UNIVERSITY OF KERALA

Revised Scheme & Syllabus of the MCA Programme
(With effect from 2015 admissions)

The major objective of the MCA programme, in addition to other academic objectives, is to create skilled manpower at the level of programmer, system analyst, project manager and system manager.

The duration of the course is six semesters in 3 years. The students holding BSc in Computer Science or BCA or equivalent degree are eligible for direct entry into the 3rd semester under Lateral Entry MCA Scheme. The student has to take, generally, five theory papers and two practical courses in the first five semesters. One seminar each is included in the second and fourth semesters. In the fifth semester a mini-project work is given as one of the practical courses. In 6th semester the student has to undergo a major project work only. In each week a student is supposed to get 10 practical hours and hence in every semester a total of 160 hours of practical training in the laboratories. The contact hours for theory/tutorial comes to around 20 hours/week. The attendance in the theory & practical is compulsory.

General:

Examinations:

University Examinations will be conducted at the end of each semester as per the scheme included in this document.

Pass Requirements and provisions for classification of successful candidates

1. A candidate shall be declared to have passed the semester examination in full if he/she secures not less than 40% marks in written examination and not less than 50% marks in written (university) plus sessional marks put together in each paper. This rule applies to practical also. For the subjects which have only sessional marks, a minimum of 50% is required for a pass; otherwise the student has to repeat that semester.

2. For a pass in main project the student has to obtain minimum 50% marks in internal evaluation and 50% marks in external evaluation. Otherwise he/she has to repeat the 6th semester.

3. If a student fails in one or more subjects, he/she needs to reappear only in those subjects. The rules for supplementary examinations will be same as that of the existing regulations.

4. Classification of (Pass) results into I Class, II Class etc shall be as per the scheme prior to 2015 admissions.
**Sessional Marks:**

The sessional marks are awarded based on 2 class tests and assignments/lab reports for theory/practical and attendance. Split up is shown below:

**Theory**

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance</td>
<td>20%</td>
</tr>
<tr>
<td>Assignments (minimum 2)</td>
<td>30%</td>
</tr>
<tr>
<td>Class tests (minimum 2)</td>
<td>50%</td>
</tr>
</tbody>
</table>

**Practical:**

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance</td>
<td>20%</td>
</tr>
<tr>
<td>Performance in the lab (lab reports and experiments)</td>
<td>40%</td>
</tr>
<tr>
<td>Lab tests (minimum 2)</td>
<td>40%</td>
</tr>
</tbody>
</table>

**Mini Project**

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance</td>
<td>20%</td>
</tr>
<tr>
<td>Topic</td>
<td>10%</td>
</tr>
<tr>
<td>Performance</td>
<td>30%</td>
</tr>
<tr>
<td>Evaluation</td>
<td>40%</td>
</tr>
</tbody>
</table>

**Main Project**

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topic</td>
<td>10%</td>
</tr>
<tr>
<td>Performance</td>
<td>40%</td>
</tr>
<tr>
<td>Evaluation</td>
<td>50%</td>
</tr>
</tbody>
</table>

For seminars, the sessional marks are based on presentation/seminar report and participation. The students are required to present the progress of the main project work twice to the Department Faculty.

**Question Paper Pattern:**

The maximum mark for the theory examinations will be 100 and the time duration will be 3 hours. The question paper shall contain two parts; Part A and Part B. Part A shall be for 40 marks and shall contain 10 compulsory short answer questions. Part B shall be for 60 marks and shall contain three modules. Each module shall contain two full questions out of which the student has to answer only one question. Each full question shall be for 20 marks.
# Scheme and Syllabus of MCA Programme - 2015

## Semester I

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Name of Subject</th>
<th>Duration in Hours</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.101</td>
<td>Probability &amp; Statistics</td>
<td>L 3 T 1 P -</td>
<td>Sessional: 50 Written / Practical: 100 Total: 150</td>
</tr>
<tr>
<td>15.102</td>
<td>Digital Systems</td>
<td>L 3 T 1 P -</td>
<td>Sessional: 50 Written / Practical: 100 Total: 150</td>
</tr>
<tr>
<td>15.103</td>
<td>Programming in C</td>
<td>L 3 T 1 P -</td>
<td>Sessional: 50 Written / Practical: 100 Total: 150</td>
</tr>
<tr>
<td>15.104</td>
<td>Microprocessor and Interfacing</td>
<td>L 3 T 1 P -</td>
<td>Sessional: 50 Written / Practical: 100 Total: 150</td>
</tr>
<tr>
<td>15.105</td>
<td>Linux and Shell Programming</td>
<td>L 2 T 1 P -</td>
<td>Sessional: 50 Written / Practical: 100 Total: 150</td>
</tr>
<tr>
<td>15.106</td>
<td>Communicative English</td>
<td>L - T - P 2</td>
<td>Sessional: 50 Written / Practical: 50 Total: 50</td>
</tr>
<tr>
<td>15.107</td>
<td>Programming in C Lab</td>
<td>L - T - P 4</td>
<td>Sessional: 50 Written / Practical: 100 Total: 150</td>
</tr>
<tr>
<td>15.108</td>
<td>Microprocessor Lab</td>
<td>L - T - P 4</td>
<td>Sessional: 50 Written / Practical: 100 Total: 150</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>14 5 10</strong></td>
<td><strong>400 700 1100</strong></td>
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</table>

## Semester II

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Name of Subject</th>
<th>Duration in Hours</th>
<th>Marks</th>
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</thead>
<tbody>
<tr>
<td>15.201</td>
<td>Data Structures &amp; Algorithms</td>
<td>L 3 T 1 P -</td>
<td>Sessional: 50 Written / Practical: 100 Total: 150</td>
</tr>
<tr>
<td>15.202</td>
<td>Operating Systems</td>
<td>L 3 T 1 P -</td>
<td>Sessional: 50 Written / Practical: 100 Total: 150</td>
</tr>
<tr>
<td>15.203</td>
<td>Object Oriented Programming with C++</td>
<td>L 2 T 1 P -</td>
<td>Sessional: 50 Written / Practical: 100 Total: 150</td>
</tr>
<tr>
<td>15.204</td>
<td>System Analysis and Design</td>
<td>L 3 T 1 P -</td>
<td>Sessional: 50 Written / Practical: 100 Total: 150</td>
</tr>
<tr>
<td>15.205</td>
<td>Computer Organization</td>
<td>L 3 T 1 P -</td>
<td>Sessional: 50 Written / Practical: 100 Total: 150</td>
</tr>
<tr>
<td>15.206</td>
<td>Technical Seminar</td>
<td>L - T - P 2</td>
<td>Sessional: 50 Written / Practical: 50 Total: 50</td>
</tr>
<tr>
<td>15.207</td>
<td>Data Structures Lab</td>
<td>L - T - P 4</td>
<td>Sessional: 50 Written / Practical: 100 Total: 150</td>
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<tr>
<td>15.208</td>
<td>Object Oriented Programming Lab</td>
<td>L - T - P 4</td>
<td>Sessional: 50 Written / Practical: 100 Total: 150</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>14 5 10</strong></td>
<td><strong>400 700 1100</strong></td>
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### Semester III

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Name of Subject</th>
<th>Duration in Hours</th>
<th>Marks</th>
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</thead>
<tbody>
<tr>
<td>15.301</td>
<td>Combinatorics and Graph Theory</td>
<td>L 3, T 1, P -</td>
<td>Sessional 50</td>
<td>Written / Practical 100</td>
</tr>
<tr>
<td>15.302</td>
<td>Algorithm Analysis &amp; Design</td>
<td>L 3, T 1, P -</td>
<td>Sessional 50</td>
<td>Written / Practical 100</td>
</tr>
<tr>
<td>15.303</td>
<td>Computer Networks</td>
<td>L 3, T 1, P -</td>
<td>Sessional 50</td>
<td>Written / Practical 100</td>
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<tr>
<td>15.304</td>
<td>Database Management System</td>
<td>L 3, T 1, P -</td>
<td>Sessional 50</td>
<td>Written / Practical 100</td>
</tr>
<tr>
<td>15.305</td>
<td>Java Programming</td>
<td>L 2, T 1, P -</td>
<td>Sessional 50</td>
<td>Written / Practical 100</td>
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<tr>
<td>15.306</td>
<td>Technical Writing in LaTeX</td>
<td>L -1, T 1, P 1</td>
<td>Sessional 50</td>
<td>M.P. -</td>
</tr>
<tr>
<td>15.307</td>
<td>Database Management Systems Lab</td>
<td>L -4, T -</td>
<td>Sessional 50</td>
<td>Written / Practical 100</td>
</tr>
<tr>
<td>15.308</td>
<td>Java Programming Lab</td>
<td>L -4, T -</td>
<td>Sessional 50</td>
<td>Written / Practical 100</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td>14 L, 6 T, 9 P</td>
<td>Sessional 400</td>
<td>Written / Practical 700</td>
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### Semester IV

<table>
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<tr>
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<th>Duration in Hours</th>
<th>Marks</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>15.401</td>
<td>Numerical Analysis &amp; Optimization Techniques</td>
<td>L 3, T 1, P -</td>
<td>Sessional 50</td>
<td>Written / Practical 100</td>
</tr>
<tr>
<td>15.402</td>
<td>Principles Of Management</td>
<td>L 2, T 1, P -</td>
<td>Sessional 50</td>
<td>Written / Practical 100</td>
</tr>
<tr>
<td>15.403</td>
<td>Computer Graphics</td>
<td>L 3, T 1, P -</td>
<td>Sessional 50</td>
<td>Written / Practical 100</td>
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<tr>
<td>15.404</td>
<td>Elective I</td>
<td>L 3, T 1, P -</td>
<td>Sessional 50</td>
<td>Written / Practical 100</td>
</tr>
<tr>
<td>15.405</td>
<td>Elective II</td>
<td>L 3, T 1, P -</td>
<td>Sessional 50</td>
<td>Written / Practical 100</td>
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<tr>
<td>15.406</td>
<td>Technical Seminar</td>
<td>L -2, T -</td>
<td>Sessional 50</td>
<td>M.P. -</td>
</tr>
<tr>
<td>15.407</td>
<td>Computer Graphics Lab</td>
<td>L -4, T -</td>
<td>Sessional 50</td>
<td>Written / Practical 100</td>
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<tr>
<td>15.408</td>
<td>Web Applications Lab</td>
<td>L -4, T -</td>
<td>Sessional 50</td>
<td>Written / Practical 100</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td>14 L, 5 T, 10 P</td>
<td>Sessional 400</td>
<td>Written / Practical 700</td>
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</table>
Elective I
15.404.1 Artificial Intelligence
15.404.2 Cloud Computing
15.404.3 Big Data Analytics
15.404.4 Data Warehousing & Mining

Elective II
15.405.1 Image Processing
15.405.2 Software Testing
15.405.3 Cyber Forensics
15.405.4 Distributed Operating Systems

Semester V

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Name of Subject</th>
<th>Duration in Hours</th>
<th>Marks</th>
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<tbody>
<tr>
<td></td>
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<td>L</td>
<td>T</td>
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<tr>
<td>15.501</td>
<td>Software Engineering</td>
<td>3</td>
<td>1</td>
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<tr>
<td>15.502</td>
<td>Cryptography &amp; Network Security</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>15.503</td>
<td>Application Programming For Mobile Devices</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>15.504</td>
<td>Object Oriented Analysis And Design</td>
<td>3</td>
<td>1</td>
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<tr>
<td>15.505</td>
<td>Elective III</td>
<td>3</td>
<td>1</td>
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<tr>
<td>15.506</td>
<td>Application Programming Lab For Mobile Devices</td>
<td>-</td>
<td>-</td>
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<tr>
<td>15.507</td>
<td>Mini Project</td>
<td>-</td>
<td>-</td>
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</tbody>
</table>

**TOTAL** 14 5 10 350 750 1100

Elective III
15.505.1 Computer Vision
15.505.2 Bio Informatics
15.505.3 Machine Learning
15.505.4 Computer Aided Design For Very Large Scale Integration Systems
## Semester VI

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Name of Subject</th>
<th>Duration in Hours</th>
<th>Marks</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
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<tr>
<td>15.601</td>
<td>Project Design and Implementation</td>
<td>-</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Module I


Module II


Module III

Tests of hypothesis- parameter and statistic-sampling distribution – Estimation and testing of hypothesis-critical region and level of significance-Errors in testing of hypothesis-one tailed and two tailed tests-procedure for testing hypothesis- confidence interval-tests of significance of large and small samples-Student’s t distribution-Snedecor’s F distribution.

Text Book:
1. T.Veerarajan-Probability , Statistics and Random process(Third edition , TataMc.Graw Hill, Chapters 1,2,4,5,8)

References:
1. Sundarapandian - Probability, Statistics and Queueing theory, PHI
2. S.M .Ross - Introduction to probability models
3. Miller and Freunnds-Richard A. Johnson - Probability and statistics for Engineers
Module I

Number systems – Decimal, Binary, Octal and Hexadecimal – conversion from systems to another representation of negative numbers – representation of BCD numbers – character representation – character coding schemes – ASCII – BCDIC etc. – Algorithms for addition, subtraction, multiplication and division of binary and BCD number – Addition and subtraction of octal and hexadecimal numbers. Representation of floating point numbers – precision – addition, subtraction, multiplication and division of floating point numbers.

Module II


Module III


Text Books

References:
Module I


Introduction to C programming – variables and arithmetic expressions- Formatted output- printf() - The For statement- Symbolic constants - Character input and output - Arrays - Types, Operators and Expressions – Formatted input-scanf() – Control Flow.

Module II


Module III


Text Books:
1. Keringhan, Ritchie. The C Programming language,

References:
1. Gottfried – Programming in C (SIE) 3rd ed- TMH
2. Venkateshmurthy, M.G., Programming Techniques through C Pearson Education India.
4. V. Rajaraman , Computer Programming in C, PHI
Module I


Module II


Module III

Programmable interface devices – basic concepts – programmable peripheral interface 8255A – programmable keyboard display interface 8279 – programmable DMA controller 8257 -internal architecture.

Intel 8086 Microprocessor – Internal architecture- introduction to programming the 8086.

Text Books:
1. Interfacing & applications of Microprocessors – Gaonkar, Prentice Hall

Reference Books:
1. Microprocessors, PC Hardware and Interfacing – N Mathivanan, PHI Learning Pvt. Ltd.
4. The 8085 microprocessor – architecture programming and interfacing, K. Udayakumar, B.S. Umashankar Pearson India.
Module I


Module II

Common administrative tasks, identifying administrative files configuration and log files, Role of system administrator, Managing user accounts-adding & deleting users, changing permissions and ownerships, Creating and managing groups, modifying group attributes, Temporary disabling of users accounts, creating and mounting file system. Checking and monitoring system performance - file security & Permissions, becoming super user using su. Getting system information with uname, host name, disk partitions & sizes, users, kernel. Installing and removing packages. Backup, restore and Compress utilities - tar, cpio, dump, rsync and restore utilities.

Module III

Bash shell programming – basic concepts, expressions, decision making selections, repetition, special parameters - positional parameters, shift, argument validation, script examples.
Communication in Linux - mesg, who- T, talk, write, wall, finger, chfn, ping, traceroute utilities, email facilities. Configuration of servers- Telnet, FTP, DHCP, NFS, SSH, Proxy Server(Squid), Web server (Apache), Samba. Daemons- init, crond, atd, xinetd, inetd, the services file. named, sshd, httpd.

References

2. Red Hat Linux Bible, Cristopher Negus, Wiley Dreamtech India
3. UNIX Shell Programming by Yeswant Kanetkar, BPB
4. Linux Administration Handbook, EviNemeth, Garth Snyder, Trent KHein - Pearson Education.
5. Beginning Linux Programming by Neil Mathew & Richard Stones, Wiley Dreamtech India
Sentence definition-static description-comparison and contrast-classification of information-recommendations- highlighting problems and providing solutions-formal and informal letter writing-using flow-charts/diagrams paragraph writing-editing.
Defining, describing objects-describing uses/functions-comparing-offering suggestions-analyzing problems and providing solutions-expressing opinions (agreement/disagreement) –expressing possibility/certainty – framing questions-providing answers.

Text Books:

1. " English for Engineers and Technologists ", Volume I. Authors : Humanities and Social Science Department, Anna University, Published by Orient Longman Ltd.,
2. Sarah Freeman, Written communication in English, Orient Longman, .
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.107</td>
<td>PROGRAMMING IN C LAB</td>
<td>0-0-4</td>
</tr>
</tbody>
</table>

Experiments covering the topics included in the subject “Programming In C” should be done in Linux platform.
15.108  MICROPROCESSOR LAB  0-0-4

1. Programming exercises on 8085 microprocessor trainer kit or PC simulator. However if simulator is used, a demo kit must be used to demonstrate actual running of the programs. A total of 36 hours (15 programs) may be set aside for this.

2. Programming exercises in 8086 microprocessor using TASM in PC. Simple programs may be given for the student to get an idea of 8086 programming methodologies. A total of 24 hours may be set aside for this. No interfacing experiments. Eg programs - Addition of 32 bit numbers, matrix multiplication, factorial, LCM, GCD, Fibonacci, String manipulation, search, find and replace, copy operations, sorting.
15.201 DATA STRUCTURES & ALGORITHMS 3-1-0

Module I

Arrays, Stacks and Queues: Array Operations, Number of Elements in an Array, Representation of Arrays in Memory, Applications of Array, Stack-Introduction, Stack Operations, Applications of Stack, Queues-Introduction, Operations on Queues, Circular Queues, Other Types of Queues, Applications of Queues.

Module II

Graphs: Introduction, Definitions and Basic Terminologies, Representations of Graphs, Graph Traversals
Single-Source Shortest-Path Problem, Minimum Cost Spanning Trees.
Trees, Binary Trees, BST, AVL Trees and B Trees

Module III

External sorting – sorting with disks, sorting with tapes. Introduction to file structures: fields, records and files, sequential file organization – variable length records and text files, hashing techniques for direct files – inverted lists – multi lists

Text Books

References
2. Samanta – Classic Data Structures, PHI, 2nd Edition
15.202 OPERATING SYSTEMS 3-1-0

Module I


Module II


Module III


Text Books:


References:

1. Hanson, P.B., Operating System Principle, Anes publication.
3. Tanenbaum – Modern Operating System – PHI
15.203 OBJECT ORIENTED PROGRAMMING WITH C++ 2-1-0

Module I
Fundamentals of object-oriented Design: Data Abstraction, Encapsulation, classes, Inheritance and Polymorphism, class Hierarchies. C++ enhancements to C: Default Function Arguments, Placement of variable declarations, the scope resolution operation, the “Const” Qualifier, References: References as Aliases, references and pointers similarities and differences, references as function parameters, references as return values. Introduction to classes: Declaring and using classes, class members, Creation and destruction of objects, constructors and destructors- accessing data members

Module II
Returning a reference, “Const” objects and member function., inline functions, Classes and dynamic memory allocation: New, delete operators, “this” pointer. Static members, friends, array of class objects. Function overloading, constructor overloading, Operator overloading : Overloading unary operator, overloading binary operator, data conversion

Module III
Inheritance and polymorphism: Derived class and base class, derived class constructors, overriding member functions, public and private inheritance, virtual functions, polymorphism, multiple inheritance, classes within classes., abstract classes, Generic functions, generic classes, exception handling, File processing – formatted – unformatted and random files. Microsoft foundation classes: Strings, data structure.

Text Books

References:
5. Kamthane, Object oriented Programming with ANSI and Turbo C++., Pearson Education
7. Jana - C++ and Object Oriented Programming, PHI
8. Dietel, Dietel – C++, How to Program, PHI
15.204 SYSTEM ANALYSIS AND DESIGN 3-1-0

Module I
Overview of system analysis and design — business system concepts, categories of information systems, system development strategies, implementation and evaluation, tools for system development. Reasons for project proposals — managing project review and selection, preliminary investigation, scope of study, conducting the investigation, testing project feasibility, handling infeasible project. Tools for determining system requirements — activities in requirements determination, fact finding techniques, tools for documenting procedures and decisions, structured analysis development strategy — features of data flow strategy, features of a data dictionary, recording data descriptions.

Module II
Application prototype development strategy — purpose of application prototyping, steps in prototype method, use of prototypes, tools for prototyping, prototype strategies. Analysis to design transition - specifying application requirements, objectives in designing an information system, what features must be designed? Output objectives, type of output, how to present information, designing printed output, designing visual display output. Design of input and control — objectives of input design, capturing data for input, input validation, checking the transaction data, modifying the transaction data.

Module III
Design of online dialogue — how is online different? Purpose and characteristics of interface, designing dialogue and dialogue strategies, data entry dialog, basic file terminology, data structure diagrams, types of files, methods of file organization System engineering and quality assurance — design objectives, program structure charts, design of software, top down structure of modules, coupling, cohesion, span of control, module size, shared modules. Managing system implementation — training, training system operators, user training, training methods, conversion methods, post implementation review, review methods. Hardware and software selection — hardware selection, determining size and capacity requirements, computer evaluation and measurement, plug compatible equipment, financial factors, maintenance and support, software selection, evaluation of software, software contracts.

Text book:

References:
5. Rajaraman V., Analysis and Design of Information Systems, PHI
15.205 COMPUTER ORGANIZATION 3-1-0

Module I


Module II


Module III


Text Books


References:

1. Pal Chaudhari., Computer Organization and Design,, PHI.,
15.206 TECHNICAL SEMINAR 0-0-2

The students are required to present seminar for 20 minutes duration which includes 5 minutes interaction with audience. Recent topics which are relevant to the field of computer technology should only be chosen. Contents should primarily be based on technical papers from recent publications appeared in proceeding of international conferences and journals such as IEEE, ACM, Elsevier and Springer.
15.207  DATA STRUCTURE LAB  0-0-4

Implementation and applications of data structures like arrays of records, stack, queue, tree, linked list, graph etc and experiments on sorting and searching should be done.
15.208 OBJECT ORIENTED PROGRAMMING LAB 0-0-4

Experiments to implement function overloading, operator overloading, constructor overloading, multiple inheritance, multilevel inheritance, friend functions, virtual functions, templates, streams etc should be done.
15.301  COMBINATORICS AND GRAPH THEORY       3-1-0

Module I
Fundamental principles of counting, permutation and combinations, binomial theorem, combination with repetition, principle of inclusion and exclusion, derangements, generating functions, the exponential generating function, recurrence relations-first order and second order- non homogeneous recurrence relations, method of generating functions

Module II
Introduction to graph – definition –sub graph-path cycles-matrix representation-graph isomorphism – Euler tour- planar graph-Euler’s formula-bipartite graph – application of kuratowski’s theorem (proof not required)cutfest dual of a graph- Hamiltonian path and cycles-sufficient condition for the existence of Hamilton cycles-graph colouring, chromatic polynomials and map colouring

Module III
Tress-definition and properties-DFS algorithm (application only no need of proof) BFS algorithm (application only – no need of proof) biconnected components and articulation points-Dijkstra’s shortest path algorithm, minimal spanning tree-Kruskal and prims algorithm, max-flow-min-cut theorem (proof not required)

Text book:
   Module I :-Sections:1.1 to 1.4,8.1,8.2,8.3,9.1,9.2,9.4,10.1,10.2,10.3,10.4
   Module II:-Sections: 11.1 to 11.6

References:
8. Yadav S K, Elements of Graph Theory, Ane’s student edition,
Module I


Module II


Module III


Text Books:

References:
15.303    COMPUTER NETWORKS     2-1-0

Module I

Introduction-Data communication and network, Protocol and Standards, Network model-OSI model, TCP/IP protocol suite
Physical Layer: Data transmission-Analog & digital Transmission-Transmission impairment-Transmission media: wired transmission- wireless transmission
Data link Layer: Error Detection and Correction-Flow control and error control-HDLC.

Module II


Module III

Transport layer: UDP-addressing-UDP operation. TCP-TCP services& Features-TCP segment-TCP connection-Error control and flow control-Congestion control
Application Layer: DNS-Distribution namespaces-Name Resolution. HTTP-Architecture-HTTP Transaction. DHCP-Address allocation packet format. Real time data transfer-RTP, RTCP, VoIP

Text Books:

1. Data Communication and networking Fourth ed. Behrouz A Forouzan
2. Data and Computer Communication Eighth Ed William Stallings

Reference:

Module I


Module II


Module III

Database security - Security requirements ,reliability And integrity, sensitive data.

Text Books:

References:
15.305     JAVA PROGRAMMING    2-1-0

Module 1

Module 2
Data Types Variables and Arrays, Operators, String Handling Fundamentals- Special string operations, character extraction, string comparison, searching strings, modifying a string, Control Statements, Introducing Classes, Closer look at Methods and Classes, Inheritance, Packages and Interfaces, Exception Handling.

Module 3

Text Book:

Reference Books:
3. Andrew Cobley, The Complete Guide to Java, , Comdex
4. H. M. Dietel & P. J. Deitel, Java: How to program, PHI
Module I

Introduction about LaTex: What is LaTex, Importance of LaTex, Installation of LaTex using net installer wizard, Creating first document, Understanding LaTex compilation, Formatting words, lines and paragraphs, Titling document, Writing special characters, Using line breaks.

Module II

Designing pages: Writing books with chapters, Creating table of contents, Designing headers and footers, Designing chapters and sections, Creating lists, Creating tables, Inserting images, Setting labels and references, Generating index, Creating list of figures and tables, Typing math formulas, Usage of hyperlink and bookmarks, Bibliography.

Module III

Troubleshooting: Understanding and fixing errors, Packages, Geometry, Hyperref, amsmath, amssymb, algorithms, algorithmic graphic, color, tilez listing Classes: article, book, report, beamer, slides, IEEtran. Writing question paper, Writing articles/research papers, Presentation using beamer.

Text Books:
1. LaTex Beginners Guide- Stefan Kottwitz
2. A guide to LaTex- Helmut Kopka, Patrick W Daly
15.307 DATABASE MANAGEMENT SYSTEMS LAB 0-0-4

1. Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOT EXISTS, UNION, INTERSECT, CONSTRAINTs.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date).
5. i) Creation of simple PL/SQL program which includes declaration section, executable section and exception Handling section
   ii) Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT-IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.
8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
10. Program development using creation of package specification, package bodies, private objects, package variables and cursors and calling stored packages.
11. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
12. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers.

Text Books:

1. ORACLE PL/SQL by example. Benjamin Rosenzweig, Elena Silvestrova, Pearson Education 3rd Edition
2. ORACLE DATABASE LOG PL/SQL Programming SCOTT URMAN, Tata McGraw Hill.
3. SQL & PL/SQL for Oracle 10g, Black Book, Dr.P.S. Deshpande
Experiments to implement packages, interfaces, multithreading, streams, AWT, applets, TCP and UDP sockets, database connectivity etc should be done.
15.401  NUMERICAL ANALYSIS & OPTIMIZATION TECHNIQUES  3-1-0

**Module 1**
Errors In Numerical Calculations Types Of Errors-Significant Digits-Programming Errors-
Numerical Solution Of Non Linear Equations-Bisection Method-Regula Falsi Method-
Newton Raphson Method –Fixed Point Method Of Iteration – Rates Of Convergence Of
These Methods-Solutions Of Algebraic Equations-Guass Elimination Method-Relaxation
Method-Gauss Seidel Iteration Method-Gauss Jordan Method-Polynomial Interpolation –
Lagrange’s Interpolation Polynomial-Divided Differences-Newton’s Divided Difference
Interpolation-finite Differences-Operators $\Delta, \nabla, e, \delta$ Gregory-Newton Forward And
Backward Difference Interpolation Polynomials-Central Differences.

**Module 2**
Mathematical Formulation Of Linear Programming problem-Formulation Of LPP-
Graphical Solution Of LPP – Canonical And Standard Form Of LPP-Simplex Method-Big M
Method- Two Phase Method-Principle Of duality-Dual Simplex Method.

**Module 3**
Transportation Problem-Initial Basic Feasible Solution-North West Corner Rule-Vogel's
Approximation Method –Tests For Optimality-Unbalanced Transportation Problem-
Assignment Problem-Travelling Salesman Problem-Network Scheduling-Rules Of Network
Construction – Critical Path Method-PERT.

**Text Books:**
2. Kanthi Swarup, P.K.Gupta,Man Mohan, Operations research , Sultan Chand &
   Sons.(module II), 5th edition

**Reference books:**
1. R Panneerselvam – Operations research, 2nd edition, PHI
3. Gerald and Wheatley , Applied Numerical Analysis, Pearson Education Asia, Sixth
   Edition
6. Kalyamoy Deb – Optimization for engineering design, algorithms and examples, PHI
7. Q S Ahamed, Z Khan, S A Khan- Numerical and Statistical Techniques, Ane’s
   Books 2009
Module I

Module II

Module III
Staffing : - Manpower planning —its use and benefits, problems and limitations, manpower inventory, manpower forecasting, job descriptions, manpower skills analysis and practices in the Indian industry. Recruitment — job specification, selection process, psychological testing, interviewing techniques, transfer, promotion and its policies, induction placement, exit interview and stay interview. Training and development: - objectives and policies, planning and organizing the training department; training manager and his job, on and off the job training techniques. Career planning, objectives of performance appraisal and its methods.

Text Books:

References:
15.403 COMPUTER GRAPHICS 3-1-0

Module I

Module II
Two dimensional transformations - Homogeneous coordinate systems - matrix formulation and concatenation of transformations - Windowing concepts - two dimensional clipping, 3D transformations and clipping.

Module III
Introduction to graphics in three dimension - plane projections - vanishing points - specification of a 3D view - introduction to Bezier curves, B-Splines and surfaces - hidden line elimination - shading - Graphical User Interfaces. Introduction to OpenGL and animations.

Text Books:

References:
4. Tay Vaughan, Multimedia making it works, 6th ed., TMH, 2004
15.406  TECHNICAL SEMINAR  0-0-2

The students are required to present seminar for 20 minutes duration which includes 5 minutes interaction with audience. Recent topics which are relevant to the field of computer technology should only be chosen. Contents should primarily be based on technical papers from recent publications appeared in proceeding of international conferences and journals such as IEEE, ACM, Elsevier and Springer. All slides should have uniform format, preferably in LaTEX.
15.407 COMPUTER GRAPHICS LAB 0-0-4

Topics covered in the subject 15.403 should be given as experiments: Line drawing algorithms, circle drawing, 2d and 3d transformations, polygons, hatching, filling, animations and 3d graphics in OpenGL.
Students have to do experiments based on Internet technologies. Principles of Database Management, E-commerce and Security have to be included. Experiments like the following should be done in this lab. Implement Web applications using HTML and JSP and PHP and deploy. Test the application on an Application Server. Debug Web applications locally and remotely. Develop applications in a team environment. Retrieve data from database using SQL and exchange information in XML format.
Module 1

Problem solving Methods: Forward, backward reasoning, problem graphs – matching


Module II

Planning: Natural language understanding – perception learning – Introduction to AI languages.

Module III
An overview of expert systems. Type of expert systems, their components and architecture. Knowledge acquisition, inter knowledge – Heuristics – Knowledge representation – production based system, frame based system.

Inference: backward chaining, forward chaining, rule value approach, Fuzzy reasoning – certainty factors – Constructing an expert system – Languages and tools – Typical expert system examples.

Text books:

References:
4. Akerkar – Introduction to Artificial Intelligence, PHI
5. Pattersen – Introduction to Artificial Intelligence and Expert Systems, PHI
Module 1


Module 2


Module 3


Text Books

References
15.404.3  BIG DATA ANALYTICS  3-1-0

Module 1

Module 2

Module 3

Text Books:

References:
Module 1

Module 2
Association Rule Mining And Classification -Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining Various Kinds of Association Rules – Correlation Analysis – Constraint Based Association Mining – Classification and Prediction - Basic Concepts - Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction

Module 3
Cluster Analysis - Types of Data – Categorization of Major Clustering Methods - K- means – 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.

Text Books:
1. Jiawei Han & Micheline Kamber - Data Mining Concepts & Techniques – 2ed – Elsevier

Reference:
2. A. Berson & S.J. Smith – Data Warehousing Data Mining, COLAP, TMH, New Delhi – 2004
Module 1


Module 2


Module 3


Text books:

References:
15.405.2 SOFTWARE TESTING 3-1-0

Module I


Module II


Module III


Text Books:

References:
Module I

Module II

Module III
Cyber attacks-Hijacked Session Attacks, Operating System Attacks ,Polymorphism, Steganography, Reversing the Steganographic process, Anti Forensics, Cloaking Techniques: Data hide and seek, Renaming Files, Manipulating File Systems, and Data Hiding on NTFS.

Text books:

References:
1. Chad Steel, “Windows Forensics”, Wiley India.
Module I


Module II

Distributed shared memory - general architecture - design and implementation - granularity - structure - consistency models - advantages of DSM. Synchronization - clock synchronization - algorithms - event ordering - mutual exclusion - deadlocks in distributed systems - handling - prevention - avoidance - detection.

Module III


Text Books:


Reference Books:

15.501 SOFTWARE ENGINEERING 3-1-0

Module I

Module II

Module III

Text books:

References:
1. Ian Sommerville, Software Engineering, 7/e, Pearson Education Asia Ed.
4. Rajiv Mall – Fundamentals of Software Engineering, PHI
15.502  CRYPTOGRAPHY & NETWORK SECURITY  3-1-0

Module I
Introduction:- Goals of Security, types of attacks, services and mechanism, different techniques. Mathematics involved – integer arithmetic, modular arithmetic, matrices, linear congruence, algebraic structures, GF(2^n) fields. Symmetric key ciphers – Kerckhoff's principle, substitution ciphers, transposition ciphers, stream and block ciphers, modern block ciphers, modern stream ciphers, DES- structure and analysis, multiple DES, security, AES- transformations, key expansion, ciphers, analysis.

Module II
Asymmetric key cryptography – RSA cryptosystem, RABIN cryptosystem, ELGAMAL cryptosystem, elliptic curve cryptosystem. Message integrity, Random oracle model, message authentication, hash functions, digital signature, entity authentication, Key management.

Module III
Network security: At application layer – Email, PGP, S/MIME. At transport layer – SSL architecture, handshake protocol, changecipherspec protocol, Alert protocol, Record protocol, SSL message format, Transport layer security. At network layer – modes, security protocols, security associations, security policy, Internet key exchange, ISAKMP.

Text Book:

Reference:
Module I

Module II
Blackberry OS Fundamentals- History of Blackberry OS, Architecture, Memory management, Interrupts, Multi-tasking.
Coding with blackberry JDE- Fundamentals of Blackberry App, Screen and user interfaces, Storing data, Threads. Simple App Development.

Module III
iOS6 – Architecture- Frameworks- SDK-Cocoa touchLayer-MVC Architecture - Basics of Objective C.

Text Books
1. Android Application Development For Dummies- Donn Felker-Wiley publishing inc.
2. iOS6 Application Development For Dummies-Wiley publishing inc.
4. Android for programmers-Pearson Education

References
1. Learning iOS-OReilly
2. Learning Android-Oreilly
3. Web resources - www.developer.blackberry.com
4. Web resources - www.docs.blackberry.com
Module I

Module II

Module III

Text Books:

References:
15.505.1 COMPUTER VISION 3-1-0

Module I

Module II
Feature Extraction Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Gaussian derivative filters and DWT.

Module III
Pattern Analysis Clustering: K-Means, K-Medoids, Mixture of Gaussians, Classification: Discriminant Function, Supervised, Un-supervised, Semisupervised; Classifiers: Bayes, KNN, ANN models, Motion Analysis:- Background Subtraction and Modeling, Optical Flow

Text Books:

References:
Module I

Bioinformatics and Computational Biology, Nature & Scope of Bioinformatics. The central dogma of molecular biology and bio-sequences associated with it, RNA classification – coding and non coding RNA- mRNA, tRNA, miRNAand sRNA ,RNAi Bio-sequence file formats; Bio-databases –primary, secondary and treasury. DNA, RNA and protein databases. Data base searches – text based and sequence based; Sequence-based Database Searches: what are sequence-based database searches, BLAST and FASTA algorithms, Various versions of basic BLAST and FASTA, Use of these methods for sequence analysis including the on-line use of the tools and interpretation of results.

Module II

Sequence alignment – local/global, pairwise/multiple, sequence alignment, scoring methods. Needleman and Wunsch algorithm, global and local alignments. Protein and RNA structure prediction, polypeptic composition, secondary and tertiary structure, algorithms for modeling RNA and protein folding, structure prediction, proteomics, protein classification, experimental techniques, ligand screening, post-translational modification prediction

Scoring matrices: basic concept of a scoring matrix, Matrices for nucleic acid and proteins sequences, PAM and BLOSUM series, principles based on which these matrices are derived. Differences between distance & similarity matrix.

Module III

Functional genomics: application of sequence based and structure-based approaches to assignment of gene functions - e.g. sequence comparison, structure analysis (especially active sites, binding sites) and comparison, pattern identification, etc. Use of various derived databases in function assignment, use of SNPs for identification of genetic traits.

DNA microarray: understanding of microarray data and correlation of gene expression data to biological processes and computational analysis tools (especially clustering approaches).

Text Books:

References:
1. Andreas Baxevanisand Francis Ouellette, “Bioinformatics- A practical guide to the Analysis of Genes and proteins”, Wiley India, 2010
3. Rastogi et. al. Bioinformatics: Methods and Applications Genomics, Proteomics and Drug Discovery, PHI
Module I


Module II

Neural Networks. Artificial Neural Nets, ANN Basics, ANN - Learning Process, Types of Networks, Perceptron, Multilayer Perceptron, Error back Propagation Algorithm, RBF Networks


Module III


Text Book


References

Module I


Module II


Module III


Text Books:


References :

1. The Verilog® Hardware Description Language, Donald Thomas, Philip Moorby, Springer Science & Business Media

Assignments: To be mainly programming in nature. Students to be guided to design combinational and sequential circuits in Verilog®. Also design of small processors can be given. Free tools are available like iverilog for Verilog® HDL development.
15.506 APPLICATION PROGRAMMING LAB FOR MOBILE DEVICES 0-0-4

Students have to develop Android application in Eclipse. Development of applications in iOS, Windows (Mobile) and Blackberry OS can also be carried out.
A mini-project should be done by the students based on concepts they have already learnt in the first two years of the MCA programme. It may be based on database concepts, object oriented concepts, image processing, computer vision, optimization tools, compiler design, etc.

**Objectives of the mini project:**

Working on Mini project is to get used to the larger project, which will be handled in the 6th semester.

The project work constitutes an important component of the MCA programme of KU and it is to be carried out with due care and should be executed with seriousness by the students. The objective of this mini project is to help the student develop the ability to apply theoretical and practical tools/techniques to solve real life problems related to industry, academic institutions and research laboratories.

**Guidelines:**

A student is expected to devote about 1-2 months in planning, analyzing, designing and implementing the project. The initiation of project should be with the project proposal that is to be treated as an assignment.

**Mini-project evaluation:**

The evaluation of the mini-project will be based on the project reports submitted by the student, a presentation and a demonstration.
15.601 PROJECT DESIGN AND IMPLEMENTATION 0-0-29

Students are advised to carry out the project work in-order to understand systematic and good software development methodologies either in their institution or in an industry including R&D institutions for duration of a full semester and submit a detailed project report. The Master’s level projects should be done individually.

Guidelines:
A student is expected to devote about 4-6 months in planning, analyzing, designing and implementing the project. The initiation of project should be with the project proposal which is to be treated as an assignment.

Project evaluation:
The evaluation of the project will be based on the project reports submitted by the student, a presentation and a demonstration at the evaluation time. The students are also advised to publish a technical paper, based on the work carried out in the project, either in international or national conference, which carries 5% weightage of the total marks for external evaluation, i.e., 15 marks out of 300 marks (communication of the technical paper to the conference can also be taken into account).