University of Rajasthan
Jaipur

SYLLABUS

Master of Computer Applications (M.C.A.)
(Two Year Course)
(Semester Scheme)

I & II Semester Examination 2020-21
III & IV Semester Examination 2021-22
Eligibility:

(a) MCA Semester I:

Passed BCA/Bachelor Degree in Computer Science/Engineering or equivalent Degree.
OR
Passed B.Sc./B.Com./B.A. with Mathematics at 10+2 Level or at Graduation Level (with additional Bridge Courses as per the norms of the concerned University).

Obtained at least 50% marks (45% marks in case of candidates belonging to reserved category) in the qualifying Examination.

(b) Bridge Course [For students other than BCA/Bachelor Degree in Computer Science/Engineering or equivalent Degree]: It is an additional and compulsory course for Non Computer Graduates. No Marks of Bridge Course will be added in calculation of CGPA and percentile. It is mandatory for the student to pass this Course in order to have basic knowledge of computer science and secure the degree.

(c) In addition to the above qualification, a candidate has to qualify the URATPG (University of Rajasthan Admission to Post-Graduate) Examination for admission to MCA Course I Semester.

Scheme of Examination:

MCA (Master of Computer Applications) Syllabus as per new scheme: credit based semester system (Four Semesters in two years) with Continuous Assessment (30% with non-inclusion in cumulative Grade point average(CGPA)).

Part-I (Course and Internal Assessment)

➢ To obtain a Professional Master's MCA Degree, a candidate is required to earn 120 credits in FOUR semesters (Two Years), out of total 144 credit points (36 credits per semester), with grade E or higher. Each student has to earn minimum 30 credits per semester (i.e., 120 credits in four semesters for MCA degree) with grade E or higher.
➢ Each semester of MCA course shall have 36 credits. There will be three core papers, three elective papers (4 credits each), two core laboratory and one elective laboratory (4 credits each).
➢ To earn credits for a paper (Theory and Practical), a candidate shall be required to obtain grade E or higher (or equivalent marks percentage) in the theory/practical examination (EoSE).
➢ Core papers (Theory and Practical) are compulsory papers for the students of MCA.
➢ Each semester will have Continuous Assessment (CA). The continuous assessment (CA) consists of two parts, namely (i) Internal Assessment and (ii) Sessional Test(s) in the ratio 30:70. The Internal Assessment component comprises of assessment of student's performance on the basis of factors like Attendance, Class Room Participation, Quiz, Home Assignment etc.
➢ To earn the credits for a paper (Theory and Practical) a candidate has to qualify in the Continuous Assessment (internal) Exam along with EoSE of that paper separately.
➢ However, the grade point/marks obtained in the continuous assessment will not be included in Semester Grade Point Average (SGPA). In Continuous Assessment and End of Semester Examination (EoSE) separate grades will be awarded.
➢ The candidate will not be permitted to appear in EoSE of a particular credit (i) if he/she does not fulfill 75% of attendance requirement, or (ii) he/she fails to secure a Semester Grade Point Average (SGPA) of 1.5 in the continuous assessment.

[Signature]

Dy. Registrar
(Domsit)
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A course is identified by a course code designated by a string of six alphanumeric characters and a course title. In a course code the first three characters of the string indicate the degree/course name in short and the later three alphanumeric characters designate a particular course. In the case of compulsory core course (CCC) the fourth character identifies the semester numeric digit and in case of the elective core courses (ECC) the fourth character indicates the cluster of specialization. For compulsory or elective theory core courses the fifth digit is '0', for laboratory core course it is '1' and for project/seminar course it is 2 and the sixth digit indicates number of the course in that category.

- Compulsory Core Courses (CCC)
- Elective Core Courses (ECC)

Part II (Examination Paper Scheme):
1. Each Theory paper (CCC & ECC) of EoSE shall carry 100 marks The EoSE will be of 3 hours duration.
   (i) Candidate has to attempt five questions in all. All questions carry equal marks.
   (ii) Question No. 1 (Compulsory) covering whole syllabus will consists of 10 short answer questions carrying 2 marks each, based on Knowledge, Understanding and Applications of the topics/ texts covered in the syllabus.
   (iii) Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit (may have sub-parts) with internal choice within the unit.

2. Each Practical paper (CCC & ECC) shall be of 3 hours duration on one day and carry 100 marks for the practical examination. The practical examination will involve 3 exercises, each of 20 marks, practical record of 15 marks and viva-voce examination of 25 marks.

Abbreviations Used:

- **Course Category**
  - CCC: Compulsory Core Course
  - ECC: Elective Core Course
  - OEC: Open Elective Course
  - SSC: Self Study Core Course
  - SEM: Seminar
  - PRJ: Project Work

- **Contact Hours**
  - L: Lecture
  - T: Tutorial
  - P: Practical or Other
  - S: Self Study

- **Relative Weights**
  - IA: Internal Assessment (Attendance/Classroom Participation/Home Assignment etc.)
  - ST: Sessional Test
  - EoSE: End of Semester Examination

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### MCA-First Semester 2020-21

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Subject Code</th>
<th>Subject Title</th>
<th>Course category</th>
<th>Credit</th>
<th>Contact Hours per Week</th>
<th>EoSE* Duration(Hrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MCA 101</td>
<td>Object Oriented Programming Through Java</td>
<td>CCC</td>
<td>4</td>
<td>3 1 0</td>
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<tr>
<td>2</td>
<td>MCA 102</td>
<td>Operating Systems</td>
<td>CCC</td>
<td>4</td>
<td>3 1 0</td>
<td>3 0</td>
</tr>
<tr>
<td>3</td>
<td>MCA 103</td>
<td>Database Management Systems</td>
<td>CCC</td>
<td>4</td>
<td>3 1 0</td>
<td>3 0</td>
</tr>
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<td>4</td>
<td>MCA 104</td>
<td>Computer Architecture</td>
<td>ECC</td>
<td>4</td>
<td>3 1 0</td>
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<tr>
<td>5</td>
<td>MCA 105</td>
<td>Web Application Development</td>
<td>ECC</td>
<td>4</td>
<td>3 1 0</td>
<td>3 0</td>
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<tr>
<td>6</td>
<td>MCA 106</td>
<td>Discrete Mathematics</td>
<td>ECC</td>
<td>4</td>
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<tr>
<td>7</td>
<td>MCA 111</td>
<td>Java Lab</td>
<td>CCC</td>
<td>4</td>
<td>0 0 6</td>
<td>0 3</td>
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<tr>
<td>8</td>
<td>MCA 112</td>
<td>DBMS Lab</td>
<td>CCC</td>
<td>4</td>
<td>0 0 6</td>
<td>0 3</td>
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<tr>
<td>9</td>
<td>MCA 113</td>
<td>Web Application Development Lab</td>
<td>ECC</td>
<td>4</td>
<td>0 0 6</td>
<td>0 3</td>
</tr>
</tbody>
</table>

Total Credit: 36

**Bridge Course** [For students other than BCA/Bachelor Degree in Computer Science/Engineering or equivalent Degree]: It is an additional and compulsory course for Non Computer Graduates. No Marks of Bridge Course will be added in calculation of CGPA and percentile. It is mandatory for the student to pass this Course in order to have basic knowledge of computer science and secure the degree.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Subject Code</th>
<th>Subject Title</th>
<th>Course category</th>
<th>Credit</th>
<th>Contact Hours per Week</th>
<th>EoSE* Duration(Hrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MCA BC1</td>
<td>Computer Fundamentals</td>
<td>CCC</td>
<td>4</td>
<td>3 1 0</td>
<td>3 0</td>
</tr>
<tr>
<td>2</td>
<td>MCA BC2</td>
<td>Programming Through C&amp;C++</td>
<td>CCC</td>
<td>4</td>
<td>3 1 0</td>
<td>3 0</td>
</tr>
<tr>
<td>3</td>
<td>MCA BC3</td>
<td>Office Automation &amp; Programming Lab</td>
<td>CCC</td>
<td>4</td>
<td>3 1 0</td>
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*EoSE- End of Semester Examination

### MCA-Second Semester 2020-21

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Subject Code</th>
<th>Subject Title</th>
<th>Course category</th>
<th>Credit</th>
<th>Contact Hours per Week</th>
<th>EoSE* Duration(Hrs)</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>MCA 201</td>
<td>Programming in Python</td>
<td>CCC</td>
<td>4</td>
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<tr>
<td>2</td>
<td>MCA 202</td>
<td>Advanced Java Programming</td>
<td>CCC</td>
<td>4</td>
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<tr>
<td>3</td>
<td>MCA 203</td>
<td>Data Communication and Computer Networks</td>
<td>CCC</td>
<td>4</td>
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<tr>
<td>4</td>
<td>MCA 204</td>
<td>Algorithms and Data Structures</td>
<td>ECC</td>
<td>4</td>
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<tr>
<td>5</td>
<td>MCA 205</td>
<td>Software Engineering</td>
<td>ECC</td>
<td>4</td>
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<tr>
<td>6</td>
<td>MCA 206</td>
<td>Data Warehousing &amp; Data Mining</td>
<td>ECC</td>
<td>4</td>
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<tr>
<td>7</td>
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<td>Python Lab</td>
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<tr>
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<td>Advanced Java Lab</td>
<td>CCC</td>
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<tr>
<td>9</td>
<td>MCA 213</td>
<td>Data Structures Lab</td>
<td>ECC</td>
<td>4</td>
<td>0 0 6</td>
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</tr>
</tbody>
</table>

Total Credit: 36

*EoSE- End of Semester Examination.

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### MCA-Third Semester 2021-22

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Subject Code</th>
<th>Subject Title</th>
<th>Course Category</th>
<th>Credit</th>
<th>Contact Hours per Week</th>
<th>EoSE * Duration(Hr)</th>
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<tbody>
<tr>
<td>1</td>
<td>MCA 301</td>
<td>Cloud Computing</td>
<td>CCC</td>
<td>4</td>
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<tr>
<td>2</td>
<td>MCA 302</td>
<td>.NET Frame Work and ASP.NET</td>
<td>CCC</td>
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<td>3</td>
<td>MCA 303</td>
<td>Mobile Application Development</td>
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<td>4</td>
<td>MCA 304</td>
<td>Artificial Intelligence</td>
<td>ECC</td>
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<tr>
<td>5</td>
<td>MCA **</td>
<td>Elective - 1( Any One in Elective Group – 1)</td>
<td>ECC</td>
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<td>3 1 0</td>
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<tr>
<td>6</td>
<td>MCA ***</td>
<td>Elective - 2( Any One in Elective Group – 2)</td>
<td>ECC</td>
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<td>7</td>
<td>MCA 311</td>
<td>.NET Lab</td>
<td>CCC</td>
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<td>0 3</td>
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<td>8</td>
<td>MCA 312</td>
<td>Mobile Application Development Lab</td>
<td>CCC</td>
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<td>9</td>
<td>MCA 313</td>
<td>Communication and Soft Skill Lab</td>
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*EoSE- End of Semester Examination.

**/***: Please see the List of Elective papers (Elective-1 and Elective-2 corresponding)

### MCA-Fourth Semester 2021-22

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Subject Code</th>
<th>Subject Title</th>
<th>Course Category</th>
<th>Credit</th>
<th>Contact Hours per Week</th>
<th>EoSE * Duration (Hrs)</th>
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<tbody>
<tr>
<td>1</td>
<td>MCA 401</td>
<td>Analysis and Design of Algorithms</td>
<td>CCC</td>
<td>4</td>
<td>3 1 0</td>
<td>3 0</td>
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<tr>
<td>2</td>
<td>MCA **</td>
<td>Elective - 3( Any One in Elective Group – 3)</td>
<td>ECC</td>
<td>4</td>
<td>3 1 0</td>
<td>3 0</td>
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<tr>
<td>3</td>
<td>MCA 411</td>
<td>ADA Lab</td>
<td>CCC</td>
<td>4</td>
<td>0 0 6</td>
<td>0 3</td>
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<tr>
<td>4</td>
<td>MCA ***</td>
<td>Elective - 4( Any One in Elective Group – 4)</td>
<td>ECC</td>
<td>4</td>
<td>0 0 6</td>
<td>0 3</td>
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<tr>
<td>5</td>
<td>MCA 413</td>
<td>Industrial Project : Minimum Two Months in an Organization approved by the Director/Head of the Centre/Department</td>
<td>CCC</td>
<td>20</td>
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*EoSE- End of Semester Examination

**/***: Please see the List of Elective papers (Elective-3 and Elective-4 corresponding)
## Elective Papers

<table>
<thead>
<tr>
<th>Elective Course Code</th>
<th>Course Category</th>
<th>Subject Title</th>
<th>Prerequisite</th>
<th>Semester</th>
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<tbody>
<tr>
<td>MCA A01</td>
<td>ECC</td>
<td>Big Data Analytics</td>
<td>-</td>
<td>III</td>
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<tr>
<td>MCA A02</td>
<td>ECC</td>
<td>E-Commerce</td>
<td>-</td>
<td>III</td>
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<tr>
<td>MCA A03</td>
<td>ECC</td>
<td>Computer Graphics</td>
<td>-</td>
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</tr>
<tr>
<td>MCA A04</td>
<td>ECC</td>
<td>Computer Oriented Numerical Methods</td>
<td>-</td>
<td>III</td>
</tr>
<tr>
<td><strong>Elective-2 (Any one)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>MCA B01</td>
<td>ECC</td>
<td>Theory of Computation</td>
<td>-</td>
<td>III</td>
</tr>
<tr>
<td>MCA B02</td>
<td>ECC</td>
<td>Soft Computing</td>
<td>-</td>
<td>III</td>
</tr>
<tr>
<td>MCA B03</td>
<td>ECC</td>
<td>Computer Based Optimization Techniques</td>
<td>-</td>
<td>III</td>
</tr>
<tr>
<td>MCA B04</td>
<td>ECC</td>
<td>Cryptography &amp; Network Security</td>
<td>-</td>
<td>III</td>
</tr>
<tr>
<td><strong>Elective-3 (Any one)</strong></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>MCA C01</td>
<td>ECC</td>
<td>Data Science with R</td>
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<td>IV</td>
</tr>
<tr>
<td>MCA C02</td>
<td>ECC</td>
<td>Machine Learning</td>
<td>-</td>
<td>IV</td>
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<td>MCA C03</td>
<td>ECC</td>
<td>Digital Marketing</td>
<td>-</td>
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<tr>
<td>MCA C04</td>
<td>ECC</td>
<td>Open Source Operating System</td>
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<td><strong>Elective-4 (Any one)</strong></td>
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<tr>
<td>MCA D01</td>
<td>ECC</td>
<td>Data Science with R Lab</td>
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<td>IV</td>
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<tr>
<td>MCA D02</td>
<td>ECC</td>
<td>Machine Learning Lab</td>
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<td>IV</td>
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<td>MCA D03</td>
<td>ECC</td>
<td>Digital Marketing Lab</td>
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<tr>
<td>MCA D04</td>
<td>ECC</td>
<td>Open Source Operating System Lab</td>
<td>-</td>
<td>IV</td>
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</table>

Note: Student have to take any one subject in Elective Group-3 and also have to take one elective lab of same subject from the Elective Group-4.

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Bridge Course Syllabus

MCA BC1 : Computer Fundamentals

Theory & Tutorial: 4 hours per week
Examination: Theory Paper - 3 hours; Max. Marks - 100, Passing Marks - 40

Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question (may have sub parts) from each unit. There will be an internal choice within the unit.

UNIT-I

Introduction to Computer: Characteristics of computers, Evolution of computer, generation of computers, classification of computers, applications of computers.


Computer System: Central processing unit (CPU), Memory, instruction format, instruction set.

Primary and Secondary Memory: Memory hierarchy, Random access memory (RAM), types of RAM, Read only memory (ROM), types of ROM. Classification of secondary storage devices, magnetic tape, magnetic disk, optical disk.

UNIT-II

Number Systems: Introduction to number system, Decimal, Binary, Octal, Hexadecimal, conversion between number bases, Arithmetic operations on binary numbers, Codes-BCD, EBCDIC, ASCII and Unicode.

Computer Software: Software definition, relationship between software and hardware, software categories, system software, application software, utility software.

Computer Languages: Introduction, classification of programming languages, generations of programming languages, features of a good programming language, Translators/ Language processors.

UNIT-III

Operating System: Introduction of operating system, types of operating system, functions of an operating system, modern operating systems.


Internet Basics: Introduction, evolution of Internet, basic Internet terms, getting connected to Internet, Internet applications, electronic mail and other Internet Services, searching the web (search engines), languages of Internet, viruses. Use of Anti-Virus software.
UNIT-IV

Office Management Tools:

**MS-Word:** Creating and Editing documents, Page formatting, Finding and replacing text, Spell & Grammar checking, Indexing, Tables and feature there in, Inserting (Objects, picture, files etc.), Using Graphics, using Mail Merge.

**MS Excel:** Spreadsheet terminology, organization of the worksheet area, editing cells using commands and functions, formatting worksheet, creating & editing charts, naming range and using statistical, mathematical and financial functions, multiple worksheets and Macros.

**MS Power Point:** Anatomy of a power Point Presentation, Creating and Viewing a presentation, Managing Slide Shows, Using hyperlinks, advanced navigation with action setting and action buttons, organizing formats with Master Slides, adding graphics, multimedia and special effects, creating presentation for the web.

**MS Access:** Planning a database (tables, queries, forms, reports), Creating and editing database, customizing tables, linking tables, designing and using forms, modifying database structure, maintaining database, Sorting and Indexing database, Querying a database and generating Reports.

**Recommended Text / Reference Books:**

2. Fundamental of Computers Anita Goel, PearsonEducation.
5. Introduction to Computer, Peter Norton’s, Tata McGraw Hill Publication.
6. MS-Office , Dr. S.S. Shrivastava, Published by Laxmi Publication.

MCA BC2: Programming Through C & C++

Theory & Tutorial: 4 hours per week
Examination: Theory Paper – 3 hours; Max. Marks – 100, Passing Marks - 40

**Note:**

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question (may have sub parts) from each unit. There will be an internal choice within the unit.

UNIT- I

**Computer Program:** Introduction, developing a program, algorithm, flowchart, pseudo code.

**Basics of C:** C Character set, tokens, variables and constants, keywords, Type casting, Scope and lifetime of variables, data types. Operators, Instructions, comment statements, simple input and output.

**Control and Looping Structures:** decision control structure, loop control structure, switch-case control structure,

**Arrays:** Introduction, types of arrays and String Handling Functions.

\[\text{Signature}\]

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Unit-II

Functions: Functions, function prototype, subroutines, scope and lifetime of identifiers parameter passing mechanism, recursion.

User defined data types: typedef, enumerated data types, union, structure, array of structures, Pre-processors, header files and standard library functions.

Pointer: Definition and uses of pointer, pointer arithmetic, pointers and arrays, pointers and function.

Input/Output: Console Input and Output functions, data files, operations on data files, text and binary files.

Unit-III


Basics: Preprocessors, comments, Data types, Operators, Control and Loops Structures, Arrays and String handling, Modular programming with Functions, Structure and Unions.

Class and Object: Pointer and Run time binding, Dynamic memory allocation, Storage class, access specifiers, Class, Member functions, member data, Objects, Constructors, Destructors, Inline member functions, Friend Functions, Static member function, Arrays of objects, Pointers and their uses.

Inheritance: Definition, Types of inheritances, types of derivations and their implementations, container classes, member access control.

Unit-IV

Polymorphism: Functions Overloading, Operator Overloading, early binding polymorphism with pointers, Unary and Binary Operator Overloading, Overload Assignment Operator.

Virtual Function: Virtual Function, late binding, pure virtual functions, abstract classes, Generic Programming with Templates, Friend function, Overloaded Function Templates, Multiple Arguments function Template.

Exception handling: Exception handling mechanism- try, throw & Catch.

Recommended Text / Reference Books:
1. Balagurusamy E; Programming in ANSI C;Fifth Edn; Mc Graw Hill.
4. Deitel HM & Deitel JP; C/C++ How to program; 5th Edn; Pearson Pub.

Practical Examination:

Each practical paper shall be of 3 hours duration on one day and carry 100 marks for the practical examination. The practical examination will involve 3 exercises, each of 20 marks, practical record of 15 marks and viva-voce examination of 25 marks.

MCA BC3: Office Automation and Programming Lab
Practical Lab
Examination: Practical Examination
Lab Exercise on Theory Paper MCA B01 and MCA B02
Course Contents in Detail - MCA I Semester 2020-21

Note:
1. Papers MCA 101, MCA 102, MCA 103, MCA 111 and MCA 112 are compulsory (CCC) and Papers MCA 104, MCA 105, MCA 106 and MCA 113 are elective (ECC).
2. Continuous assessment (Internal) will be done by the concerned teacher on the basis of test papers, regularity in the class and performance of the student. Maximum marks in continuous assessment of each paper is 100.

MCA 101: Object Oriented Programming Through Java

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question (may have sub parts) from each unit. There will be an internal choice within the unit.

Unit-I

Introduction to OOP: Basic concepts of Object Oriented Programming, Objects and Classes, Data abstraction and Encapsulation, Inheritance, Polymorphism, Dynamic binding, Message communication: Benefits & applications of OOP.

Introduction to Java: History, Java features, Java Environment- JDK, API. Types of Java program. Creating and Executing a Java program; Java tokens: Keywords, Character set, Identifiers, Literals, Separator; Java Virtual Machine (JVM); Command Line Arguments; Comments in Java program.

Elements: Constants Variables, Data types, Scope of variables, Type casting. Operators-Arithmetic, Logical, Bit wise operator, Increment and Decrement, Relational, Assignment, Conditional, Special operator, Expressions, Evaluation of expressions.

Unit-II

Decision Making and Branching: If statement and its types, switch statement; Decision making and looping -while loop, do While, for loop, break labeled loop, continue statement.

Arrays: One Dimensional Array, Multidimensional Array, Vectors, Wrapper classes; String Array, String Methods, String Buffer Class.

Class and Objects: Defining a class, Methods, Creating objects, Accessing class members, Constructors, Method overloading, Static members, Nesting of Methods, this keyword.

Inheritance: Define a subclass, deriving a sub class, Single Inheritance, Multilevel Inheritance, Hierarchical Inheritance, Overriding methods, Final variables and methods, final classes, Finalize methods, Abstract methods and classes, Visibility Control- Public access, Private access, friend, protected. Interface-Multiple Inheritance, Defining interface, Extending interface, Implementing Interface, Accessing interface variables.

Unit-III

Packages: Java API Packages-System Packages, Naming Conventions, Creating & Accessing a Packages, Finding Packages and CLASSPATH, Adding Class to a Packages, Hiding Classes.

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JAVA Streams: Data Flow with Java Streams, Input Streams, Output Streams.

Exception Handling: Advantages of Exception Handling, Types of Errors, Basics of Exception Handling, try blocks, throwing an exception, catching an exception, finally statement, declaring and throwing custom Exceptions.

Multithreading: Creating threads, life cycle of a thread, defining & running thread, thread methods, thread priority, synchronization, implementing run-able interface, thread scheduling.

Unit-IV


Networking: Java utility for networking, Manipulating URLs, reading a file on a Web server, Establishing simple Client Server.

Recommended Books:

4. Cay Horstmann, Gary Cornell; Core Java Fundamentals – Volume I and II; Pearson Education.
5. Khalid A. Mughal, Rolf W. Rasmussen; A Programmer's Guide to Java Certification (2nd Edn.).

MCA 102: Operating Systems

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Basic Concepts: Necessity of an Operating System, Operating system structure, Evolution of Operating System (multiprogramming systems, batch systems, timesharing system, distributed systems and Real Time system), Operating system structure, Operating system components and services, system calls, system programs, Virtual machines.

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Unit-II

**Process management**: process concept, process scheduling, cooperating processes, Threads, Inter-process communication, CPU scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real time scheduling and Algorithm evaluation.

**Process Synchronization and Deadlocks**: The Critical section problem, synchronization hardware semaphores, Classical problems of synchronization, Critical regions, Monitors, Deadlocks-System model, Characterization, Deadlock prevention, Avoidance and Detection, Recovery from deadlock, Combined approach to deadlock handling.

Unit-III

**Storage management**: Memory management- Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation with paging, Virtual Memory, Demand paging and its performance, page replacement algorithms, Allocation of frames, Threshing, Page Size and other considerations, Demand segmentation, File systems, secondary storage Structure, File concept access methods, directory implementation, Efficiency and performance recovery.

**Disk Structure and Scheduling**: Disk structure, Disk scheduling methods, Disk management, Recovery Disk structure, disk structure, disk scheduling methods, disk management, Swap-Space management, Disk reliability.

Unit-IV


**Case Study**: Windows NT - Design principles, System components, Environments subsystems, File system, Networking and program interface.

**Recommended Text / Reference Books:**

1. Galvin P.B, Silberschatz; Operating System Principles; (Seventh Edition), Wiley 2018

**MCA 103: Database Management System**

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

**Note**: 1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consist of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

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Unit-I

Overview of DBMS: Basic concepts, DBMS v/s File system, Database system architecture, Schemas, Instances, Components, Database users, Three-tier architecture, Client/Server architecture, Data independence, Database models.

Data modeling using the Entity Relationship Model : Data Modeling using ER Model, ER diagram, mapping constraints, Keys, Types of Keys, Generalization, aggregation, reduction of ER diagrams to tables, Integrity Rules, Dependency and its types, Data Dictionary, Normalization (1NF, 2NF, 3NF, BCNF), inclusion dependencies, loss less join decompositions, Dr. E.F. Codd's Rules.

Unit-II


Unit-III

SQL and PL/SQL : Introduction to SQL: Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, SQL operators, Tables, views and indexes, Constraints, Group By and Having Clause, Order By Clause, Queries and sub queries, Functions-string, date, numeric, aggregate, Join, PL/SQL basics, blocks, architecture, variables, constants, attributes, character set, PL/SQL control structure, data types, conditional and sequential control statements, cursors, exceptions, triggers, functions, procedures and packages.

Unit-IV

Concurrency Control: Locks Based Protocols, Time Stamp Based Protocols, Validation Based Protocol, Multiple Granularity, Multi-version Schemes.


Emerging Databases: Introduction to emerging Databases-OODBMS, ORDBMS, Distributed database, Multimedia database, Special database-limitations of conventional databases, advantages of emerging databases.

Recommended Text / Reference Books:

3. Ivan Bayross; SQL/PL4th Edn; BPB, 2009
MCA-104: Computer Architecture

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper - 3 hours; Max. Marks - 100

Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Basic Building Blocks: Logic gates, basic combinational logic, Boolean functions & Expressions, multiplexer, decoders, encoders, comparators, adder and substractures, BCD to 7 segment decoder, sequential circuits, RS, JK, D and T flip flops, counter and shift register, Clock and Timing events.

Basic of Computer organization: System buses and instruction cycles, memory subsystem organization and interfacing, I/O subsystem organization and interfacing, Register transfer languages.

Unit-II

Instruction and Addressing: Addressing methods and machine program sequencing memory location addresses, encoding of information, instructions types, Instruction format and instructions sequencing addressing modes, paging, relative, indirect and indexed addressing.

CPU design: Specifying a CPU, design and implementation of a simple CPU (fetching instructions from memory decoding and executing instructions, establishing required data paths, design of ALU, Number representation, Arithmetic operations, floating point arithmetic. Design of the control unit and design verification), design and implementation of a simple micro-sequence.

Unit-III

Memory Organization: Main memory concepts, Auxiliary memory, Associative memory, virtual memory & paging and cache memory organization.

Input and Output organization: Asynchronous data transfer, programmed I/O Interrupts (types, processing of interrupts implementing interrupts inside CPU) Direct memory access, I/O processors, serial communication.

Unit-IV

Vector and Array Processing: Shared-Memory, Multiprocessing, Distributed Multi Computing.


Recommended Text / Reference Books:
3. Malvino B; Digital Computer Electronics III Edition; TMHL

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MCA 105: Web Application Development

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consist of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I


Introduction of HTML and XHTML: introduction markup language, editing HTML & XHTML: Common tags, headers, text styles linking, images, formatting text, horizontal rules and more line breaks, ordered lists and unordered lists, basic HTML/XHTML tables: intermediate tables and formatting, forms, more complex forms, internal linking, creating and using image maps.

Unit-II

JavaScript: Introduction to scripting language, memory concepts, arithmetic decision making. Java script control structures, Java script functions, program modules in java script, functions, scope rules, recursion java script global functions.

Java script arrays: introduction, array declaring and allocating memory, passing arrays to functions, multiple subscripted arrays. Java script objects-introduction, math, string, data, Boolean and number objects etc.

Unit-III

CSS: introduction – inline styles, creating style sheets with the style element, conflicting styles, linking external style sheets, positioning elements, backgrounds, element dimensions, text flow and the CSS box model, user style sheets, Filter and Transitions, HTML DOM, Browser BOM.

Event model: introduction, event ON CLICK, event ON LOAD – error handling with ON ERROR, tracking the mouse with event, more DHTML events.

Unit-IV

PHP & Web Server Architecture: Arrays, String, Functions include & require statements, Simple File & Directory Access Operations, Error handling, Processing HTML form using GET, POST, REQUEST, SESSION, COOKIE variables, Sending E-mail, Database Operations with PHP, Connecting to MySQL (or any other database), Selecting a db, building & Sending Query, retrieving, updating & inserting data, CMS: Wordpress. Note: XAMPP is used for PHP. Wordpress: Introduction & Installations.

Recommended Text / Reference Books:


MCA 106: Discrete Mathematics

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:
- Candidate has to attempt five questions in all. All questions carry equal marks.
- Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
- Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit.
There will be an internal choice within the unit.

Unit-I

Matrices: Introduction, Rank of Matrix, Solving System of Equations, Inverse of a Matrix, Set theory, Principle of inclusion and exclusion, partitions, Relations, Properties of relations, Matrices of relations, Closure operations on relations, Functions- injective, subjective and objective functions.

Unit-II

Permutation and Combination: Permutation, Combination with and without repetition.
Probability: Probability Classical, relative frequency and axiomatic definitions of probability, addition rule and conditional probability, multiplication rule, total probability, Bayes’ Theorem and independence problems.

Unit-III

Proposition Calculus: Propositions and logical operators, Truth table, Propositions generated by a set, Equivalence and implication, Basic laws, Functionally complete set of connectives, Normal forms, Proofs in Propositional calculus, Predicate calculus.

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Unit-IV

Recurrence Relation & Generating Function: Discrete numeric function, generating function, Recurrence relations, Homogeneous linear Recurrence relation with constant coefficients.

Finite State Machine : finite state machines as models of physical systems, equivalent machine, finite state machine as language recognizes, finite state language of type-3 languages.

Recommended Books:


Practical Examination :

Each practical paper shall be of 3 hours duration on one day and carry 100 marks for the practical examination. The practical examination will involve 3 exercises, each of 20 marks, practical record of 15 marks and viva-voce examination of 25 marks.

MCA 111: Java Lab
Practical Lab
Examination: Practical Examination
Lab Exercise on Theory Paper MCA 101
List of experiments:

1. Simple java applications for understanding references to an instance of a class
2. Handling Arrays in JAVA
3. Handling strings in JAVA
4. Implementation polymorphism
5. Package creation
6. Developing user defined packages in Java
7. Use of Inheritances
8. Use of Interfaces
9. Threads, Multithreading
10. Collection handling
11. GUI/Swings applications
12. I/O Stream handling
13. Exception Handling

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MCA 112: DBMS Lab
Practical Lab
Examination : Practical Examination
Lab Exercise on Theory Paper MCA 103

List of experiments:

1. SQL data types, Operators, Literals, Constraints
2. Assignment on Queries: Select / From / Where/ Group By/Having Clause/ Order By Clause/ SQL Operators/ Joins/ Built-in Functions
3. PL/SQL Block Structure
4. Conditional Statements
5. Iterations: Simple Loops, For Loop, While Loop, Nested Loops
6. Exception Handling
7. Database Programming with Record Variables
8. Database Programming with Cursors, Cursor-For Loop
9. Procedures & Functions
10. Triggers
11. Packages

MCA 113: Web Application Development Lab
Practical Lab
Examination : Practical Examination
Lab Exercise on Theory Paper MCA 105

List of experiments:

HTML:
- Basics Elements & Attributes, HTML Formatting tags, Links,
- Images, Tables, Forms Elements
- HTML5 Audio and Video, HTML5 Input Types & Attributes
- CSS Syntax, CSS Attribute Selectors
- CSS properties: Fonts, Background, Colors, Links, Lists,
- CSS Box Model, Display, Opacity, Float, Clear
- CSS Layout, CSS Navigation Bar,
- CSS Rounded Corners, CSS Border Images, CSS Animations

JavaScript:
- Displaying Output, Declaring Variables, Operators, Arithmetic, Data Types, Assignment,
- JavaScript Functions, Booleans, Comparisons, Conditional
- JavaScript Switch, Loops, Break, Type,
- JavaScript Objects, Scope,
- Strings and String Methods
- Numbers and Number Methods, Math, JavaScript Dates: Formats and Methods
- JavaScript Events, JavaScript, JavaScript Forms (API and Validation), Objects,
- JavaScript Functions, JavaScript DOM, JavaScript Validation, Browser BOM

PHP:
- Installing XAMPP
- Variables, Data Types, Constants, Operators, Programming Loops,
- PHP Functions,
- Arrays
- Strings Functions
- PHP Form Handling, Require & Include
- PHP with MySQL
Syllabus of MCA II Semester: 2020-21

Note:
1. Papers MCA 201, MCA 202, MCA 203, MCA 211 and MCA 212 are compulsory (CCC) and Papers MCA 204, MCA 205, MCA 206 and MCA 213 are elective (ECC).
2. Continuous assessment (Internal) will be done by the concerned teacher on the basis of test papers, regularity in the class and performance of the student. Maximum marks in continuous assessment of each paper is 100.

MCA-201: Programming in Python

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction: Installing Python; basic syntax, interactive shell, editing, saving, and running a script; data types; variables, assignments; immutable variables; numerical types; arithmetic operators and expressions; comments in the program; understanding error messages; Conditions, boolean logic, logical operators; ranges; Control statements: if-else, loops (for, while); short-circuit (lazy) evaluation.

Unit-II

String manipulation: subscript operator, indexing, slicing a string; strings and number system: converting strings to numbers and vice versa.
Regular Expression: Regular Expression: Introduction/Motivation, Special Symbols and Characters for REs, REs and Python.
Lists, tuples, and dictionaries: basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries.
Design with functions: complexity; arguments and return values; formal vs actual arguments, named arguments. Program structure and design. Recursive functions.

Unit-III

Text files: manipulating files and directories, os and sys modules; text files: reading/writing text and numbers from/to a file; creating and reading a formatted file (csv or tab-separated).

Classes and OOP: classes, objects, attributes and methods; defining classes; design with classes, data modeling; persistent storage of objects, inheritance, polymorphism, operator overloading (_eq_, _str_, etc); abstract classes;

Exception Handling: Exceptions in Python, Detecting and Handling Exceptions, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions.

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Unit-IV

Multithreading: Understanding threads, Forking threads, synchronizing the threads, Programming using multithreading.

Graphical user interfaces: event-driven programming paradigm; tkinter module, creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes - sizes, fonts, colors, layouts, nested frames

Database Interaction: MySQL Database Connection using Python, Creating and Searching Tables, Reading and storing config information on database, Programming using database connections Python

Recommended Books:

2. Dr. M. Suresh Anand, Dr. R. Jothikumar, Dr. N. Vadivelan, “Python Programming”, Notion Press, 1st Edition, 2020
6. SakisKasampalis, Quan Nguyen, Dr Gabriele Lanaro, Ingram, “Advanced Python Programming”, short title, 2019

MCA 202: Advanced Java Programming

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit.
   There will be an internal choice within the unit.

Unit-I


Unit-II

Java Server Pages: Basic JSP Architecture, Life Cycle of JSP, JSP Tags & Expressions, JSP Implicit Objects, JSP Directives, Tag Libraries ,Using JDBC with JSP , Accessing a Database, Adding a Form, Updating the Database.


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Unit-III

JDBC: The JDBC Connectivity Model, Types of JDBC Drivers, Basic steps to JDBC, setting up a connection to database, Creating and executing SQL statements, ResultSet and ResultSet Metadata Object, Accessing Database.

Unit-IV


Recommended Books:


MCA 203: Data Communication and Computer Networks

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I


Network Models: Internet model, OSI seven layer network model, Functions of OSI layers, LAN technologies – protocols and standards, LAN hardware, TCP/IP (Protocols, architecture, layers, services).

Unit-II

Data transmission: Data Communication Systems, DTE-DCE Interface, Modems, Transmission media (Guided & Unguided), Multiplexing – FDM, WDM, TDM, Digital Subscriber Line, Error detection and correction; Microwave-Electromagnetic spectrum, Characteristics, use of MIW in communications; Satellite- Artificial Satellite, Geosynchronous Satellites, Orbital classification, Multiple accessing.
Optical fiber communication: Basic concept of light propagation, Fiber Cables, Light sources, Optical Detectors, Fiber cable losses, wave division multiplexing, fiber distributed data interface, the fiber channel

Unit-III

Internet: Internet Architecture, Internet protocol and datagram, Routing protocols, UDP, Internet standard services, DNS.

Networking Technology: ISDN (Services, Channels, Layers, Broadband ISDN), Cable Modem System, SMDS, Frame relay, fast Ethernet, 100VG-any LAN and Gigabit Ethernet, FDDI and CDDI, Asynchronous Transfer, ATM (Architecture, layers, classes, services).

Unit-IV


Recommended Text/Reference Books:

7. M.A. Miller, Data and Network Communications, Thomas Kearning

MCA 204: Algorithms and Data Structures

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction: Algorithms, pseudo code, efficiency of algorithms, analyzing algorithms and problems, complexity measures, basic time analysis of an algorithm, space & time complexity. Data abstraction and basic data structures, data types and abstract data types.
Basic data structures – Arrays, Stack, Queues and their applications, dequeue and priority queues. 
linked and sequential representation of arrays, stacks & queue. Polish notations, Arithmetic
expressions

Unit-II

Linked lists: Representation of linked list in memory, insertion, deletion, traversal and searching of
linked list, Circular linked list, Doubly linked list.
Trees: Basic concepts, linked representation, representation in continuous memory. Binary and N-ary
trees, Searching, insertion and deletion in binary search tree, traversing algorithms using stacks,
header nodes threads.

Unit-III

Graphs: Graphs and their representations, sequential representation- Adjacent matrix, incidence
matrix, linked representation of graphs, operations on graph, traversing a graph. DFS and BFS
algorithms.
Heap: Heap structures, heap sort algorithm.

Unit-IV

Sorting and Searching: Use various data structures for searching and sorting, Internal and external
sorting techniques, linear and binary search, Hash tables & Hashed searching, Bubble sort, Insertion
sort, Selection sort, Merge sort, Radix sort, quick sort.

Recommended reference books:
3. A.V. Aho, J.E. Hopcroft, and J.D. Ullman, Data Structures and Algorithms, 3rd Edition:
Pearson Education Asia, 2008
5. Jean-Paul Tremblay and Paul G. Sorenson, An Introduction to Data structures with
applications TMH Publishing Co.Ltd.
6. A. Michael Berman: Data Structures via C++ Oxford University Press.
7. Jean-Paul Tremblay and Paul G. Sorenson, An Introduction to Data Structures with
application, TMH Publishing Co. Ltd.

MCA 205: Software Engineering

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:
- Candidate has to attempt five questions in all. All questions carry equal marks.
- Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2
marks each.
- Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit.
There will be an internal choice within the unit.

Unit-I

Introduction to System, Software and Software Engineering: Systems concepts and definitions:
System’s theory, Definition of System, System Characteristics/features, System Components.
The Evolving Role of Software, Software: A Crisis on the Horizon and Software Myths, Software
Engineering: A Layered Technology, Software Process Models, The Linear Sequential Model, The
Prototyping Model, Spiral model, The RAD Model, Evolutionary Process Models, Component-Based

Unit-II


**Project Planning & Scheduling**: Size Estimation, Cost Estimation, Models, Static, single variable models, Static, Multivariable Models, COCOMO, The Putnam Resource Allocation Model, Risk Identification and Projection: RMMM, Project scheduling and Tracking, Object-oriented concepts and principles, software risks, Risk identification, Risk projection, risk refinement, risk mitigation, monitoring and management, the RMMM plan

Unit-III


Unit-IV

**Software Testing**: Fundamentals, White Box Testing, Black Box Testing, software testing strategies, verification and Validation, System Testing, Unit testing, Integration testing and Debugging.


**Emerging technologies**: Introduction to Security engineering, Service-Oriented s/w engineering, Aspect-Oriented s/w engineering and S/W Reengineering, CMM level-5 (concept and advantages).

**Reference /Text Books**


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MCA 206 : Data Warehousing & Data Mining

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2
   marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit.
   There will be an internal choice within the unit.

Unit-I

Introduction to Data Warehousing: Introduction, Data Warehouse importance and functions,
Multidimensional Data Model, Data Mattting and it’s usage, Cost of data marting, Metadata, Data
warehouse Architecture, Building a Data warehouse, Implementation, Further Development, Planning
and Project Management of Data Warehouse.

Unit-II

Data Mining: Data Warehousing to Data Mining, Evolution Analysis, Classification of Data Mining
Systems, Architecture of data mining system, Major Issues in Data Mining. Data preprocessing :
Needs preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction,
Deserialization and Concept Hierarchy Generation; Analysis of Attributes Relevance. Discriminating
between Different Classes. Data Warehouse and OLAP Technology for Data Mining.

Unit-III

Association Rules: Association Rule Mining, Single- Dimensional Boolean Association Rules from
Transactional Databases. Apriori algorithm, Use of sampling for frequent item-set, FP tree algorithm,
Multi-Level Association Rules from Transaction Databases. Issues regarding classification &
prediction. Different Classification Methods- Decision Tree, Bayes Classification, Rule based,
Classification by Back-Propagation, Prediction.

Unit-IV

Clustering and Applications of Data Mining: Cluster Analysis, Types of Data Categorization of
Major Clustering Methods, Kmeans, Partitioning Methods, Hierarchical Methods, Density Based
Methods, Grid Based Methods, Model-Based Clustering Methods, Clustering High Dimensional Data,
Constraint Based Cluster Analysis, Outlier Analysis, Data Mining Applications.

Future Trends: Multidimensional Analysis and Descriptive Mining of Complex Data Objects.
Active learning, Reinforcement learning, Text mining, Graphical models, Web Mining. Basics of
Data Mining Tools. Spatial Databases, Multimedia Databases, Time Series and Sequence Data, Text
Databases, Web Mining, Spatial mining, Temporal Mining, Applications and Trends in Data Mining.

Recommended Books:
1. Data Warehousing in the Real World – SAM ANAHORY & Dennis MURRAY. Pearson
   Edn Asia.
2. Data Mining – Concepts and Techniques- JIA WEI HAN & MICHELINE KAMBER
   Hareout India.
3. Data Warehousing ; Reema Thereja; Oxford
4. Data Mining Introductory and advanced topics MARGARET H DUNHAM PEARSON
   EDUCATION.
Practical Examination:

Each practical paper shall be of 3 hours duration on one day and carry 100 marks for the practical examination. The practical examination will involve 3 exercises, each of 20 marks, practical record of 15 marks and viva-voce examination of 25 marks.

MCA 211: Python Lab

Practical Lab
Examination: Practical Examination-
Exercises based on the Theory paper MCA 201.

List of Experiments:

1. Implement a sequential search
2. Create a calculator program
3. Explore String Functions
4. Implement Selection Sort
5. Implement Stack
6. Read and Write into a file
7. Demonstrate usage of basic regular expression
8. Demonstrate use of advanced regular expressions for data validation
9. Demonstrate use of List
10. Demonstrate use of Dictionaries
11. Create Comma separate files(CSV), Load CSV files into internal data structure
12. Write script to work like a SQL SELECT statement for internal data structure

MCA 212: Advanced Java Lab

Practical Lab:
Examination: Practical Examination-
Exercises based on the Theory paper MCA 202.

List of Experiments:

1. Dynamic HTML using Servlet
2. Use of get() and Post() methods
3. Cookies in Servlet
4. Session tracking and Management
5. JDBC
6. JSP Actions elements
7. Directives elements in JSP
8. JSP Tags
9. Implement JDBC with JSP
10. Implement JDBC with Servlet
11. Applications using Spring Web MVC
MCA 213: Data Structures Lab
Practical Lab
Examination: Practical Examination-
Exercises based on the Theory paper MCA 204

List of Experiments:

1. Array implementation of Stack and Queue
2. Linked list implementation of List, Stack, Queue
3. Array implementation of QUEUE
4. Applications of List, Stack and Queue ADTs
5. Implementation of Binary Trees and operations of Binary Trees
6. Implementation of Binary Search Trees
7. Implementation of AVL Trees
9. Graph representation and Traversal algorithms
10. Applications of Graphs
11. Implementation of searching and sorting algorithms
Syllabus of MCA III Semester 2021-22

Note:
1. Papers MCA 301, MCA 302, MCA 303, MCA 311 and MCA 312 are compulsory(CCC) and Papers MCA 304, MCA 305, MCA 306 and MCA 313 are elective(ECC).
2. Continuous assessment(Internal) will be done by the concerned teacher on the basis of test papers, regularity in the class and performance of the student. Maximum marks in continuous assessment of each paper is 100.

MCA-301 : Cloud Computing

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I


Unit-II


Unit-III


Unit-IV


Cloud Platforms in Industry: Amazon web services, Google AppEngine, Microsoft Azure Design, Aneka: Cloud Application Platform -Integration of Private and Public Clouds Cloud applications:
Protein structure prediction, Data Analysis, Satellite Image Processing, CRM and ERP, Social networking, Cloud Application - Scientific Application, Business Application.

**Recommended Text / Reference Books:**


**MCA-302 : .NET Frame Work and ASP.NET**

Theory & Tutorial: 4 hours per week ( 4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

**Unit-I**


**Unit-II**

**Windows Programming:** Creating windows forms, windows controls, Mouse Events, Menus and Dialog Boxes.

**Working with Data Controls:** Basics of ADO.NET, Architecture of ADO.NET, ADO.NET providers, Connection, Command, Data Adapter, Dataset, Connecting to Data Source, Accessing Data with Data set and Data reader, Create an ADO.NET application, Using Stored Procedures.

**Unit-III**

**ASP.NET Framework:** Client and server architecture, All standard Controls, Validation Controls. Rich Web Controls, Creating and Implementing User and Custom Controls, Designing Website with Master Pages.

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Unit-IV


Recommended Books:

5. Steven Holzner; ASP.NET 4.0 (Cover C# & VB ) Black Book; Dreamtech Press.
6. Steven Holzner; .NET Programming Black Book; Dreamtech Press.

MCA-303: Mobile Application Development

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consist of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

INTRODUCTION: Introduction to mobile applications – Market and business drivers for mobile applications – Difficulties in Mobile Development- Mobile Myths- When to Create an App- Types of Mobile App. Design Constraints for mobile applications both HW and SW related, Architecting mobile applications, user interfaces for mobile applications, touch events and gestures.

Unit-II

Unit-III

TECHNOLOGY | ANDROID: Establishing the development environment, Android architecture, Android Application Structure, Emulator, Android virtual device, UI design, Fragments, Activity, Services, broadcast receiver, Intents/Filters, Content provider-SQLite Programming, SQLITE open, Helper, SQLite Database, Interaction with server side application.

Unit-IV

Advanced Android: Using Google Maps, GPS and Wi-Fi Integration, Android Notification, Audio Manager, Bluetooth, Camera and Sensor Integration, Sending SMS, Phone Calls, Publishing Android Application.

Recommended Text / Reference Books:


MCA-304 : Artificial Intelligence

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

General Issues and overview of AI: The AI problems: what is an AI technique, Characteristics of AI applications Problem Solving, Search and Control Strategies General Problem solving, Production systems, Control strategies, forward and backward chaining Exhaustive searches: Depth first, Breadth first search.

Heuristic Search Techniques: Hill climbing, Branch and Bound technique, Best first search and A* algorithm, AND/OR Graphs, Problem reduction and AO* algorithm, Constraint Satisfaction problems Game Playing Min Max Search procedure, Alpha-Beta cutoff; Additional Refinements.
Unit-II

Knowledge Representation: First Order Predicate Calculus, Resolution Principle and Unification, Inference Mechanisms Horn's Clauses, Semantic Networks, Frame Systems and Value Inheritance, Scripts, Conceptual Dependency AI Programming Language- Introduction to PROLOG.

Unit-III


Unit-IV


Recommended Text / Reference Books:


Practical Examination

Each practical paper shall be of 3 hours duration on one day and carry 100 marks for the practical examination. The practical examination will involve 3 exercises, each of 20 marks, practical record of 15 marks and viva-voce examination of 25 marks.

MCA 311 : .NET Lab

Practical Lab : Examination : Practica
I Examination
Lab Exercise based on Theory Paper MCA 302.

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MCA 312 : Mobile Application Development Lab

Practical Lab : Examination : Practical Examination
Lab Exam Exercise based on Theory Paper MCA 303.

1. Introduction to Android Studio and setting Emulator
   - Setting up development environment
   - Launching emulator, Editing emulator settings, Emulator shortcuts
   - Logcat usage

2. Application Structure
   - Look at Basic building blocks – Activities, Services, Broadcast, Receivers & Content, UI Components, Views & Notifications
   - AndroidManifest.xml, Users-permission & uses-sdk, Android API levels (versions & version names), Providers, Components for communication - Intents & Intent Filters
   - Activity/services/receiver declarations, Resources & R.java, Assets, Layouts & Drawable Resources, Activities and Activity lifecycle
   - Introduction to DDMS, File explorer, Explicit Intent.

3. Basic UI Design, Styles & Themes
   - Form widgets, Text Fields, Layouts, styles.xml
   - draw able resources for shapes, gradients(selectors), style attribute in layout file, Applying themes via code and manifest file

4. Dialog boxes
   - Alert Dialogs
   - Toast, Time and Date

5. Images and media, Composite
   - ListView and ListActivity, Custom listview
   - GridView using adapters
   - Gallery using adapters

6. Menu
   - Option menu, Context menu
   - Sub menu, menu from xml
   - menu via code

7. Adapters
   - ArrayAdapter
   - BaseAdapter

8. Receivers and services
   - Alarm Via services
   - Broadcast Receiver

9. Content Providers
   - SQLiteDatabase and SQLiteOpenHelper
   - DB programming using 2 and 3 tier architecture
   - Reading and updating Contacts, Reading bookmarks

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MCA 313 : Communication and Soft Skill Lab

Practical Lab : Examination : Practical Examination

Contents:


3. **Presentation Skills** : Elements of effective presentation, structure of presentation, external factors and content. Debates, Seminar, Speeches, Lectures, Interviews, Mock Interviews, Commonly asked questions in interviews.

4. **Group Discussion** : Structure of GD, Moderator led and other GDs, Strategies in GD, Team work, body language, Mock GD, Problem solving, Reflective thinking, Critical thinking, Negotiation skills.

5. **Career Skills** : SWOT Analysis, IQ, EQ and SQ, Art of giving feedback, Decision making, Time Management, Team Management and Leadership Skills, 8 habits of successful people.

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Elective Theory Papers for Elective Group-1 of MCA III Sem

MCA A01 : Big Data Analytics

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consist of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Understanding Big Data: Introduction, Need, convergence of key trends, structured data Vs. unstructured data, industry examples of big data, web analytics – big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and its applications in healthcare, medicine, advertising etc.


Unit-II

Big Data Technologies: Hadoop: Open source technologies, cloud and big data, Crowd Sourcing Analytics, inter and trans firewall analytics.


Unit-III


NoSQL Data Management: Introduction to NoSQL, aggregate data models, key-value and document data models, relationships, graph databases, schemaless databases, materialized views, distribution models, sharding, master-slave replication, peer-peer replication Consistency: relaxing consistency, version stamps.

Unit-IV


Map Reduce Applications: MapReduce workflows, unit tests with MRUnit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce – YARN, failures in classic Map-reduce and
YARN – job scheduling, shuffle and sort, task execution, MapReduce types – input formats – output formats, MapReduce – partitioning and combining, Composing MapReduce Calculations.

Recommended Text / Reference Books:

2. Professional NOSQL, Shashank Tiwari, Wrox, September 2011
3. Hadoop in Practice, Alex Homes, Dreamtech Press, 2015

MCA A02: E-Commerce

Theory & Tutorial: 4 hours per week (4 Credits)  
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I


Unit-II


Other Models: Brokerage Model, Aggregator Model, Info-Mediated Model, Community Model and value chain Model. Mobile-commerce,

Unit-III


Unit-IV


Recommended Books:

5. Lexis Leon; Enterprise Resource Planning; TMH
6. Brady, Manu, Wegner; Enterprise Resource Planning; TMH
8. Dimpi Srivastava, Arti batra; ERP Systems; I K International Publishing House

MCA A03: Computer Graphics

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:
- Candidate has to attempt five questions in all. All questions carry equal marks.
- Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
- Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I


Unit-II


**Unit-III**


**Unit-IV**

Computer Animation: Design of Animation Sequence, General computer Animation Function- Raster animations, Key Frame system, Morphing, Simulating Accelerations, Motion Specifications, Kinematics and Dynamics.

**Recommended Text / Reference Books:**


**MCA 403: Computer Oriented Numerical Methods**

Theory & Tutorial: 4 hours per week (4 Credits)  
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

**Unit-I**


**Unit-II**

Interpolation and Numerical differentiation: Newton’s Forward Difference Interpolation, Newton’s Backward Difference Interpolation, Langrange’s Interpolation Formula.
Numerical Integration Definite Integral, Trapezoid Rule, Simpson’s Rule, Romberg Algorithm, Adaptive Simpson’s Scheme, Gaussian Quadrate Formulas.

Unit-III

Solution of Linear Equations: Gaussian Elimination, Gaussian Elimination with Scaled Partial Pivoting, Iterative Solution of Linear Systems, Gauss-Seidel Iteration Method, Power Methods, Eigenvalues and Eigenvectors.


Unit-IV

Smoothing of Data and the Method of Least squares, Least Squares curve fitting, Straight line and non linear curve fitting, Cubic splines, Chebyshev polynomials.

Random Numbers, Estimation of Areas and Volumes by Monte Carlo Techniques.

Recommended Books;


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Elective Theory Papers for Elective Group-2 of MCA III Sem

MCA B01 : Theory of Computation

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2
   marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit.
   There will be an internal choice within the unit.

UNIT-I

Automata: Introduction of automata, computability, and complexity; mathematical notations and
terminology; finding proofs and types of proofs.
Automata and Languages: Regular languages, finite automata, formal definition of a finite automaton,
formal definition of computation, designing finite automata.

UNIT-II

Non-deterministic finite automata: Equivalence of NFAs and DFAs, closure under the regular
operations, Regular Expressions: formal definition of a regular expression, equivalence with finite
automata, nonregular languages: pumping lemma for regular languages.

UNIT-III

Push down Automata and Context free languages: Context free grammars, designing context free
grammar, ambiguity in CFG and its removal, Chomsky normal form push down automata: formal
definition, graphical notations, Languages accepted by PDA, Equivalence of PDA and CFG, Non-
context free languages.

UNIT-IV

Turing Machines and Computability: Formal definition of turing machines with examples,
Decidability, undecidability and reducibility: Decidable languages; decidable problems concerning
regular languages and context free languages, the halting problem, undecidable problems, mapping
reducibility, decidability of logical theories, turing reducibility.

Recommended Books:

   learning India Pvt. Ltd., New Delhi.
2. John E. Hopcroft, Rajeev Motwani & Jeffrey D. Ullman, “Introduction to Automata
5. John C Martin, “Introduction to languages and theory of computation”, Mcgraw Hill
7. Kohavi,”Switching & Finite Automata Theory”,TMH

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MCA B02 : Soft Computing

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

UNIT-I


UNIT-II


UNIT-III


UNIT-IV


Recommended Text / Reference Books:

MCA B03: Computer Based Optimization Techniques

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper - 3 hours; Max. Marks - 100

Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consist of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I


Special cases in LPP: alternate optimum solution, an unbounded solution, infeasible Solution, Duality in LPP, Revised Simplex method.

Unit-II

Transportation Problem: Definition, methods for finding initial basic feasible solutions – North West corner rule, least cost cell entry method, Vogel’s approximation method, methods for finding optional solution – MODI Method.

Assignment Problems: Definition & concept, solution of an assignment problem for optimum solution – Hungarian Method.

Sequencing: Job – problems for processing N Jobs on 2 machines, processing N jobs on 3 machines, processing N jobs on processing M machines, processing 2 jobs on M machines (Graphic Method).

Unit-III

Inventory Models: What is inventory? Types of Inventories, Inventory Decisions, Cost involved in inventory problems, Controlled & Uncontrolled variables, deterministic inventory control system, concept of an average inventories, concept of economic order quantity (EOQ). (In short Model-I, II and Model III).

Replacement Models: Introduction – The replacement problem, replacement of items that deteriorate (with money value), replacement of items that fail completely (Mortality theorem).

Unit-IV


Queuing Theory: Introduction queuing system, queering problem, transient & steady states, traffic intensity, distribution of queuing system (Birth & Death Process), Queuing Models – I, II & III.

Recommended Text / Reference Books:

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**MCA B04 : Cryptography & Network Security**

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2
   marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit.
   There will be an internal choice within the unit.

**Unit I**

Introduction to Security Attacks : Cryptography, Security Attacks, Security Services and
Mechanism.

Classical Encryption Techniques : Classical Techniques, Conventional Encryption Model,
Classical Encryption Techniques.

Modern Techniques: Simplified DES, Block Ciphers Principles, DES Standards, DES Strength,
Differential & Linear Cryptanalysis, Block Cipher Design Principles, Block cipher Modes of
Operation.

**Unit II**

Conventional Encryption Algorithms: Triples DES, International Data Encryption Algorithm, RC5,
RC2 placement & Encryption Function, Key Distribution, Random Number generation, Placement of
Encryption Function.

Public Key Encryption: Public Key Cryptography: Principle of public key Cryptosystems, RSA
algorithm, Key Management, Fermat’s Theorem & Euler’s Theorem.

**Unit III**

Message Authentication & Hash Function: Authentication Requirements, Authentication Function,
Message Authentication Codes, Hash Function, Birthday Attacks, Security of Hash Function &
MAC’s, MD5 Message Digest algorithm, Secure Hash Algorithm(SHA).
Digital Signatures: Digital Signature, Authentication Protocol, Digital Signature Standard(DSS),
proof of digital signature algorithm.

**Unit IV**

Network and System Security: Authentication Application- Kerberos x.509, Dictionary
Authentication Services, Electronic Mail Security, Pretty Good Privacy (PGP), S/mime. Security:
Architecture, Authentication Header, Encapsulation security payloads, combining security
association, Key Management. Web Security: Secure socket layer & Transport layer security, Secure
Systems.

**Recommended Text / Reference Books:**

1. Willium Stalling; Cryptography and Network Security, Fifth Edn, Pearson.;
3. V.K. Pachghare; Cryptography and Information Security; PHI.
Syllabus of MCA IV Semester-2021-22

Note:
1. Papers MCA 401, MCA 402, MCA 411, MCA 412 and MCA 413 are compulsory (CCC) and Paper MCA 403 is elective (ECC).
2. Continuous assessment (Internal) will be done by the concerned teacher on the basis of test papers, regularity in the class and performance of the student. Maximum marks in continuous assessment of each paper is 100.

MCA-401 : Analysis and Design of Algorithms

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Divide and Conquer Algorithms: General method, Binary search, Merge sort, Quick Sort.

Unit II

Dynamic Programming: General method, Multistage graphs, Optimal Binary Search trees, 0/1 Knapsack, Travel Salesman Problem, Flow Shop Scheduling.

Unit III

Advanced data structure: Red-Black Tree, M-way trees, B-trees, Binomial Trees, Fibonacci Heaps, Data Structure for Disjoint Sets.
Backtracking: General method, 8 Queens Problem, Sum of Subsets, Graph Colouring, Hamiltonian Cycles, Knapsack Problem.

Unit IV

Branch and Bound: 0/1 Knapsack Problem, Travel Salesman Problem.

Reference Books:
1. Thomas H Cormen, C.E. Leiserson, R.L. Rivest, C. Stein; Introduction to Algorithms, 3 ed; PHI.
2. E. Horowitz, S. Sahni, S. Raja Sekaran; Fundamentals of computer Algorithms;
3. Aho A.V., J.D Ullman; Design and analysis of Algorithms, Addison Wesley
Elective Theory Papers for Elective Group-3 of MCA IV Sem

MCA-C01 : Data Science with R

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction to Data Science: What is Data Science, Need for Data Science, Components of Data Science, Big data, Facets of data: Structured data, Unstructured data, Natural Language, Machine-generated data, Graph-based or network data, Audio, image and video, Streaming data, The need for Business Analytics, Data Science Life Cycle, Applications of data science.

Unit-II

Data Science Process: Overview of data science process, setting the research goal, Retrieving data, Cleansing, integrating and transforming data, Exploratory data analysis, Data Modeling, Presentation and automation, Types of Analytics: Descriptive analytics, Diagnostic analytics, Predictive analytics, Prescriptive analytics.

Unit-III


Unit-IV


Recommended Books:


MCA-C02 : Machine Learning

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.

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2. Question No. 1 covering whole syllabus will consist of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Concept Learning: Introduction, a concept learning task, concept learning as search, Find-S algorithm, Version space and Candidate-Elimination algorithm, Inductive bias

Unit-II


Evaluating Hypothesis: estimating hypothesis accuracy, basics of sampling theory, comparing learning algorithms.

Unit-III


Unit-IV

Instance based Learning: Nearest neighbor classification, k-nearest neighbor, locally weighted regression, lazy and eager learner

Reinforcement Learning: Introduction, Elements of Reinforcement Learning, Difference between Reinforcement Learning and Supervised Learning, Applications of Reinforcement Learning, The Learning Task, Q learning, Nondeterministic rewards and actions, Temporal difference learning, Model based learning, Semi-Supervised Learning, Computational Learning Theory.

Recommended Text / Reference Books:

MCA-C03 : Digital Marketing

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper - 3 hours; Max. Marks - 100

Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit.
   There will be an internal choice within the unit.

Unit-I

Digital Marketing Fundamentals: Marketing v/s Sales, Marketing Mix and 4 Ps, What is Digital Marketing, CRM platform, CRM models, CRM platform, Marketing Automation, Inbound vs Outbound Marketing, Content Marketing, Understanding Traffic, Understanding Leads, Strategic Flow for Marketing Activities.

Unit-II

Website Planning and Structure: WWW, Domains, Buying a Domain, Website Language & Technology, Core Objective of Website and Flow, One Page Website, Google Analytics, Tracking Code, Website Auditing.

Search Engine Optimization: Basic Concepts, how Search Engine works, Keywords, Keywords, titles, meta tags, On page optimization techniques, Off page Optimization techniques, SEO Audit & Future of SEO.

Unit-III

Email Marketing: Content Writing, Email Machine – The Strategy, Email Frequency, Triggers in Email using 4Ps, Sequence of Email Triggers, Email Software and Tools, Importing Email Lists, Planning Email Campaign, Email Templates and Designs, Sending HTML Email Campaigns, WebForms Lead Importing, Integrating Landing Page Forms, Campaign Reports and Insights, Segmentation Strategy Segmentation, Lists Auto-Responder Series Triggering Auto - Responder Emails

Google Adwords: Basics, Google Ad Types, Pricing Models, PPC Cost Formula, Ad Page Rank, Billing and Payments, Adwords User Interface, Keyword Planning, Keywords Control, Creating Ad Campaigns, Creating Text Ads, Creating Ad Groups, Bidding Strategy for CPC.

Unit-IV

Recommended Text / Reference Books:

1. Ian Dodson, "The Art of Digital Marketing", Wiley, 2018
5. Philip Kotler, "Marketing 4.0: – Moving from Traditional to Digital", Wiley, 2017

MCA-C04: Open Source Operating System

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consist of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction to concept of Open Source Software: Introduction to Linux, Evolution of Linux, Linux vs. UNIX, Different Distributions of Linux, Installing Linux, Linux Architecture, Linux file system (inode, Super block, Mounting and Unmounting), Essential Linux Commands (Internal and External Commands), Kernel, Process Management in Linux, Signal Handling, System call, System call for Files, Processes and Signals.

Unit-II

Filter-The grep family, advanced filters-sed and awk vi editor: General startup of vi editor and it modes, Creating and editing files, features of vi, screen movement, cursor movement insertion, deletion searching, submitting operations, yank put, delete commands reading & writing files, advance editing techniques vim (improved vi).

Shell: meaning and purpose of shell, introduction to types of shell, the command line, standard input and standard output, redirection pipes, filters special characters for searching files and pathnames.

Unit-III

Shell Programming: Shell Programming – Introduction to Shell, Various Shell of Linux, Shell Commands, I/O Redirection and Piping, Vi and Emacs editor, Shell control statements, Variables, if-then-else, case-switch, While, Until, Find, Shell Meta characters, Shell Scripts, Shell keywords, Tips and Traps, Built in Commands, Handling documents, C language programming, Prototyping, Coding, Compiling, Testing and Debugging, Filters.

Unit-IV

Linux System Administrations: File listings, Ownership and Access Permissions, File and Directory types, Managing Files, User and its Home Directory, Booting and Shutting down (Boot Loaders, LILO, GRUB, Bootstrapping, init Process, System services)
Networking: Networking tools, E-mail Remote login, FTP, Network and Server setup LAN. Connection with Internet Setting-up routers, Proxy Servers, Print-Server, File server, mail Server, Web server and Database server.

Recommended Text / Reference Books:

4. Beginning Linux Programming N, Mathew, R. Stones, Wrox, Wiley India Ed.
5. Yshawant P, Kanetkar, Shell Programming
6. Linux System Programming, Robert Love, O" Reilly SPD.
8. Richard Petersen: The Complete Reference ; Linux; TMH

Practical Examination

Each practical paper shall be of 3 hours duration on one day and carry 100 marks for the practical examination. The practical examination will involve 3 exercises, each of 20 marks, practical record of 15 marks and viva-voce examination of 25 marks.

MCA 411: ADA Lab

Practical Lab: Examination: Practical Examination
Lab Exercise based on Theory Paper MCA 401.

List of Experiments:

1. Linear search & binary search, Sorting Techniques
2. Stacks and queues operations (with arrays and pointers)
3. Link List and Trees operations (with arrays and pointers)
4. graphs – basic traversal and search techniques
5. Greedy method:-knapsack problem
6. Greedy method minimum cost spanning tree
7. Dynamic Programming – 0/1 Knapsack
8. Dynamic Programming – traveling salesman problem
9. Backtracking 8-Queens problem
10. Backtracking Sum of Subsets
11. Branch and Bound -0/1 Knapsack problem
12. Sequential and Dynamic Implementations

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Elective Lab Papers for Elective Group-4 of MCA IV Sem

MCA D01 : Data Science with R Lab

Practical Lab : Examination : Practical Examination
Lab Exercise based on Theory Paper MCA C01.


Data science with R/Python : Overviews, data visualisation using graphics in R, GGplot 2, File format of graphics output, introduction to hypotheses, types of hypothesis, data sampling, confidence and significance level, hypothesis tests, parametric test, non-parametric test.


MCA D02 : Machine Learning Lab

Practical Lab : Examination : Practical Examination
Lab Exercise based on Theory Paper MCA C02.

List of Experiments(Contents):

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training samples. Read the training data from a .csv file.
2. Implement working of the decision tree based ID3 algorithm using appropriate data set to classify it.
3. Develop an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data set.
4. Implement the naïve Bayesian classifier using appropriate data set and compute its accuracy, considering few data sets.
5. Implement Bayesian network considering medical data. Use this model to demonstrate the diagnosis of Heart Disease Data Set.
7. Implement k-means algorithm to cluster same set of data as in experiment 6 and compare the results of these two algorithms and comment on the quality of clustering.
8. Implement k-Nearest Neighbor algorithm to classify the iris data set and display both correct and incorrect predictions.
9. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Apply it on an appropriate data set and draw graph.

MCA D03 : Digital Marketing Lab

Practical Lab :
Examination : Practical Examination
Lab Exercise based on Theory Paper MCA C03.

List of Experiments(Contents):

1. Search Engine Optimization
2. Blogs Creation
3. Website Analytics and Auditing
4. Social media Ad Structure
5. FaceBook Campaigns
6. YouTube Marketing
7. Email Marketing
8. Google Adwords

MCA D04 : Open Source OS Lab

Practical Lab :
Examination : Practical Examination
Lab Exercise based on Theory Paper MCA C04.

List of Experiments(Contents):

1. Basic Shell Commands
2. Study of Unix/Linux
   • General purpose utility command
   • File system navigation
   • File attributes
   • System's environment
   • Simple and advanced filters
3. I/O Redirections
4. Working with vi editor

Shell Programs:
5. Implementation of Shell Programming Concepts:
   • Shell programming in bash
   • Shell Variables Input concepts
   • Expression
   • Decisions and repetition
   • Special parameters and variables
   • Command line arguments
   • Case statements
   • Changing positional parameters and argument validation
   • String manipulation
   • File Operations
   • Base conversion
6. User defined functions.

Administration:
7. Installing Linux through bootable media/ through NFS
8. Creating & Managing User Accounts

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MCA 413: Industrial Training (Major Project)

Practical Lab: Examination: Practical Examination

Guidelines for Preparation the Project Report:

1. Objective: Student should able to develop a small real-time application using programming languages which is part of their course curriculum or any new upcoming programming languages/technology.

2. Project Report Formulation:
   a. The project report should contain the following:
      - Original copy of the Approved Performa and Project Proposal.
      - Bio-data of the guide with her/his signature and date.
      - Certificate of Originality (Format given).
      - Project documentation.
      - A CD consisting of the executable file(s) of the complete project should be attached on the last page of the project report. In no case, it should be sent separately. The student needs to retain the identical copy of the CD that should be carried while appearing for the viva-voce along with the project report.
   b. Project Documentation:
      - Project documentation may be about 100 to 125 pages (excluding coding).
      - The project documentation details should not be too generic in nature.
      - Appropriate project report documentation should be done, like, how you have done the analysis, design, coding, use of testing techniques/strategies, etc., in respect of your project.
      - The project report should normally be printed with single line spacing on A4 paper (one side only). All the pages, tables and figures must be numbered. Tables and figures should contain titles.
      - Two copies of the original project report in the bound form along with the CD (containing the executable file(s) of the project should be enclosed in the last page) is to be prepared at the time of final viva. One copy of the same Project Report and the CD containing the executable file(s) shall be retained by the student, which should be produced before the examiner at the time of viva-voce.

3. MANUAL FOR PREPARATION OF MCA Project (Prescribed Format and Specification)

4. Essential Components of Project Report:
   a. Title Page
   b. Certificate from Company
   c. Certificate from Guide
   d. Acknowledgement
   e. Index with printed Page Numbers

CHAPTER 1: INTRODUCTION
1.1 Company/Educational Institute Profile
1.2 Existing System and Need for System
1.3 Scope of Work
1.4 Operating Environment – Hardware and Software

CHAPTER 2: PROPOSED SYSTEM
2.1 Proposed System
2.2 Objectives of System
2.3 User Requirements

CHAPTER 3: ANALYSIS & DESIGN

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3.1 Entity Relationship Diagram (ERD)
3.2 System Architecture
3.3 Database Requirements & User Interfaces
3.4 Data Flow Diagram (DFD)

3.5 Data Dictionary
3.6 Table Design
3.7 Code Design

3.6 Menu Screens
3.7 Input Screens
3.8 Report Formats
3.9 Test Procedures and Implementation

CHAPTER 4: User Manual

4.1 User Manual
4.2 Operations Manual / Menu Explanation
4.3 Forms and Report Specifications

Drawbacks and Limitations
Proposed Enhancements
Conclusions
Bibliography

Annexure:
Annexure 1: Input Forms with data
Annexure 2: Output Reports with data
Annexure 3: Sample Code

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Major Project / Industrial Training

MCA-413

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Session: <Session>

A Project Report on

Title of the Project

Submitted for partial fulfillment of requirement for award of the degree of

Master of Computer Application (MCA 2021)

BY STUDENT

Name-
Enrollment No.-
Batch-

Under the Supervision

Name of the guide

To

University Centre for Computer Science & Information Technology (UCCS & IT)
University of Rajasthan
Jaipur

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