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 man power 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>Weightage</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>Weightage</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

- Attendance: 20%
- Topic: 10%
- Performance: 30%
- Evaluation: 40%

Main Project

- Topic: 10%
- Performance: 40%
- Evaluation: 50%

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

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>3 1</td>
<td>150</td>
</tr>
<tr>
<td>15.102</td>
<td>Digital Systems</td>
<td>3 1</td>
<td>150</td>
</tr>
<tr>
<td>15.103</td>
<td>Programming in C</td>
<td>3 1</td>
<td>150</td>
</tr>
<tr>
<td>15.104</td>
<td>Microprocessor and Interfacing</td>
<td>3 1</td>
<td>150</td>
</tr>
<tr>
<td>15.105</td>
<td>Linux and Shell Programming</td>
<td>2 1</td>
<td>150</td>
</tr>
<tr>
<td>15.106</td>
<td>Communicative English</td>
<td>- - 2</td>
<td>50</td>
</tr>
<tr>
<td>15.107</td>
<td>Programming in C Lab</td>
<td>- - 4</td>
<td>150</td>
</tr>
<tr>
<td>15.108</td>
<td>Microprocessor Lab</td>
<td>- - 4</td>
<td>150</td>
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<tr>
<td>TOTAL</td>
<td></td>
<td>14 5 10</td>
<td>1100</td>
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### Semester II

<table>
<thead>
<tr>
<th>Subject Code</th>
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<th>Duration in Hours</th>
<th>Marks</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
</tr>
<tr>
<td>15.201</td>
<td>Data Structures &amp; Algorithms</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>15.202</td>
<td>Operating Systems</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>15.203</td>
<td>Object Oriented Programming with C++</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>15.204</td>
<td>System Analysis and Design</td>
<td>3</td>
<td>1</td>
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<tr>
<td>15.205</td>
<td>Computer Organization</td>
<td>3</td>
<td>1</td>
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<tr>
<td>15.206</td>
<td>Technical Seminar</td>
<td>-</td>
<td>-</td>
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<tr>
<td>15.207</td>
<td>Data Structures Lab</td>
<td>-</td>
<td>-</td>
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<tr>
<td>15.208</td>
<td>Object Oriented Programming Lab</td>
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<td>-</td>
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### Semester III

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<th>Marks</th>
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<tr>
<td></td>
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<td>T</td>
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<tr>
<td>15.301</td>
<td>Combinatorics and Graph Theory</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>15.302</td>
<td>Algorithm Analysis &amp; Design</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>15.303</td>
<td>Computer Networks</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>15.304</td>
<td>Database Management System</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>15.305</td>
<td>Java Programming</td>
<td>2</td>
<td>1</td>
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<tr>
<td>15.306</td>
<td>Technical Writing in LaTeX</td>
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<tr>
<td>15.307</td>
<td>Database Management Systems Lab</td>
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<td>15.308</td>
<td>Java Programming Lab</td>
<td>-</td>
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### Semester IV

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<th>Duration in Hours</th>
<th>Marks</th>
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<tbody>
<tr>
<td>15.401</td>
<td>Numerical Analysis &amp; Optimization Techniques</td>
<td>3 1 -</td>
<td>150</td>
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<tr>
<td>15.402</td>
<td>Principles Of Management</td>
<td>2 1 -</td>
<td>150</td>
</tr>
<tr>
<td>15.403</td>
<td>Computer Graphics</td>
<td>3 1 -</td>
<td>150</td>
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<tr>
<td>15.404</td>
<td>Elective I</td>
<td>3 1 -</td>
<td>150</td>
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<tr>
<td>15.405</td>
<td>Elective II</td>
<td>3 1 -</td>
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<tr>
<td>15.406</td>
<td>Technical Seminar</td>
<td>- - 2</td>
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<tr>
<td>15.407</td>
<td>Computer Graphics Lab</td>
<td>- - 4</td>
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<tr>
<td>15.408</td>
<td>Web Applications Lab</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>14 5 10</strong></td>
<td><strong>1100</strong></td>
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**Elective I**

- 15.404.1 Artificial Intelligence
- 15.404.3 Big Data Analytics
- 15.404.2 Cloud Computing
- 15.404.4 Data Warehousing & Mining

**Elective II**

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

### Semester V

<table>
<thead>
<tr>
<th>Subject Code</th>
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<th>Duration in Hours</th>
<th>Marks</th>
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<tbody>
<tr>
<td>15.501</td>
<td>Software Engineering</td>
<td>3 1 -</td>
<td>150</td>
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<tr>
<td>15.502</td>
<td>Cryptography &amp; Network Security</td>
<td>3 1 -</td>
<td>150</td>
</tr>
<tr>
<td>15.503</td>
<td>Application Programming For Mobile Devices</td>
<td>2 1 -</td>
<td>150</td>
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<tr>
<td>15.504</td>
<td>Object Oriented Analysis And Design</td>
<td>3 1 -</td>
<td>150</td>
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<tr>
<td>15.505</td>
<td>Elective III</td>
<td>3 1 -</td>
<td>150</td>
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<tr>
<td>15.506</td>
<td>Application Programming Lab For Mobile Devices</td>
<td>- - 4</td>
<td>150</td>
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<tr>
<td>15.507</td>
<td>Mini Project</td>
<td>- - 6</td>
<td>200</td>
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<tr>
<td><strong>TOTAL</strong></td>
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<td><strong>14 5 10</strong></td>
<td><strong>1100</strong></td>
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**Elective III**
<table>
<thead>
<tr>
<th>Subject Code</th>
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<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>
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<tr>
<td>TOTAL</td>
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</table>

**15.101 PROBABILITY & STATISTICS 3-1-0**

**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-Sndecor’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
4. Purna Chandra Biswal – Probability and Statistics , PHI.
15.102 DIGITAL SYSTEMS 3-1-0

Module I

Number systems – Decimal, Binary, Octal and Hexadecimal – conversion form systems to another reportation 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:

15.103 PROGRAMMING IN C 3-1-0

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
4. V. Rajaraman, Computer Programming in C, PHI

15.104 MICROPROCESSOR AND INTERFACING 3-1-0

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 YeswantKanetkar, BPB
4. Linux Administration Handbook, EviNemeth,Garth Snyder, Trent KHein -Pearson Education.
5. Beginning Linux Programming by Neil Mathew & Richard Stones, Wiley Dreamtech India

15.106 COMMUNICATIVE ENGLISH 0-0-2

Reading- Skimming-scanning-detailed reading-predicting content-interpreting charts and tables-identifying stylistic features in texts - evaluating texts-understanding discourse coherence-guessing meaning from the context- note making / transferring information.

Word formation with prefixes and suffixes-discourse markers and their functions-degrees of comparison- expressions relating to recommendations and comparisons-active and passive voice-antonyms-tense forms- gerunds- conditional sentences-modal verbs of probability and improbability-acronyms and abbreviations - compound nouns and adjectives-spelling-punctuation.
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, .

15.107 PROGRAMMING IN C LAB 0-0-4

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


Process scheduling - pre-emptive and non-pre-emptive -scheduling criteria - scheduling algorithms – different types - algorithm evaluation - deterministic modelling only.

Module II


Module III


File system – structure and implementation. Directory implementation – File allocation methods – Free space management using link list only.

Secondary storage structure – Overview – disk structure - disk scheduling - FCFS, SST, C-SCAN - selecting a disk scheduling algorithm.

Text Books :

References :
1. Hanson, P.B., Operating System Principle, Ane’s publication.
3. Tanenbaum – Modern Operating System – PHI
4. Deitel. H.M., Operating system principles, Pearson Education
Bhatt – Introduction to Operating Systems, concepts and practice, 2nd edition, 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, 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

Basic Structure of digital computer - functional units - basic operational concepts - bus structures - software. Memory locations and addresses – Instructions and instruction sequencing – basic instruction types – Instruction execution and straight line sequencing – branching - Addressing modes, assembly language.

Basic I/O operations, stacks, subroutines – nesting and processor stack – parameter passing.

Module II

Basic processing unit – fundamental concepts - execution of a complete instruction – multiple bus organization - sequencing of control signals – Hardwired control and micro-programmed control. Pipelining – basic concepts only.


Module III

Memory organization – basic concepts, semiconductor RAM memories - memory system considerations – semiconductor ROM memories - speed, size and cost. Cache memory – mapping functions – replacement algorithms, multiple module memories and interleaving.

Virtual memory – paging and segmentation.
Computer peripherals – input devices – output devices, and storage devices, RAID.

**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)cutest dual of a graph- Hamiltonian path and cycles-sufficient condition for the existence of Hamilton cycles-graph colouring, chromatic polynomials and map colouring
Scheme & Syllabus

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:
7. Yadav S K, Elements of Graph Theory, Ane’s student edition,

15.302 ALGORITHM ANALYSIS & DESIGN 3-1-0

Module I


Module II

Dynamic Programming: General Method – Multistage Graphs – All-Pair shortest paths – Optimal binary search trees – 0/1 Knapsack – Travelling salesperson problem.

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:

15.304 DATABASE MANAGEMENT SYSTEM 3-1-0

Module I

Purpose of Database system - Advantages of DBMS over File Processing System –View of Data - Data Abstraction - Data Independence – Data models – Database languages – Database Administrator

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 DATA BASE LOG PL/SQL Programming SCOTT URMAN, Tata Mc- Graw Hill.

3. SQL & PL/SQL for Oracle 10g, Black Book, Dr.P.S. Deshpande

15.308 JAVA PROGRAMMING LAB 0-0-4

Experiments to implement packages, interfaces, multithreading, streams, AWT, applets, TCP and UDP sockets, database connectivity etc should be done.
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 Ä, e, ä 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
6. Kalyamoy Deb – Optimization for engineering design, algorithms and examples, PHI

Module 1

Definition of Management — Functions of Management – Fayol’s Principles of Management. -
Organization - Classical theories of organization(Classical Organization Theory, Neo-Classical Theory
and Systems Theory) Planning:- Nature, Scope, Objectives and Significance of Planning, Types of
Models (Only Theory – No Problems). Forecasting:- Business Forecasting, Steps in Forecasting,

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 Open GL and animations.

Text Books:

References:
4. Tay Vaughan, Multimedia making it works, 6th ed., TMH, 2004
6. Desai – Computer Graphis, PHI

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.

15.408 WEB APPLICATIONS LAB 0-0-4

Students have to do experiments based on Internet technologies. Principles of Database Management, E-commerce and Security have to be included. Experiments like the flowing 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


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. Akkerkar – Introduction to Artificial Intelligence, PHI
5. Patterson – 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:

15.404.4 DATA WAREHOUSING & MINING 3-1-0

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
15.405.1 DIGITAL IMAGE PROCESSING 3-1-0

Module 1


Module 2


Module 3


Text books:

References:

15.405.2 SOFTWARE TESTING 3-1-0

Module I

Need for Testing—Psychology of testing—Testing economics—white box testing , Black box testing, Grey box Testing—Retesting regression Testing—Verification and Validation Testing

Module II


Module III


Text Books:

References:

15.405.3 CYBER FORENSICS 3-1-0

Module I


Module II


Network Forensics –Email Investigations – E-Mail Tracking, IP Tracking, E-Mail Recovery, Encryption and Decryption methods, Search and Seizure of Computers, Recovering deleted evidences, Password Cracking-Cell Phone and Mobile Devices Forensic- Cyber Forensics Tools

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.

15.405.4 DISTRIBUTED OPERATING SYSTEMS 3-1-0

Module I
Distributed computing system -fundamentals – evolution – models – advantages. Distributed operating system – design issues. Introduction to Distributed computing environment.


Module II
Distributed shared memory – general architecture – design and implementation – granularity – structure – consistency models – advantages of DSM.


Module III

Process management – process migration.


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(2ⁿ) 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:

15.503 APPLICATION PROGRAMMING FOR MOBILE DEVICES 2-1-0

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.
Module I


Tools for systems analysts: Data flow diagrams – case study for use of DFD, good conventions – leveling of DFDs – leveling rules – logical and physical DFDs – software tools to create DFDs

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


Text Books:

References:

15.505.2 BIO INFORMATICS 3-1-0

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

**15.505.3 MACHINE LEARNING 3-1-0**

**Module I**

Introduction to learning. Types of Learning, Rote learning, Learning by parameter adjustment, Learning by general problem solving, Concept learning, Learning by analogy.

Association Learning, Basics of Association, Apriori Algorithm, Eclat Algorithm, FP Growth Algorithm, Tertius Algorithm.

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


Unsupervised learning, Clustering, K-Means Clustering, Fuzzy Clustering, Hierarchical Clustering, Agglomerative and Divisive Clustering, Hierarchical Agglomerative Clustering, Cluster Similarity, Reinforcement Learning, Markov Decision Problem, Q-learning, Q-Learning Algorithms, Temporal Difference Learning, On-Policy and Off-Policy Learning, Advantages of TD Prediction Methods, Learning Automata.

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.

15.507 MINI PROJECT 0-0-6

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).
UNIVERSITY OF KERALA

Revised Scheme & Syllabus
of the MCA Programme

(With effect from 2015 admissions)