Pushing Algorithm and Edge Chasing Algorithm.  
**Agreement Problem:** Classification of Agreement Protocols, Byzantine Agreement Problem, Solution to Byzantine Agreement Problem.  
**Communication in Distributed System:** Communication Between Distributed Objects, Events and Notifications, Concept of DCOM, Inter Process Communication- RPC, Distributed Objects and Middleware - RMI and CORBA, Case Study-JINI.  
III | **Distributed File System:** Issues in Distributed File Systems, Mechanism for Building Distributed File Systems, Case Studies of SUN – NFS, AFS, CODA.  
**Failure Recovery:** Failure Recovery in Distributed Systems, Concepts in Backward and Forward Recovery, Recovery in Concurrent Systems.  
**Distributed Share Memory:** Design issues in Distributed Shared Memory, Algorithm for Implementation of Distributed Shared Memory.  

**Text Book:**

**Reference Books:**
- Gerald Tel "Distributed Algorithms", Cambridge University Press.  

**Outcome:**
- Understanding of the technical demands and potential solutions for distributed systems that impose high requirements on data storage and transport.  
- A sound understanding of the principles and concepts involved in designing distributed systems and Internet applications Ability to implement a distributed application using Java RMI.
MCA5003: .NET FRAMEWORK USING C#

Objective: To understand the concepts of dot net framework and its technologies in programming.

Credits: 03

Semester V

L–T–P: 3–0–0

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>Introduction of C# with Feature: Data Types, Identifiers, Variables &amp; Constants, C# Statements, Object Oriented Concept, Object and Classes, Arrays and Strings, Delegates and Events, Properties and Indexer.</td>
<td>14</td>
</tr>
</tbody>
</table>

Text Books:

Reference Books:

Outcome:
- The goal of this course is to help students to make learn the Microsoft. NET Framework with C# language.
- After completing this course students will be able to understand data-driven applications SQL Server and ADO.NET, building stand-alone applications, create web-based distributed applications and develop Real world Application using the .NET Framework, C#.
# MCA5021: DATA MINING & WAREHOUSING  
*(Elective III)*

**Objective:** The use of Algorithm, Probability, Statistics and Data structure in information retrieval and storing techniques.

**Credits:** 03  
**Semester:** V  
**L-T-P:** 3–0–0

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
</table>
| I          | **Introduction:** Overview, Motivation (For Data Mining), Data Mining-Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Computer And Human Inspection),Inconsistent Data, Data Integration and Transformation.  
**Data Reduction:** Data Cube Aggregation, Dimensionality Reduction, Data Compression, Numerosity Reduction, Clustering, Discretization and Concept Hierarchy Generation.  
**Data Warehousing:** Overview, Definition, Delivery Process, Difference Between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept Hierarchy, Process Architecture, 3 Tier Architecture, Data Marting, Aggregation, Historical Information, Query Facility, OLAP Function And Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining Interface, Security, Backup And Recovery, Tuning Data Warehouse, Testing Data Warehouse. | 13 |
| II         | **Concept Description:** Definition, Data Generalization, Analytical Characterization, Analysis of Attribute Relevance, Mining Class Comparisons, Statistical Measures in Large Databases, Measuring Central Tendency, Measuring Dispersion of Data, Graph Displays of Basic Statistical Class Description, Mining Association Rules in Large Databases, Association Rule Mining, Mining Single-Dimensional Boolean Association Rules From Transactional Databases– A priori Algorithm, Mining Multilevel Association Rules From Transaction Databases and Mining Multi-Dimensional Association Rules From Relational Databases.  
**Classification And Predictions:** What is Classification & Prediction, Issues Regarding Classification and Prediction, Decision Tree, Bayesian Classification, Classification By Back Propagation, Multilayer Feed-Forward Neural Network, Back Propagation Algorithm, Classification Methods Knearest Neighbor Classifiers, Genetic Algorithm. | 14 |
| III        | **Knowledge Discovery, Data Mining Cluster Analysis:** Data Types in Cluster Analysis, Categories of Clustering Methods, Partitioning Methods. Hierarchical Clustering- CURE And Chameleon, Density Based Methods-DBSCAN, OPTICS, Grid Based Methods- STING, CLIQUE, Model Based Method –Statistical Approach, Neural Network Approach, Outlier Analysis, Multimedia Data-Mining, Multimedia-Databases, Mining Multimedia Data, Data-Mining And The World Wide Web, Web Data-Mining, Mining And Meta-Data, Data Visualization & Overall Perspective, Data Visualization, Applications of Data-Mining. | 13 |

**Text Book:**  
- Jiawei Han, Micheline Kamber, (2006)*"Data Mining Concepts & Techniques" Elsevier, Second Edition .

**Reference Books:**  

**Outcome:**  
- Understanding to apply data mining concept, algorithm and approaches for real life application.
# MCA5022: CLOUD COMPUTING

(Elective-III)

**Objective:** To understand cloud computing, its key security and control considerations identify various cloud services, cloud characteristics and service attributes and to evaluate various cloud delivery models.

<table>
<thead>
<tr>
<th>Credits: 03</th>
<th>Semester VIII</th>
<th>L–T–P: 3–0–0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Module No.</strong></td>
<td><strong>Content</strong></td>
<td><strong>Teaching Hours</strong></td>
</tr>
<tr>
<td>II</td>
<td><strong>Working with Public Clouds</strong> – Concept of Public Cloud, Importance of Public Cloud, When to opt for Public Cloud, Public Cloud Service Models, and Public Cloud players. Infrastructure as a Service Offerings, IaaS Vendors, PaaS offerings, PaaS vendors, Software as a Service. Implementing public cloud (one out of AWS, Windows Azure, IBM or Rackspace)</td>
<td>14</td>
</tr>
<tr>
<td>III</td>
<td><strong>Business Clouds</strong> - Cloud Computing in Business, Various Biz Clouds focused on industry domains (Retail, Banking and Financial sector, Life Sciences, Social networking, Telecom, Education), Cloud Enablers (Business Intelligence on cloud, Big Data Analytics on Cloud), Role of Cloud computing in SCM and CRM, Future directions in Cloud Computing - Future technology trends in Cloud Computing with a focus on Cloud service models, deployment models, cloud applications, and cloud security, Migration paths for cloud, Selection criteria for cloud deployment. Current issues in cloud computing leading to future research directions.</td>
<td></td>
</tr>
</tbody>
</table>

**Text Book:**


Reference Books:

- Rittinghouse, John, W, Cloud computing: Implementation, management and security.

Outcome: After successful completion of this Cloud computing, the participant will be able to:

- Understanding the systems, protocols and mechanisms to support cloud computing
- Develop applications for cloud computing
- Explain virtualization and their role in elastic computing
- Explain the four primary cloud category “types”.
MCA5023: MOBILE COMPUTING
(Elective III)

Objective: To study the specifications and functionalities of various protocols/standards of mobile communication system networks. To introduce wireless communication and networking principles, that support connectivity to cellular networks, wireless internet and sensor devices.

Credits: 03
Semester IV

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>III</td>
<td><strong>Adhoc Networks:</strong> Localization, MAC Issues, Routing Protocols, Global State Routing (GSR), Destination Sequenced Distance Vector Routing (DSDV), Dynamic Source Routing (DSR), Ad Hoc on Demand Distance Vector Routing (AODV), Temporary Ordered Routing Algorithm (TORA), QoS in Ad Hoc Networks, Applications.</td>
<td>14</td>
</tr>
</tbody>
</table>

Text Books:

Reference Books:

Outcome:
- Students will demonstrate the ability to design a system, component or process as per needs and specification.
- An awareness of professional and ethical issues, in particular to those relating security and privacy of user data and user behavior.
MCA5024: AGILE SOFTWARE DEVELOPMENT
(Elective III)

Objective
Awareness of basics of software engineering concepts and waterfall methodology and exposure to any object oriented programming language such as Java, C# in agile framework

Credits: 03

Semester III

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>III</td>
<td>Agile Testing: The Agile lifecycle and its impact on testing, Test-Driven Development (TDD), xUnit framework and tools for TDD, Testing user stories - acceptance tests and scenarios, Planning and managing testing cycle, Exploratory testing, Risk based testing, Regression tests, Test Automation, Tools to support the Agile tester Industry Trends: Market scenario and adoption of Agile, Agile ALM, Roles in an Agile project, Agile applicability, Agile in Distributed teams, Business benefits, Challenges in Agile, Risks and Mitigation, Agile projects on Cloud, Balancing Agility with Discipline, Agile rapid development technologies</td>
<td>14</td>
</tr>
</tbody>
</table>

References:
- Ken Schwaber & Mike Beedle, Agile Software Development with Scrum, Pearson, 2008
- Mike Cohn, User Stories Applied: For Agile Software, Addison Wesley 2004

Outcome:
- Understand the background and driving forces for taking an Agile approach to software development
- Understand the business value of adopting Agile approaches
- Understand the Agile development practices
- Drive development with unit tests using Test Driven Development
- Apply design principles and refactoring to achieve Agility
## MCA5041: CRYPTOGRAPHY & NETWORK SECURITY
(Elective IV)

**Objective:** To learn different security mechanisms to secure transmission of data on network.

**Credits:** 03

### Module No. | Content | Teaching Hours
--- | --- | ---
I | **Introduction to Cryptography:** Introduction to Security Attacks, Services And Mechanisms, Introduction to Cryptology, Conventional Encryption Model, Classical Encryption Techniques-Substitution Ciphers & Transposition Ciphers, Cryptanalysis, Stereography, Stream & Block Ciphers. **Modern Block Ciphers:** Block Ciphers Principles, DES Principal, Strength of DES, Differential & Linear Cryptanalysis of DES, Block Cipher Model of Operation, Triple DES, AES, BLOWFISH, IDEA Encryption & Decryption, Confidentiality Using Conventional Encryption, Traffic Confidentiality, Key Distribution, Random Number Generation. | 15
II | **Principles of Public Key Cryptography:** Principle of Public Key Cryptography, Prime and Relative Prime Numbers, Modular Arithmetic, RSA Algorithm, Security of RSA Key Management. **Message Authentication & Hash Function:** Authentication Recruitments, Authentications Functions, Message Authentication Codes, Digital Signatures, Authentication Protocols Digital Signatures Standard (DSS), Proof of Digital Signatures Algorithm. | 15

**Text Book:**

**Reference Books:**
- Bruce Schiener, “Applied Cryptography”.
- Atul Kahate, “Cryptography and Network Security”, TMH.

**Outcome:**
- After completion of this course students will have an idea about advance concept of information security.
- The student will able to understand the concepts of risk, threats, vulnerabilities and attack and
- To learn security protocols at different layers of Network layer heirachy.
MCA5042: SOFTWARE PROJECT MANAGEMENT
(Elective IV)

Objective: To learn the concepts used to develop a software project and to manage the project.

Credits: 03

Semester V

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
</table>
| II         | **Project Monitoring and Control:** Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators- Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking.  
**Software Reviews:** Types of Review- Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.  
**Software Project Management Tools:** CASE Tools. | 12             |

Text Book:

Reference Books:
- Royce, "Software Project Management", Pearson Education.

Outcome:
- After completion of this course students will have sufficient idea Software Project Management Techniques. He will be able to understand the role of design patterns in software development and
- To understand and be able to explain Software Metrics and Software Reliability.
MCA5043: ARTIFICIAL INTELLIGENCE  
(Elective IV)

Objectives: The main purpose of this course is to provide the most fundamental knowledge to the students so that they can understand what the AI is. Due to limited time, we will try to eliminate theoretic proofs and formal notations as far as possible, so that the students can get the full picture of AI easily. Students who become interested in AI may go on to the graduate school for further study.

Credits: 03  
Semester V  
L-T-P: 3–0–0

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
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</thead>
</table>
| I          | **Introduction**: Introduction to AI, AI Techniques, Level of Model, Criteria for Success, Turing Test.  
**Problems, Problem Spaces & Search**: Defining Problem as a Space, Search, Production System, Problem Characteristics, Production System Characteristics, Issues in the Design of Search Programs.  
**Heuristics Search Strategies**: Generate and Test, Hill Climbing, Best First Search (A*), Problem Reduction (AO*), Constraint Satisfaction, Means Ends Analysis. | 12 |
**Using Predicate Logic**: Representing Simple Facts in Logic, Representing Instance and is-a Relationship, Computable Functions and Predicates, Resolution, Natural Deduction.  
**Game Playing and Search**: Introduction, Min-Max algorithm, Alpha-Beta Cut Off, Example of Games. | 14 |

Text Book:

Reference Books:

Outcome:
- After completion of this course students will have an idea about soft computing skills and modern intelligent system.
MCA5044: BUSINESS INTELLIGENCE
(Selective-IV)

Objective: To learn different data models, concepts related to data warehousing and to use them in business intelligence.

Credits: 03
Semester VII
L–T–P: 3–0–0

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Teaching Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>Basics of Data Integration (Extraction Transformation Loading): Concepts of Data Integration, Needs and Advantages of using Data Integration, Introduction to Common Data Integration Approaches; Meta Data - Types and Sources, Introduction to Data Quality, Data Profiling Concepts and Applications, Introduction to ETL using Kettle.</td>
<td>13</td>
</tr>
</tbody>
</table>

Text Book:

Reference Books:
- Mike Biere (2010), "Business Intelligence for the Enterprise", Pearson.
- Larissa Terpeluk Moss & Shaku Atre (2003), "Business Intelligence Roadmap", Pearson.

Outcome:
At the end of this course, student will be able to
- Differentiate between Transaction Processing and Analytical applications and describe the need for business intelligence.
- Demonstrate understanding of technology and processes associated with business intelligence framework.
- Demonstrate understanding of Data warehouse implementation methodology and project life cycle.
- Given a business scenario, identify the metrics, indicators and make recommendations to achieve the business goal.
MCA5081: WEB TECHNOLOGY LAB

Objective: To implement the basic concepts of Object oriented programming and knowledge of Java programming, XML, ASP etc. to develop an interactive web page.

Credits: 02  Semester V  L–T–P: 0–0–4

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Lab Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTML</td>
<td>Design a profile page consisting of your CV using following HTML elements: Font, Color-Background &amp; Foreground, Margins, Lists, Links, Graphics: Image Scaling, Alignments, Text Wrapping B/W images, Table: Bordering, Image, cell color, cell alignment. • Apply various types of CSS to above experiment. • Design a web form for user registration with some constraints using javascript. • Program based on javascript functions.</td>
<td>48</td>
</tr>
<tr>
<td>XML</td>
<td>Programs for Internal &amp; External DTD containing student information and displaying it using CSS. • Design XML DTD containing student information using features of Entity and attribute. • Design a program to perform searching based on XML file data. • Design a XML parsing program to read Element value from any XML file using JavaScript. • Design a XML parsing program for data binding and fetching the data in HTML form. • Design a java program to read data from XML file.</td>
<td></td>
</tr>
<tr>
<td>ASP, JSP &amp; PHP</td>
<td>Design a web application in ASP using Request &amp; Response for handling HTML form components. • Design ASP application demonstrating the use of Application object and to display the number of times the page has been visited. • Design ASP application demonstrating database connectivity. • Design a website in JSP/PHP for online purchasing.</td>
<td></td>
</tr>
</tbody>
</table>

Outcome: At the end of the course, students will be able to:

- Develop web based application.
- Write clear and effective Server side & Client side script.
- Access data using PHP & JSP
MCA5082: .NET FRAME WORK LAB

Objective: To implement various concepts of dot net framework technologies in algorithms.

Credits: 02

Semester V

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Lab Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>• Working with OOPS concepts.</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>• Code access security with C#. (Properties and Indexers).</td>
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<td></td>
<td>• Working with Delegates and Events on Console.</td>
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<td></td>
<td>• File handling with C#.</td>
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<td></td>
<td>• Working with multiple threads.</td>
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<td></td>
<td>• Using System.Net Web Client to retrieve or upload Data with C#.</td>
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<td></td>
<td>• Client Server Networking with TCP, UDP and Socket.</td>
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<td></td>
<td>• Working with Page and Forms using ASP.NET.</td>
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<td></td>
<td>• Data Base access model (Working with ADO.NET).</td>
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<tr>
<td></td>
<td>• Creating Web Service and Consume in web based application.</td>
<td></td>
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</tbody>
</table>

Outcome:

At the end of the course, students will be able to:

• Explain the principles of object-oriented programming.
• Write clear and effective C# code.
• Access data using ADO.NET.
• Develop web applications using ASP.NET Web Forms.
• Develop and use ASP.NET Web Services.
**MCA5083: MINI PROJECT III**

**Objective:** To implement a computer language to build a software system to reduce the paper work.

**Credits:** 02  
**Semester:** V  
**L–T–P :** 0–0–4

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Content</th>
<th>Lab Hours</th>
</tr>
</thead>
</table>
| I          | Students are required to develop a real time application project comprising of minimum 1000 LOC on any platform in a modular structure.  
The development of the project must consist of the following:  
Project Planning – Schedule and Activity Estimation using MS Project 2000  
SRS in IEEE 830-1998 format  
Process Framework for development  
Software Design Document as per IEEE-1016  
Interfaces Detail and Component Level Design  
Test Cases development as per the stated Software requirement, which is further to be tested on any CASE tool.  
In order to obtain creativity, it is required that, the software must have minimal use of library/ library functions of respective language/ package | 48        |

**Outcome:**

*After completing the project, the students should gain an insight into the development process of real projects and to understand the concepts of software products and software processes.*