



# RCSS

RAJAGIRI COLLEGE OF  
SOCIAL SCIENCES  
(AUTONOMOUS)

Dept. of Computer Science

Master of Computer Applications

Syllabus and Scheme

2019 Admission onwards

## Vision and Mission of the Rajagiri College of Social Sciences (Autonomous)

The mission statement of the institute and the department is derived from the vision of education of the Carmelites of Mary Immaculate (CMI), an indigenous group of Catholic priests, who manage the institution.

The hallmarks of CMI education reflecting the mission are:

- All round formation: aiming to carve an integrated personality for the formation of future leaders, Openness to all: to serve all sections of the society irrespective of caste/creed affiliations.
- Community oriented: mobilizing their resources for the welfare and progress of the community The ultimate goal: a just, humane society

### Vision

To become a centre par excellence of learning, unique in experience, value based in approach, and pioneering in efforts for enriching and fulfilling LIFE.

### Mission

To facilitate comprehensive and integrated development of individuals, to effectively function as social beings, imbued with righteousness and courage of conviction.

## Rajagiri School of Computer Science

### Vision

To create technically competent individuals, who are innovative and uphold human values.

### Mission

To develop globally recognised competent and innovative IT professionals, committed to lifelong learning, and blended with social commitment through comprehensive programmes.

### Master of Computer Applications programme

The MCA programme of the institute has been designed in line with the mission. The programme adheres strictly to an academic schedule that creates a strong knowledge base in the programme. Students are given training in the current technologies and an in-depth understanding of the current environment through various activities. The activities include extracurricular pursuits and value added programmes that foster awareness in contemporary technologies which help in the holistic development of students.

The Rajagiri Immersive Learning Experience Methodology is a pedagogical innovation of the institute. This methodology aims to evolve the Rajagiri student into a socially responsible professional. The Immersive Learning methodology is based on four dimensions – conceptual learning, experiential engagement, executive modelling and corporate competency.

The faculty keep themselves abreast with the latest trends in technology through regular online and onsite /offsite training programmes. Prominent industry professionals and academicians conduct workshops and lectures for the faculty. Faculty are regularly sent for Faculty Development Programmes and other courses to enhance their knowledge base.

Rajagiri governance policy encourages a creative and flexible atmosphere where all individuals are respected and valued by the community. The Advisory Board is constituted of eminent corporate professionals and distinguished leaders from the society. The Advisory Board (administrative council, governing body, academic council and BoS) meets at least once a year during April-May to review the activities of the past year and chart the future activities of the programme. The Advisory Board guides and ensures progress of the institute in achieving high standards. They provide directions regarding industry-relevant courses to be included in the syllabi, which are vetted and approved by the Mahatma Gandhi University. Further, students are provided Add-on Courses (AOC) every semester to keep abreast of the latest developments and trends in the industry.

#### Programme Educational Objectives of the MCA Programme

- PEO1 : Graduates of the program will be computer professionals of probity, positive attitude and scientific temper
- PEO2 : Graduates of the program will have sound theoretical knowledge and skill for software development and implementation
- PEO3 : Graduates of the program will possess good communication, technical and innovative skills
- PEO4 : Graduates of the program will have a sense of social awareness

#### Programme Outcome (PO)

At the end of the Programme, a student will be able to achieve the following programme outcomes:

##### **1. Computational Knowledge:**

Apply knowledge of computing fundamentals, computing specialisation, mathematics, and domain knowledge appropriate for the computing specialisation to the abstraction and conceptualisation of computing models from defined problems and requirements.

##### **2. Problem Analysis:**

Identify, formulate, research literature, and solve *complex* computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.

##### **3. Design /Development of Solutions:**

Design and evaluate solutions for *complex* computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate

consideration for public health and safety, cultural, societal, and environmental considerations.

#### **4. Conduct Investigations of Complex Computing Problems:**

Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

#### **5. Modern Tool Usage:**

Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.

#### **6. Professional Ethics:**

Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practice.

#### **7. Life-long Learning:**

Recognise the need, and have the ability, to engage in independent learning for continual development as a computing professional.

#### **8. Project management and finance:**

Demonstrate knowledge and understanding of the computing and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

#### **9. Communication Efficacy:**

Communicate effectively with the computing community, and with society at large, about *complex* computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.

#### **10. Societal and Environmental Concern:**

Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.

#### **11. Individual and Team Work:**

Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.

#### **12. Innovation and Entrepreneurship**

Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

## Program Specific Objectives

**PS01: Data Analytics:** Acquire knowledge of Data pre-processing and Data quality, Modelling and design of data warehouses, Algorithms for data mining, skills to design, analyse and develop algorithms and implement using high-level programming languages and to define and critically analyse mining approaches for various domains.

**PS02: High-Level Programming:** Acquire skills to design, analyse and develop algorithms and implement those using high-level programming languages, to maintain web server services required to host a website, Install, configure, design and develop mobile application development tools.

**PS03: Software Conceptualization and Implementation:** Acquire knowledge to design a solution to a given problem using one or more design patterns and implement the design in a programming language by lifecycle paradigms, apply software testing and quality assurance techniques; to work collaboratively team environment to develop software from conceptualization to completion, including requirements elicitation, system modeling, system design, implementation, unit and system testing, integration, source code management configuration management, and release management

**PS04: Practices and tools in Information Security:** Acquire a practical overview of the issues involved in the field of information security and assurance; acknowledge the ethical considerations in all dimensions of information security, and utilize the software tools to explore, rectify or prevent the unauthenticated actions in the domain.

### Mapping of PO to PEO

Program Educational Objectives	PEO1	PEO2	PEO3	PEO4
Program Outcomes				
PO1: Computational Knowledge		√		
PO2: Problem Analysis			√	
PO3: Design /Development of Solutions	√			
PO4: Conduct Investigations of Complex Computing Problems			√	
PO5: Modern Tool Usage			√	
PO6: Professional Ethics	√			√
PO7: Life-long Learning	√			
PO8: Project management and finance				√
PO9: Communication Efficacy			√	
PO10: Societal and Environmental Concern	√			√
PO11: Individual and Team Work	√			√

PO12: Innovation and Entrepreneurship			√	
PSO1: Data Analytics		√	√	
PSO2: High-Level Programming		√	√	
PSO3: Software Conceptualization and Implementation		√	√	
PSO4: Practices and tools in Information Security		√	√	

### Eligibility Criteria

A candidate seeking admission to MCA course must have a pass with not less than 50% marks in any recognized regular bachelor's Degree course of minimum three years' duration in any discipline with Mathematics at 10+2 level. **OR** A pass with not less than 50% marks in any recognized Regular Bachelor's Degree course of minimum three years' duration in any discipline with Mathematics/Statistics/Business Mathematics/ Business Statistics as one of the Subjects. **OR** A pass with not less than 50% marks in BCA/BSc Computer Science/ BSc Information Technology/ B.Tech degree of a minimum three years duration from a recognized University.

\*Reservation of seats shall be as per rules prescribed in the relevant rules by the Directorate of Technical Education, Government of Kerala from time to time.

#### Duration of the Course:

The course shall extend over a period of three academic years consisting of six semesters.

#### Medium of Instruction

The medium of instruction, examination, seminar and project report shall be in English.

## Continuous Assessment Criteria

### Theory Course

Sl No	Component	Marks
1	Continuous Assessment Examination (CAE)	7.5 Marks
2	CAE 2	7.5 Marks
3	Assignment/Project/Term paper (Individual)/Class Participation/Presentation/Quizzes/Seminars/Case Studies/ Group Project work/VIVA voce etc... (Any two is compulsory)	7.5 Marks
4	Attendance	2.5 Marks
	<b>Total</b>	<b>25 Marks</b>

### Practical Course

#### Internal Marks

Lab Performance	7.5 marks
Continuous Assessment Examination	7.5 marks
Attendance	2.5 marks
Assignment/Project/ Test/Viva Voce	2.5 marks
<b>Total</b>	<b>25 marks</b>

#### External Examination (Theory and Practical)

Total Marks : 75 marks

### Mini Project

#### Components of Internal assessment

Presentation	:	15 marks
Guide	:	10 marks

#### End Semester Examination Evaluation Criteria

Record	:	20 marks
Viva	:	25 marks
Demonstration	:	30 marks

### Main project

#### Components of Internal assessment

Presentation	:	80 marks
Guide	:	40 marks
Interim Report	:	30 marks
Demonstration	:	50 marks
Internal Marks	:	200

#### Components of External Assessment based on Viva by External Examiner

Analysis	:	40 marks
Design	:	60 marks
Implementation	:	60 marks
Testing	:	40 marks
External Marks	:	200 marks



### Eligibility to appear for ESE:

Permission for admission to ESE is granted only if:

- He/she has secured minimum 50% of CIA of each course to appear for the ESE of the same.
- A student has at least 75% of attendance for each subject at the end of the semester. His progress and conduct have been satisfactory. The sessional marks allotted for attendance shall be awarded in direct proportion to the percentage of attendance secured by the candidate in the subject. However, full sessional marks for attendance shall be awarded to those who are securing 80% of the attendance and above
- Condonation – As per regulations/ policy of the Examination Cell of Rajagiri College of Social Sciences (Autonomous), Kalamassery
- Pass in CIA of individual course is a prerequisite for appearing for the corresponding ESE of the Course.
- Every candidate shall register for all the courses at the end of each semester. A candidate who does not register for exam will not be permitted to attend the end semester examination and shall not be permitted to attend the next semester.

### Eligibility for Promotion to Next Year

Students will be allowed to go till the last semester of the studies of corresponding programme and in case of any back log papers even after last semester, the policy for supplementary chances of examination will be applicable for them.

### Pass Requirements for MCA Programme

A candidate shall be declared to have passed in any subject in full in any semester if he/she secures not less than 50% marks in sessional, not less than 40% marks in the End Semester Examination including project and viva and not less than 50% of the overall aggregate marks for the subject ie., Final Semester Examination marks and CIA of the subjects put together.

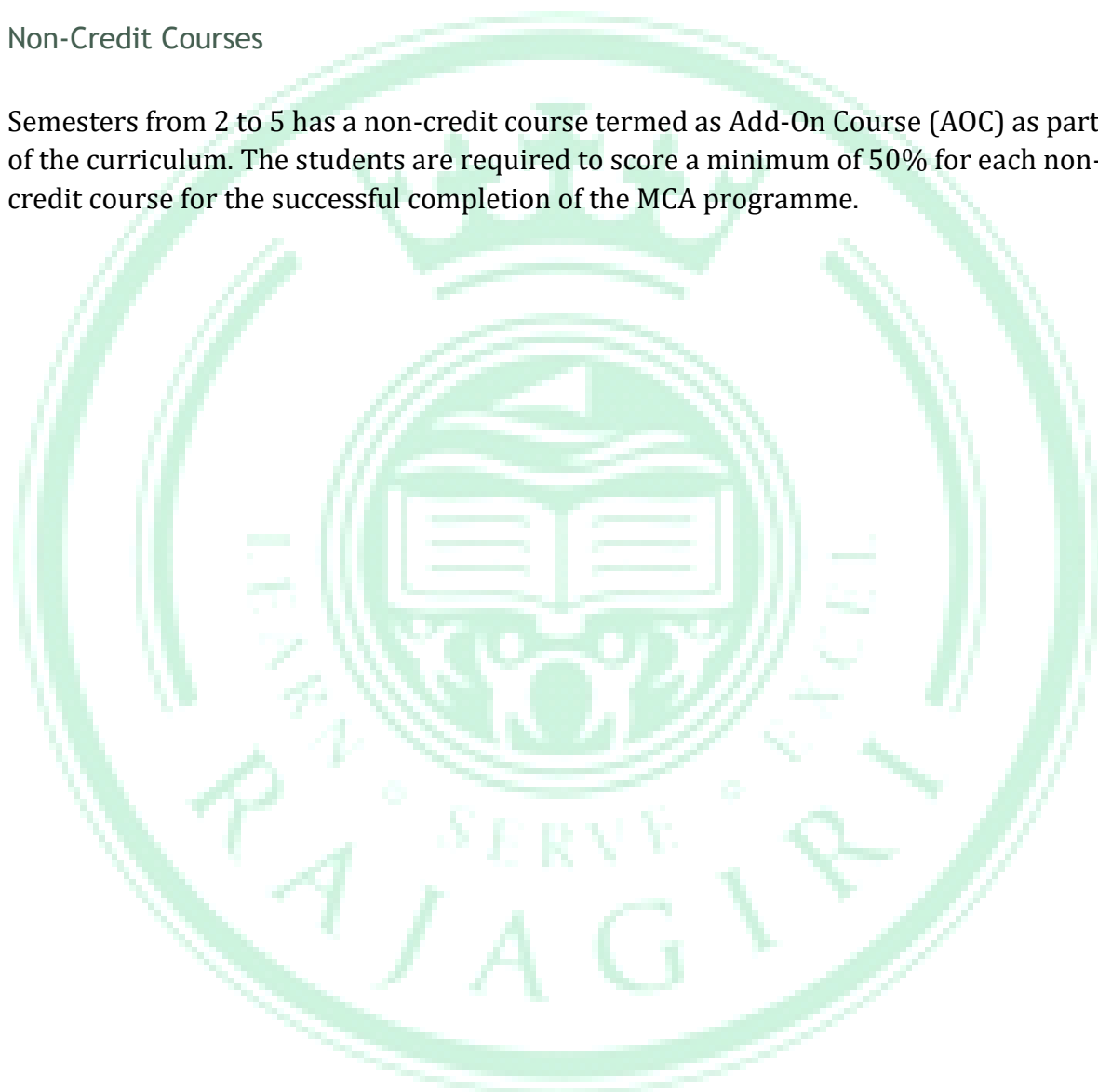
- A candidate who is absent for the end semester exam or secures 'F' grade or less than 40% in ESE in any subject will retain the already secured sessional marks for subsequent supplementary appearance in the examination of that subject.
- Students who have secured not less than 50% marks in aggregate for all the semesters within the prescribed period of the programme shall be declared to have passed the degree examination in Second Class.
- Students who have secured not less than 60% marks in aggregate for all the semesters within the prescribed period of the programme shall be declared to have passed the degree examination in First Class.



- Students who have secured not less than 75% marks in aggregate for all the semesters within the prescribed period of the programme shall be declared to have passed the examination in First Class with distinction.
- Photocopies of the answer scripts of the ESE shall be made available to the students for scrutiny on request Revaluation/ scrutiny shall be done as per the prevailing rules after collecting the prescribed fee.

### Non-Credit Courses

Semesters from 2 to 5 has a non-credit course termed as Add-On Course (AOC) as part of the curriculum. The students are required to score a minimum of 50% for each non-credit course for the successful completion of the MCA programme.



## SCHEME

I Semester

Course No:	Subject	No. of hours per week			Duration of exam in hrs	CIA Marks Max	ESE Exam Marks	Total Mark	Credits
		Lecture	Tutorial	Lab					
MCA101	Probability and Statistics	3	1	-	3	25	75	100	4
MCA102	Computer Organization and Architecture	3	1	-	3	25	75	100	4
MCA103	Problem Solving with Structured Programming in C	3	1	-	3	25	75	100	4
MCA104	Database Management System	3	1	-	3	25	75	100	4
MCA105	Essentials of Management and Organizational Behaviour	3	1	-	3	25	75	100	4
MCA106	C Programming Lab	-		4	3	25	75	100	1
MCA107	DBMS Lab	-		4	3	25	75	100	1
	Total	20		10				700	22

## II Semester

Course No:	Subject	No. of hours per week			Duration of exam in hrs	CIA Marks Max	ESE Exam Marks	Total Mark	Credits
		Lecture	Tutorial	Lab					
MCA201	Operations Research	3	1	-	3	25	75	100	4
MCA202	Operating Systems	3	1	-	3	25	75	100	4
MCA203	C++ and Object Oriented Programming Paradigms	3	1	-	3	25	75	100	4
MCA204	Software Engineering	3	1	-	3	25	75	100	4
MCA205	Data Structures	3	1	-	3	25	75	100	4
MCA206	CPP Lab	-		4	3	25	75	100	1
MCA207	Data Structures Lab	-		4	3	25	75	100	1
AOC1	System Administration			2					
	Total	20		10				700	22

## III Semester

Course No:	Subject	No. of hours per week			Duration of exam in hrs	CIA Marks Max	ESE Exam Marks	Total Mark	Credits
		Lecture	Tutorial	Lab					
MCA301	Design and Analysis of Algorithms	3	1	-	3	25	75	100	4
MCA302	Data Communications and Computer Networks	3	1	-	3	25	75	100	4
MCA303	System Software	3	1	-	3	25	75	100	4
MCA304	Java Programming	3	1	-	3	25	75	100	4
MCA305	Computer Graphics and Multimedia	3	1	-	3	25	75	100	4
MCA306	Java Lab	-		4	3	25	75	100	1
MCA307	Graphics and Multimedia Lab	-		4	3	25	75	100	1
AOC2	Communicative English			2					
	Total	20		10				700	22

## IV Semester

Course No:	Subject	No. of hours per week			Duration of exam in hrs	CIA Marks Max	ESE Exam Marks	Total Mark	Credits
		Lecture	Tutorial	Lab					
MCA401	Internet Programming using Framework	3	1	-	3	25	75	100	4
MCA402	Artificial Intelligence	3	1	-	3	25	75	100	4
MCA403	Information Security	3	1	-	3	25	75	100	4
MCA404	MCA 4xx	3	1	-	3	25	75	100	4
MCA405	MCA 4xx	3	1	-	3	25	75	100	4
MCA406	Internet Programming using Framework lab	-		4	3	25	75	100	1
MCA407	Mini Project using PhP	-		6	3	25	75	100	2
AOC3	Yoga			2					
	Total	20		10				700	23

## V Semester

Course No:	Subject	No. of hours per week			Duration of exam in hrs	CIA Marks Max	ESE Exam Marks	Total Mark	Credits
		Lecture	Tutorial	Lab					
MCA501	Data Mining	3	1	-	3	25	75	100	4
MCA502	Linux Administration, Management and Networking	3	1	-	3	25	75	100	4
MCA503	Parallel Programming	3	1	-	3	25	75	100	4
MCA504	MCA 5xx	3	1	-	3	25	75	100	4
MCA505	MCA 5xx	3	1	-	3	25	75	100	4
MCA506	Linux Lab	-		4	3	25	75	100	1
MCA507	Data Mining using R	-		4	3	25	75	100	1
AOC4	Certification Course			2					
	Total	20		10				700	22

## VI Semester

Course No:	Subject	No. of hours per week	CIA Marks Max	ESE Exam Marks	Total Mark	Credits
		Total Hours per Week				
MCA601	Project	28	200	200	400	12
MCA602	Viva Voce	Will be conducted at the end of Semester. A comprehensive Viva based on subjects learned during the course, by an external Examiner	100		100	2
	Total				500	14



## Specialization Tracks

The course is designed to make an MCA graduate, expert in any of the following specialization tracks based on Program Specific Objectives.

- 1: Data Science
- 2: Advanced Programming
- 3: Advanced Software Engineering
- 4: Information Security

A student can choose the specialization track on or before the end of the 2<sup>nd</sup> Semester. For each track, two pools of subjects are given. In a given Specialization track, a student can choose any two subjects from pool 1 in semester 4 and any two subjects from pool 2 in semester 5, in consensus with the faculty council. A batch can pick a maximum of two tracks based on the majority selection of its students.

### 1: Data Science

#### Pool 1

Data Warehousing (Subject Code: 411)  
 Digital Image Processing (Subject Code: 412)  
 Soft Computing (Subject Code: 413)

#### Pool 2

Big Data Analytics (Subject Code: 511)  
 Information Retrieval Analytics (Subject Code: 512)  
 Social Media Mining (Subject Code: 513)

### 2: Advanced Programming

#### Pool1

J2EE (Subject Code: 421)  
 AngularJS framework (Subject Code: 422)  
 Android (Subject Code: 423)

#### Pool2

Struts and Hibernate (Subject Code: 521)  
 Open Source Lab – Python (Subject Code: 522)  
 PhoneGap Framework (Subject Code: 523)

### 3: Advanced Software Engineering

#### Pool1

Software Requirements Engineering (Subject Code: 431)  
 Software Design and architecture (Subject Code: 432)  
 Software Testing (Subject Code: 433)

**Pool2**

Software Project Management (Subject Code: 531)

Software Risk Management (Subject Code: 532)

User Interface Design (Subject Code: 533)

**4: Information Security****Pool 1**

Ethical Hacking (Subject Code: 441)

Web and Database Security (Subject Code: 442)

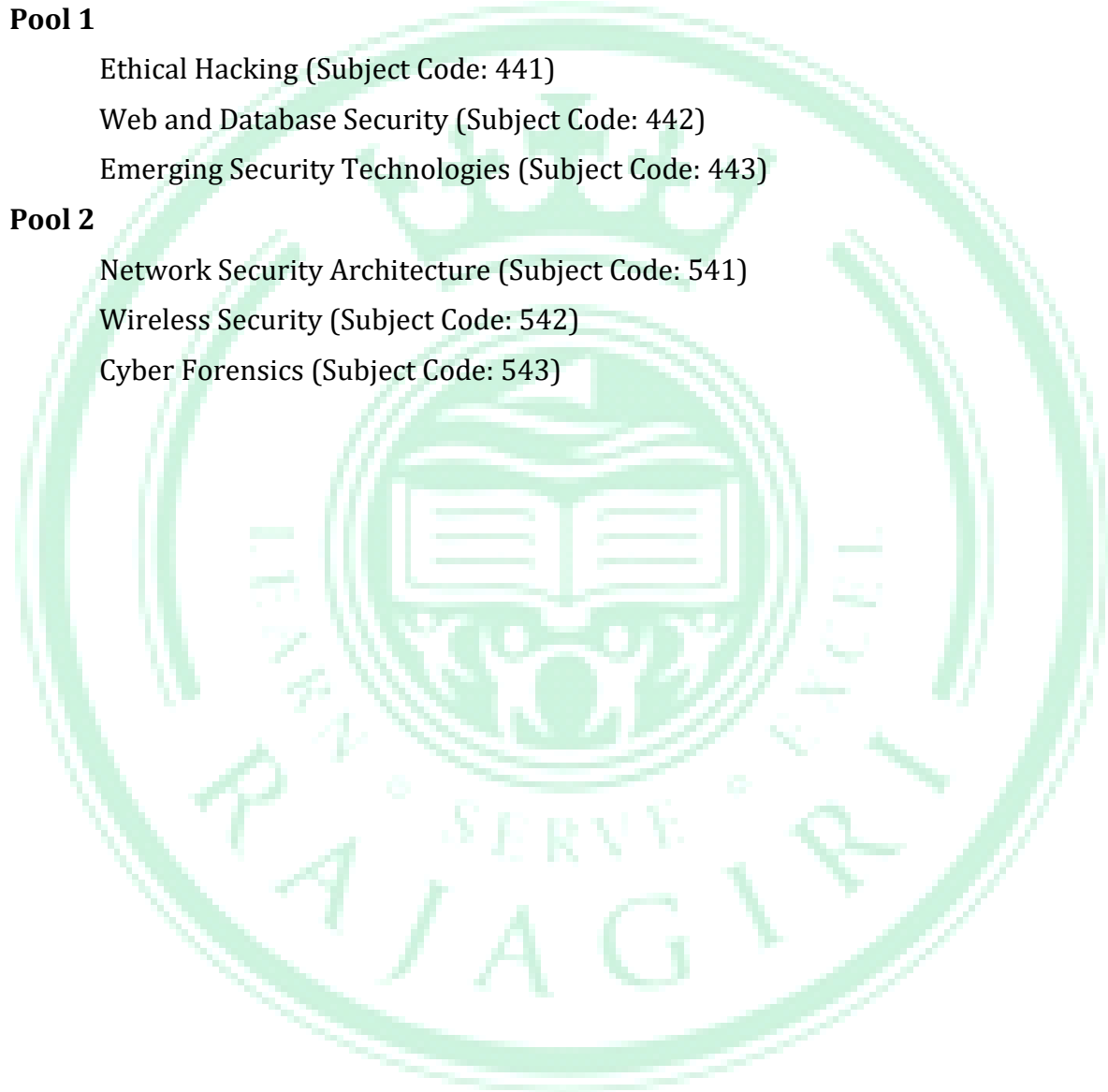
Emerging Security Technologies (Subject Code: 443)

**Pool 2**

Network Security Architecture (Subject Code: 541)

Wireless Security (Subject Code: 542)

Cyber Forensics (Subject Code: 543)



## Semester 1

## Probability and statistics

[illegible]

MCA101.4	2	3	3
MCA101.5	2	2	1 2

## Computer Organization and Architecture

Course Code	MCA102	Course Title	Computer Organization and Architecture
Course Type	Core	Contact Hours	4 Hours per Week
Credit	4	Domain	Professional Core
Syllabus			
I	<b>Basic components of a computer, Number systems and representations</b> Basic components of a computer, Number systems - Efficiency of number systems, Decimal, Binary, Octal, Hexadecimal conversion from one to another- Binary addition, subtraction, multiplication and division, representation of signed numbers, addition and subtraction using 2's complement and I's complement. Floating point representation. Binary codes - BCD code, Alphanumeric code		
II	<b>Design, Minimization and Implementation of Combinational and Sequential Logic Circuits</b> Logic Gates - Basic logic gates- AND, OR, NOT, NAND, NOR, Exclusive OR, Exclusive NOR gates- Logic symbols, truth table and timing diagrams. Boolean Algebra - Basic laws and theorems, Boolean functions, truth table, minimization of boolean function using K map method, Realization using logic gates and universal gates. Combinational circuits - Half adder, Full Adder, Parallel binary adder, fast adder, Subtractor, Decoders, Encoders, Multiplexers, Demultiplexers. Sequential circuits - Flip Flops – RS, JK, T and D Flip Flops, Edge triggered Flip Flops, introduction to registers.		
III	<b>Memory Organization</b> Memory Locations and addresses, Memory Operations, Instructions and Instruction sequencing, Addressing modes, Basic Input Output Operations. The Main Memory- Memory Hierarchy – Main memory - RAM-ROM – Cache Memory – Performance Considerations -Virtual Memory- Memory Management Requirements.		
IV	<b>Processing Unit</b> The Processing Unit : Basic Concepts - Instruction execution cycle - sequencing of control signals - hardwired control - microprogrammed control - control signals - microinstructions- microprogram sequencing. Introduction to pipelining.		
V	<b>Input / Output Organization</b> Input / Output Organization: Accessing I/O devices - Interrupts: Interrupt processing – hardware interrupts –programmable interrupt controller – Vectored Interrupts - Interrupt nesting - Daisy chaining - Direct memory access (DMA): DMA operations & DMA Controller		
TEXT/REFERENCE BOOKS:			
R	Digital Fundamentals - Floyd, Pearson Education, 2004.		
R	Digital Principles and Applications – Donald P Leach and Albert Paul Malvino5th Edition		
R	Computer Organization, V C Hamacher, Mc-Graw Hill International Edition, Fifth Edition.		
R	Computer Architecture and Design: The Hardware/Software Interface - John Hennessy and David Patterson, Morgan Kaufmann Publishers Inc, Third Edition		

Computer Organization and Architecture: Designing for performance - William Stallings – Eighth Edition.	
<b>COURSE PRE-REQUISITES:</b>	
Basic Knowledge in Digital Logic	
<b>COURSE OBJECTIVES:</b>	
1. To familiarize the basic components and functional units of computers, their design and working. 2. To understand how efficient memory systems are designed to work closely with the processor, and how input/output (I/O) systems bring the processor and memory together with a wide range of devices.	
<b>COURSE OUTCOMES:</b>	
<b>CO. No</b>	<b>Course Outcome description</b>
MCA102.1	Understanding of number systems and representations
MCA102.2	Understanding of Boolean algebra, design and implementation of various logic circuits
MCA102.3	Understanding of various types of memories and their working
MCA102.4	Understanding how instructions are executed by the processor
MCA102.5	Ability to understand various data transfer techniques between the processor and I/O devices
<b>CO-PO AND CO-PSO MAPPING</b>	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA102.1	3 1
MCA102.2	1 3 3
MCA102.3	1 3
MCA102.4	2 3
MCA102.5	3

### Problem Solving with Structured Programming in C

Course Code	MCA103	Course Title	Problem Solving with Structured Programming in C
Course Type	Core	Contact Hours	4 Hours per Week
Credit	4	Domain	Computing
Syllabus			
<b>I</b>	<b>Introduction:</b> Introduction to structured programming concept, algorithm, flowchart, program. Steps in building a C program. Introduction to C Language: The C character set, identifiers and keywords, data types, constants, variables and arrays, declarations, expressions, statements, Lvalues and Rvalues, type conversion, symbolic constants.		
<b>II</b>	<b>Operators and Control Statements:</b> Operators and expressions: Arithmetic operators, unary operator, relational and logical operator, assignment operators, the conditional operator, type conversion in expressions. Data input and output: scanf, printf, get, put, puts, gets functions. Control statement: Branching: if else statement, Looping, nested control structure, switch statement, break statement, continue statement, comma operator, goto statement.		
<b>III</b>	<b>Functions and Arrays:</b> Functions: Overview, function prototypes, passing arguments to a function, recursion. Command line arguments. Arrays: Defining an array, passing array to functions, multidimensional arrays, strings: one dimensional character array, array of strings.		
<b>IV</b>	<b>Pointers:</b> Pointers: Fundamentals, void pointer, null pointer, passing pointers to a function, pointers and one dimensional arrays, dynamic memory allocation, operation on pointers, pointers and multidimensional arrays, array of pointers, pointer to an array, pointers and strings, structure pointer, pointers to function. Structures, unions & enumerations: Defining a structure, processing a structure, user defined data types, bit fields, structure		

	and pointers, passing structure to function, self-referential structures, enumeration and union.																	
V	<b>Files:</b> Data files: Why files, opening and closing a data file, reading and writing a data file, processing a data file, unformatted data file, concept of binary file. Program structure: Storage classes, automatic variables, external variables, static variables, Register variables. Macros.																	
<b>TEXT/REFERENCE BOOKS:</b>																		
R	The c programming language – Brian W Kernighan & Dennis Ritchie IInd edition Eastern Economy Edition, Prentice Hall 2001																	
R	Programming with C – Byron S Gottfried– Schaum’s outlines 2nd Edition,2010																	
R	Computer Science: A Structured Programming Approach Using C, Forouzan, 3rd Cengage Learning 2007																	
R	C – How to Program, Deitel&Deitel, Pearson Education Asia, 6th Edition,2009																	
R	Programming in C –PradipDey, Manas Ghosh – Oxford Higher Education ,2007																	
R	Ansi C programming Bronson, Cengage learning, C2009																	
R	Understanding pointers in C- YashavantKanetkar – BPB publication , 2009																	
R	Let us C - YashavantKanetkar – BPB publication C. 1997																	
R	C by discovery – l s Foster – Pearson C 2005																	
R	Working with C – YashavantKanetkar – BPB publication,2008																	
R	Instant C program – Ivor Horton – Wrox, 1995																	
R	The art of programming computer science with ‘C’ – Steven c Lawlor – Wess , Cengage C2006																	
<b>COURSE PRE-REQUISITES:</b>																		
Basic Problem Solving Logic																		
<b>COURSE OBJECTIVES:</b>																		
<ol style="list-style-type: none"><li>1. To understand the basics of C programming and use it for problem solving.</li><li>2. To present the syntax and semantics of the “C” language as well as data types offered by the language</li><li>3. To develop logic and basic programming skills, so that one can switch over to any other programming language easily.</li></ol>																		
<b>COURSE OUTCOMES:</b>																		
<b>CO. No</b>	<b>Course Outcome description</b>																	
MCA103.1	Identify and use appropriate C language constructs to solve problems.																	
MCA103.2	Implement algorithms using Control Structures in C																	
MCA103.3	To understand the concept of code reusability with the help of user defined functions.																	
MCA103.4	To understand pointers for implementing dynamic memory allocation and solving memory access problems.																	
MCA103.5	To understand the concept of file system for handling data storage and apply it for solving problems.																	
<b>CO-PO AND CO-PSO MAPPING</b>																		
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4																	
MCAI03.1	3													2				
MCAI03.2	3														3			
MCAI03.3	2														3			
MCAI03.4	2														3			
MCAI03.5	2														3			



## Database Management System

Course Code	MCA104	Course Title	Database Management System
Course Type	Core	Contact Hours	4 Hours per Week
Credit	4	Domain	Computing
Syllabus			
I	<b>Module I -Introduction to Database Systems and E-R Model</b> Overview, A Historical Perspective, Files System versus DBMS, Advantages of DBMS, Describing and storing data in a DBMS, Transaction management, Structure of a DBMS, People who work with Databases, Overview of Database Design. Entities, Attributes and Entity Sets, Relationships and Relationship sets, Additional Features of E-R Model: Key Constraints. Conceptual Design with the E-R Model		
II	<b>Module II -Relational Model and Query Languages</b> Introduction to the Relational Model. Integrity Constraints over Relations: Primary Key, Foreign Key and General Constraints. E-R Model to Relational Model: Entity Sets to Tables, Relationship Sets to Tables, Translating, Relationship Sets with Key Constraints. Translating Relationship Sets with Participation Constraints, Translating Weak Entity Sets, Translating Class Hierarchies. Translating E-R Diagrams with Aggregation, Introduction to Query Languages, Relational Algebra: Selection and Projection Operations. Set Operations, Renaming, Joins, Division		
III	<b>Module III- Relational Database Design</b> Introduction to Schema Refinement, Functional Dependencies, Properties of Decomposition, Normal Forms: First Normal Form, Second Normal Form, Third Normal Form, Boyce Codd Normal Form, Fourth Normal Form, Fifth Normal Form		
IV	<b>Module IV: PL/SQL</b> Introduction to PL/SQL, PL/SQL Identifiers, Control Structures, Composite Data Types, Explicit Cursors, Stored Procedures and Functions, Triggers, Compound, DDL, and Event Database Triggers		
V	<b>Module V -Transaction Management, Concurrency Control and Distributed System</b> Transaction concepts, properties of transactions, serializability of transactions, testing for serializability, System recovery, Two- Phase Commit protocol, Recovery and Atomicity, Log-based recovery, concurrent executions of transactions and related problems, Locking mechanism, solution to concurrency related problems, deadlock, , two-phase locking protocol, Isolation, Intent locking		
TEXT/REFERENCE BOOKS:			
R	Database Management Systems – Raghu Ramakrishnan and Johannes Gehrke, Third Edition, McGraw Hill, 2003		
R	Database Systems: Design , Implementaion and Management, Peter Rob, Thomson Learning, 7Edn.		
R	Concept of Database Management, Pratt, Thomson Learning, 5Edn.		
R	Database System Concepts – Silberchatz, Korth and Sudarsan, Fifth Edition, McGraw Hill, 2006		
R	The Complete Reference SQL – James R Groff and Paul N Weinberg		
COURSE PRE-REQUISITES:			
Basic Computer Knowledge			
COURSE OBJECTIVES:			
1. To introduce the basic concepts including the structure and operation of the relational data model.			



2. Understand and successfully apply logical database design principles, including E-R diagrams and database normalization. 3. Construct simple and moderately advanced database queries using Structured Query Language (SQL). 4. Understand the concept of a database transaction and related database facilities, including concurrency control, backup ,recovery, locking protocols, Security and Integrity.	
<b>COURSE OUTCOMES:</b>	
<b>CO. No</b>	<b>Course Outcome description</b>
MCA104.1	Have good understanding of the relational data model.
MCA104.2	Understand and successfully apply logical database design principles, E-R diagrams.
MCA104.3	Understand normalizing database
MCA104.4	Gain ability to write database queries using SQL.
MCA104.5	Understand the concept of database transactions, concurrency control, backup, recovery, locking protocols, Security and Integrity.
<b>CO-PO AND CO-PSO MAPPING</b>	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA104.1	2 1
MCA104.2	2 1
MCA104.3	2 1
MCA104.4	3 1
MCA104.5	2 1

### Essentials of management and Organizational behaviour

<b>Course Code</b>	MCA105	<b>Course Title</b>	Essentials of management and Organizational behaviour
<b>Course Type</b>	Core	<b>Contact Hours</b>	4 Hours per Week
<b>Credit</b>	4	<b>Domain</b>	Management
<b>Syllabus</b>			
<b>I</b>	Basic concepts, Evolution and growth of management ,Basic Managerial Concepts, Levels of management, Managerial Skills, Concept of management principles, nature and need of management, management functions, management thought – classical approach, scientific management, fayol's management, bureaucratic approach, systems approach, Contingency approach.		
<b>II</b>	Planning, Organizing, Staffing, Directing - Planning – Meaning, nature, structure, steps, effective planning, MBO, SWOT Analysis. Organizing – meaning, process, structure, formal and informal, types of organization, departmentation, delegation of authority. Staffing – meaning, nature, staffing process, recruitment & selection. Directing, supervision.		
<b>III</b>	Motivation, controlling, Coordination -Motivation – significance, motivational theories- Maslow's need hierarchy, McGregor's Theory X & Theory Y. Leadership, Controlling-concepts, steps, objectives, features of a good control system. Coordination- Meaning, nature, significance, types of coordination, Techniques of effective coordination.		
<b>IV</b>	Marketing Management Marketing Management-importance, scope. Core Marketing Concepts, Marketing research, Customer value, Customer relationship management, Brand Equity, Product Life Cycle, Pricing Strategies, Distribution Channels, Promotions – Sales promotions, advertising and public relations. Global marketing.		
<b>V</b>	Organizational Behavior -Organizational behavior – Key elements, scope, models of OB, Individual behavior- personality, Perception, Attitudes values and job satisfaction, Group behavior- team building- Types, process, roles. Job frustration, Job stress, Communication.		
<b>TEXT/REFERENCE BOOKS:</b>			

T	Principles & Practice of Management –T.N.Chabra
R	Principles of Management, R N Gupta, S.Chand& Company Ltd.
T	Organizational Behavior, S.S Khanka, S.Chand& Company Ltd Principles of Management, L M Prasad, Sultan Chand Publications
<b>COURSE PRE-REQUISITES:</b>	
Nil	
<b>COURSE OBJECTIVES:</b>	
<ol style="list-style-type: none"> <li>1. Understand fundamental concepts and principles of management, including the basic roles, skills, and functions of management</li> <li>2. Be knowledgeable of historical development, theoretical aspects and practice application of managerial process</li> <li>3. Be familiar with interactions between the environment, technology, human resources, and organizations in order to achieve high performance</li> <li>4. Be aware of the ethical dilemmas faced by managers and the social responsibilities of businesses.</li> </ol>	
<b>COURSE OUTCOMES:</b>	
<b>CO. No</b>	<b>Course Outcome description</b>
MCA105.1	Understand the basic concepts of management, evolution of management, clear knowledge of the management function like planning & organizing, Different School of thought
MCA105.2	Understand the different management functions in detail.
MCA105.3	Understand the concept of motivational theories , coordination & controlling, leadership
MCA105.4	Understand basics of marketing, sales promotion , global marketing
MCA105.5	Understand basic of Organizational behaviour, models of OB ,attitudes ,behaviour
<b>CO-PO AND CO-PSO MAPPING</b>	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA105.1	2 2 2
MCA105.2	2 2
MCA105.3	3 2 2 2 3
MCA105.4	2 3
MCA105.5	2 2 3

### C Programming Lab

Course Code	MCA 106	Course Title	C Programming Lab
Course Type	Core	Contact Hours	4 Hours per Week
Credit	1	Domain	Computing
Syllabus			
<b>I</b>		<ol style="list-style-type: none"> <li>1. Familiarization of Editor (Turbo C), compiling, executing, debugging, watch, break point</li> <li>2. Implementation of the various Data Types in C, values, ranges, type conversion</li> <li>3. Implementation of various Storage Types.</li> <li>4. Demonstration of for loop.</li> <li>5. Demonstration of do...while loop.</li> <li>6. Demonstration of while loop.</li> <li>7. Demonstration of nested if (Hint: Use logical operators).</li> <li>8. Demonstration of switch... case structure.</li> <li>9. Implementation of arrays.</li> <li>10. Implementation of multidimensional arrays</li> <li>11. Implementation of functions</li> <li>12. Demonstration of various string operations</li> <li>13. Demonstration of pointer operations.</li> <li>14. Demonstration of recursion</li> <li>15. Demonstration of Debugging a C program.</li> </ol>	

II	<div><div>1. Implementation of structures</div><div>2. Implementation of Union, enumeration.</div><div>3. Implementation of pointers to structures and unions.</div><div>4. Demonstration of dynamic allocation of memory</div><div>5. Demonstration of bitwise operations.</div><div>6. Demonstration of macro processing.</div><div>7. Demonstration of various file operations.</div><div>8. Implementation of character counting, line counting and word counting for a file.</div><div>9. Program to find the lengthiest line in a text file.</div></div>
TEXT/REFERENCE BOOKS:	
R	The c programming language – Brian W Kernighan & Dennis Ritchie IInd edition Eastern Economy Edition, Prentice Hall 2001
R	Programming with C – Byron S Gottfried– Schaum’s outlines 2nd Edition,2010
R	Computer Science: A Structured Programming Approach Using C, Forouzan, 3rd Cengage Learning 2007
R	C – How to Program, Deitel&Deitel, Pearson Education Asia, 6th Edition,2009
R	Programming in C –PradipDey, Manas Ghosh – Oxford Higher Education ,2007
R	Ansi C programming Bronson, Cengage learning, C2009
R	Understanding pointers in C- YashavantKanetkar – BPB publication , 2009
R	Let us C - YashavantKanetkar – BPB publication C. 1997
R	C by discovery – I s Foster – Pearson C 2005
R	Working with C –YashavantKanetkar – BPB publication,2008
R	Instant C program – Ivor Horton – Wrox, 1995
R	The art of programming computer science with ‘C’ – Steven c Lawlor – Wess , Cengage C2006
COURSE PRE-REQUISITES:	
MCA103	
COURSE OBJECTIVES:	
<div><div>1. To provide hands on exposure to problem-solving through programming in C</div><div>2. To develop logic and basic programming skills, so that one can switch over to any other programming language easily.</div></div>	
COURSE OUTCOMES:	
CO. No	Course Outcome description
MCA106.1	Write C programs and learn how to edit, compile, debug, correct, recompile and run it.
MCA106.2	Given a computational problem, identify and abstract the programming6task involved and implement it using appropriate C language constructs.
MCA106.3	Understand and Implement user defined functions, procedures, pointers and file systems
MCA106.4	To understand the different coding standards and conventions for writing a readable and simple code
MCA106.5	Debug and trace the execution of programs written in C language.
CO-PO AND CO-PSO MAPPING	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCAI06.1	1 3
MCAI06.2	2 2 1 3
MCAI06.3	2 2 1 3
MCAI06.4	1 3
MCAI06.5	1 3

## DBMS Lab

Course Code	MCA107	Course Title	DBMS Lab
Course Type	Core	Contact Hours	4 Hours per Week
Credit	1	Domain	Computing
Syllabus			
I	INTRODUCTION TO SQL Data Definition, Constraints, and Schema Changes, Data Types Create Schema Create Table Drop Table Alter Table Drop a Column (An Attribute)		
II	BASIC QUERIES IN SQL Aliases, * and Distinct, Empty Where-Clause Unspecified Where-Clause Use of Distinct Set Operations Nesting of Queries		
III	THE EXISTS FUNCTION Explicit Sets Nulls in SQL Queries Aggregate Functions Grouping The Having-Clause Substring Comparison		
IV	ARITHMETIC OPERATIONS Order by Specifying Updates in SQL- Insert, Delete, Update		
V	SQL TRIGGERS Views in SQL		
TEXT/REFERENCE BOOKS:			
R	Database Management Systems – Raghu Ramakrishnan and Johannes Gehrke, Third Edition, McGraw Hill, 2003		
R	Database Systems: Design , Implementation and Management, Peter Rob, Thomson Learning, 7Edn.		
R	Concept of Database Management, Pratt, Thomson Learning, 5Edn.		
R	Database System Concepts – Silberchatz, Korth and Sudarsan, Fifth Edition, McGraw Hill, 2006		
R	The Complete Reference SQL – James R Groff and Paul N Weinberg		
COURSE PRE-REQUISITES:			
COURSE OBJECTIVES:			
1. To provide hands on exposure to creating databases 2. To develop logic and basic programming skills using SQL language to join tables and provide the best possible results.			
COURSE OUTCOMES:			
CO. No	Course Outcome description		
MCA107.1	To design, create and alter relational tables and include integrity constraints		
MCA107.2	To insert , delete and update records in a table		
MCA107.3	Gain ability to write data retrieval queries, subqueries using SQL.		
MCA107.4	To write queries for joining multiple tables.		

MCA107.5	To implement the concept of triggers, procedures and functions using PL/SQL.															
CO-PO AND CO-PSO MAPPING																
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
MCA107.1		3	1		1											
MCA107.2		3			1											
MCA107.3		3	2		1											
MCA107.4		3	2		1											
MCA107.5		3	2													



## Semester 2

### Operations Research

Semester 2			
Course Code	MCA201	Course Title	Operations Research
Course Type	Core	Contact Hours	4 Hours per Week
Credit	4	Domain	Mathematics
Syllabus			
I	Linear programming problems - Mathematical formulation, graphical method of solution, simplex method		
II	Duality in linear programming problems, dual simplex method, sensitivity analysis, transportation and assignment problems, Traveling salesman Problem.		
III	Game theory Introduction, two-person zero-sum games, some basic terms, the maxmini-minimax principle, games without saddle points-Mixed Strategies, graphic solution of $2 \times n$ and $m \times 2$ games, dominance property. CPM & PERT- project scheduling, critical path calculations, Crashing.		
IV	Queueing theory -basic structure of queueing systems, roles of the Poisson and exponential distributions, classification of queues basic results of M/M/1: FIFO systems, extension to multi-server queues.		
V	Simulation: simulation concepts, simulation of a queueing system using event list,pseudo random numbers, multiplication congruential algorithm, inverse transformation method, basic ideas of Monte-Carlo simulation.		
TEXT/REFERENCE BOOKS:			
R	Taha.H.A ,operation Research : An Introduction, McMilan publishing Co., 1982. 7th ed.		
R	Ravindran A, Philips D.T &Solbery.J.J, Operations Research: Principles and practice, John Wiley & Sons, New York, 1987.		
R	Frank S. Budnick, Dennis Mcleavey and Richard Mojena, Principles of Operations Research for Management. All India Traveler Book seller, Delhi.		
R	Gillet.B.E., Introduction to Operations Research - A Computer oriented algorithmic approach, McGraw Hill, 1987.		
R	Hillier.F.S&Liberman.G.J, operation Research, Second Edition, Holden Day Inc, 1974.		
COURSE PRE-REQUISITES:			
Familiarity with Linear Algebra			
COURSE OBJECTIVES:			
To introduce the students how to use variables for formulating complex mathematical models in management science, linear programming, game theory, queueing theory and simulation.			
COURSE OUTCOMES:			
CO. No	Course Outcome description		
MCA201.1	Formulate a real-world problem as a mathematical programming model.		
MCA201.2	Understand the theoretical workings of the simplex method for linear programming and perform iterations of it by hand.		
MCA201.3	Solve specialized linear programming problems like the transportation and assignment problems		
MCA201.4	Understand the basic concept of game theory and queueing theory.		
MCA201.5	Understand the network analysis techniques and Simulation.		
CO-PO AND CO-PSO MAPPING			
	PO1	PO2	PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA201.1	2	1	
MCA201.2			2
MCA201.3	2		1
MCA201.4		2	1
MCA201.5		2	2

### Operating Systems

Course Code	MCA202	Course Title	Operating Systems
Course Type	Core	Contact Hours	4 Hours per Week
Credit	4	Domain	Professional Core
Syllabus			
I	<b>File System</b> File Systems, File concept, File support, Access methods, Allocation methods, Directory systems, File protection, free space management <b>Disk Management</b> -Secondary-Storage Structure, Disk structure, Disk scheduling, Disk management, Swap-space management, Disk reliability.		
II	<b>Memory Management</b> Memory Management, Memory partitioning, Swapping, Paging, Segmentation, Virtual memory, Overlays, Demand paging, Performance of Demand paging, Page replacement algorithms, Allocation algorithms		
III	<b>Process Management and Concurrency management</b> Process and Thread Management, Concept of process and threads, Process states, Process management, Context switching, Interaction between processes and OS, Multithreading, Concurrency Control, Concurrency and Race Conditions, Mutual exclusion requirements		
IV	<b>Concurrency Management</b> Software and hardware solutions for mutual exclusion, Semaphores, Classical IPC problems and solutions Deadlock, Characterization, Avoidance and Prevention, Detection, Recovery		
V	<b>Protection and case STUDY: LINUX</b> Protection, Goals of protection, Domain of protection, Access matrix, Implementation of access matrix, Revocation of access rights. Case Study Linux OS –File System, basic commands, Processes, Access permissions, redirection, filters		
TEXT/REFERENCE BOOKS:			
R	Silberschatz, Galvin, and Gagne, “Operating System Concepts”, Eighth Edition, Wiley Publication, 2011.		
R	Andrew S. Tanenbaum, “Modern Operating Systems”, Second Edition, Pearson Education, 2004.		
R	Gary Nutt, “Operating Systems”, Third Edition, Pearson Education, 2004		
R	Harvey M. Deital, “Operating Systems”, Third Edition, Pearson Education, 2004.		
R	Milan Milenkovic, “Operating Systems: Concept and Design”, 2nd Edition, 2001.		
R	“Linux Command Line And Shell Scripting Bible (English) 2nd Edition”, Wiley Publication.		
R	Richard Petersen, “Linux: The Complete Reference”, Sixth Edition, 2007		
COURSE PRE-REQUISITES:			
Nil			
COURSE OBJECTIVES:			
1. To provides a comprehensive introduction to understand the underlying principles, techniques and approaches used in operating systems. 2. To understand how OS manage resources such as memory, peripherals, and schedule CPU time and learn how applications communicate with the user and the underlying hardware.			
COURSE OUTCOMES:			
CO. No	Course Outcome description		
MCA202.1	Elaborate the understanding of an operating system by giving emphasis on the file systems and Hard Disk Management.		
MCA202.2	Comprehend the primary memory control and interaction of an operating system.		
MCA202.3	Understand the concept of Process Management and Inter Process communication Component of an Operating System		
MCA202.4	Realize the importance and the implementation of protection mechanism used by an operating system		
MCA202.5	Learn the concepts of operating system through experimental practice using Linux operating system		
CO-PO AND CO-PSO MAPPING			



	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
MCA202.1			3													
MCA202.2	1		3													
MCA202.3	2		3													
MCA202.4			3													
MCA202.5			1		2											

### C++ And Object Oriented Programming Paradigms

Course Code	MCA 203	Course Title	C++ And Object Oriented Programming Paradigms
Course Type	Core	Contact Hours	4 Hours per Week
Credit	4	Domain	Computing
Syllabus			
I	Introduction to Object-Oriented Programming: Evolution of programming methodologies. Procedural Approach Vs Object-Oriented Approach. Encapsulation and Abstraction, Message Passing, Inheritance, Reusability, Extensibility, Polymorphism, Overloading. Objects and Classes: Access Specifiers. Memory Allocation for Objects, Friend Functions and Friend Classes, Static Data Members, Static Member functions. this pointer. Comparison of class with structure. Inline functions. Arrays of Objects; Objects as Function Arguments; Returning Objects; Constructing Two-Dimensional Arrays. String Manipulation using objects.		
II	Constructors and Destructors: Purpose of Constructors and Destructors. Default Constructors, Constructors with & without parameters, Constructor Overloading, Copy Constructor. Invoking Constructors and Destructors. Pointers in C++ : Pointer declaration and Access, Pointer to data member, pointer to member functions, pointer to object., memory management – new and delete		
III	Polymorphism: Overloading Concepts, Function Overloading: Operator Overloading: Defining Operator Function, Rules for overloading Operators. Overloading unary operators, overloading binary operators, Overloading Comma, [], (), -, new, delete Operators, Overloading << and >> Operators for Objects. Type Conversions –Basic to Class, Class to Basic and One class to another class type.		
IV	Inheritance: Basic Concepts, Reusability & Extensibility. Defining derived classes, protected access specified in Base class constructors and destructors in derived classes – Types of Inheritances. Protected visibility mode; Member Classes: Nesting of Classes. Virtual Functions: Virtual Base Classes, virtual member function access, late binding, pure virtual function, abstract classes.		
V	Console I/O operations: C++ streams and C++ stream classes – Predefined Objects, unformatted I/O operations, Formatted I/O operations - manipulators -User defined manipulators. Disk I/O Operations: Stream Classes, classes for file stream operations, opening and closing a file, file modes, writing and reading objects, binary versus character files, tellg() and seekg(), seekp() and tellp(). Updating a File:Error Handling During File Operations.  Templates: Generic Functions- A generic swap function, Functions with more than one Generic Type, Overloading a Function Template. Generic Classes, Class template with more than one Generic Type  Exception Handling: Fundamentals of Exception Handling, Catching Class Types, Using Multiple catch statements, Catching All Exception, Restricting Exception, throw statement		
TEXT/REFERENCE BOOKS:			
R	Object oriented Programming with c++. Balagursamy 4th edition or above		
R	Deitel&Deitel, C++ How to program, Pearson Education Asia, 7th Edition, 2010.		
R	Computer Science: A Structured Programming Approach Using C++, Forouzan, Thomson Learning , 2 Edn		
R	Gaddis Tony, Starting Out with C++, dreamtech Press,		
R	C++ Programming: Malik, Thomson Learning , 3 Edn		
R	K.R VenugopalRajkumar, Mastering C++ , TMH.		
R	Sotter A Nicholas and Kleper J Scott, Professional C++. Wiley Publishing Inc.		

R	Schildt Herbert, The Complete Reference C++, Tata McGraw Hill, 4th Edition
<b>COURSE PRE-REQUISITES:</b>	
MCA103	
<b>COURSE OBJECTIVES:</b>	
To enable the students to gain an understanding of various OOP concepts using the programming language C++.	
<b>COURSE OUTCOMES:</b>	
<b>CO. No</b>	<b>Course Outcome description</b>
MCA203.1	To introduce the object oriented concepts
MCA203.2	To familiarize with constructors, destructors and pointers in CPP
MCA203.3	To perform overloading and type conversions
MCA203.4	To gain knowledge in inheritance
MCA203.5	To familiarize the features such as templates and exception handling
<b>CO-PO AND CO-PSO MAPPING</b>	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA203.1	3 2
MCA203.2	3 2
MCA203.3	3 2
MCA203.4	3 2
MCA203.5	3 2

### Software Engineering

Course Code	MCA204	Course Title	Software Engineering
Course Type	Core	Contact Hours	4 Hours per Week
Credit	4	Domain	Professional Core
Syllabus			
I	<b>Software process</b> Software engineering definition, Software problems, important qualities of a software product, software engineering principles. Process Models – The Waterfall Model, Prototyping, incremental model, Spiral Model, V-Model. Agile development		
II	<b>Requirement Analysis, Design</b> Understanding Requirements, Requirements Modeling: Scenarios, Software requirements specification, SRS, Role & Skills of system Analyst, Design Concepts, Software Architecture, User Interface Design		
III	<b>Coding, Testing and Maintenance</b> Coding – programming principles and guidelines, Coding Standards, refactoring, verification, complexity metrics. Testing – Levels of testing, testing for conventional and object oriented applications, Maintenance – Need for maintenance, Management of maintenance, challenges of maintenance phase.		
IV	<b>Quality Management</b> Quality concepts, Software Metrics- LOC based, Function point Metric, Quality Metrics, Review techniques, software quality assurance, Software configuration management, Change Management		
V	<b>Software Project Management</b> Project Management Concepts, Estimation for Software Projects, Project Scheduling, Risk Management		
TEXT/REFERENCE BOOKS:			
R	Software Engineering, a Practitioner’s Approach- Roger S Pressman 7th Edition, Tata Mc-Graw Hill Publishing Co. Ltd.		
R	Software Engineering – Ian Somerville 9th Edition, Pearson Education		
R	An Integrated Approach to Software Engineering- Pankaj Jalote 3rd edition, Narosa Publishing House		
R	Fundamentals of Software Engineering- Ghezzi, Jazayer’s and Mandriolli 2nd Edition, PHI		
R	Software Engineering principles & Practice- Waman S Jawadekar 2nd Edition, Tata Mc-Graw Hill Publishing Co. Ltd.		

R	Software Project Management: Pankaj Jalote, Pearson Education
R	Software Project Management –A Unified Framework: Walker Royce, Pearson Education.
R	Software Project Management –S A Kelkar .Prentice Hall India
<b>COURSE PRE-REQUISITES:</b>	
Basic Knowledge of Computer Science	
<b>COURSE OBJECTIVES:</b>	
<ol style="list-style-type: none"> <li>1. Knowledge of basic Software Engineering methods and practices, and their appropriate application</li> <li>2. A general understanding of software process models.</li> <li>3. An understanding of software requirements and the SRS document.</li> <li>4. An understanding of design concepts and different software architectural styles.</li> <li>5. An understanding of implementation issues such as modularity and coding standards.</li> <li>6. An understanding of approaches to verification and validation including static analysis, and reviews, and software testing approaches</li> <li>7. An understanding of software evolution and related issues such as version management.</li> <li>8. An understanding on quality control and how to ensure good quality software.</li> <li>9. An understanding on quality control and how to ensure good quality software.</li> <li>10. An understanding of the role of project management including planning, scheduling, risk management, etc.</li> </ol>	
<b>COURSE OUTCOMES:</b>	
<b>CO. No</b>	<b>Course Outcome description</b>
MCA204.1	To analyse, design and manage the development of a computing-based system, component or process to meet desired needs within realistic constraints in one or more application domains.
MCA204.2	To understand software testing and quality assurance techniques at the module level, and understand these techniques at the system level
MCA204.3	To use knowledge, techniques, skills and modern tools necessary for software engineering practice
MCA204.4	To function on multidisciplinary teams
MCA204.5	To communicate effectively with stakeholders involved in projects
MCA204.6	Adapt to a regular system of teaching learning and assessment, thereby making them professionally ethical.
<b>CO-PO AND CO-PSO MAPPING</b>	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA204.1	2 3 2 2 2 2 2 3 2
MCA204.2	2 2 2 2 2 2 2 2 2
MCA204.3	2 2 2 2 2 2 2 2 2
MCA204.4	1 1 2 3 2 3 2 3 2
MCA204.5	1 1 2 3 2 3 2 3 2

### Data Structures

Course Code	MCA 205	Course Title	Data Structures
Course Type	Core	Contact Hours	4 Hours per Week
Credit	4	Domain	Computing
Syllabus			
<b>I</b>	<b>Introduction:</b> Data Structures, Data Types, Structure. <b>Arrays:</b> Ordered lists –Representation of array, Merits and Demerits of array as data structure. Polynomial Representations, Polynomial addition, Polynomial Multiplication and sparse matrices <b>Stack:</b> Definition and concepts, Operations on stacks. Application of stacks- Infix to postfix conversion, Evaluation of Arithmetic Expression.		
<b>II</b>	<b>Queue:</b> Representation of queue, circular queue and double ended queue. Priority queue: implementation by array using Heap Sort <b>Dynamic Memory Allocation Functions:</b> malloc, calloc, realloc and free <b>Linked List:</b> Operations – insertion, searching, removing, updating, sorting and reversing.		

	<b>Polynomial:</b> Representations, Addition, Multiplication using Linked List.															
<b>III</b>	<b>Linear Data Structures:</b> Linked stacks, Linked queues, Circular Linked List and Double Ended Queue, Doubly Linked List and Circular doubly linked list. <b>Non Linear Data Structures:</b> Trees, Graphs. <b>Graph:</b> Representation of Graph on Computer: Adjacency matrix and adjacency list, merits and demerits of graph representation <b>Searching:</b> Linear Search, Binary Search															
<b>IV</b>	<b>Trees:</b> Basic terminology, binary trees, binary search tree <b>Binary search tree:</b> Insertion, Deletion, searching and Traversal - in-order, pre-order and post-order. Threaded Binary Tree: Operations <b>Balanced Trees:</b> AVL Tree: properties, insertion, deletion and rotations															
<b>V</b>	<b>Advanced Data Structures:</b> Red black tree: properties. <b>B-Trees:</b> Data Structure on secondary storage, Definition of B trees, Basic operations on B Trees – searching, creating an empty node, splitting a node in B Tree, Inserting a key in to B Tree and Deleting a Key from a B Tree <b>Definition and Structure:</b> B+ Trees <b>Data Structure for Disjoint Sets:</b> Disjoint set operation, linked list representation of disjoint sets, Disjoint-set forests															
<b>TEXT/REFERENCE BOOKS:</b>																
R	Introduction to Algorithms - Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest															
R	Fundamentals of data structures – Ellis Horowitz and SartajSahni (Galgotia , 1994)															
R	Fundamentals of computer algorithms- Ellis Horowitz, SartajSahni, SanguthevarRajeshekharan (Universities Press , 2007)															
R	Data Structure using C & C++ b, Tannenbaum and Augustine,prentice hall.															
R	Data Structures – a pseudocode approach with C –Richard F Gilberg, Behrouz A Forouzan, Thomson Learning, 2 Edn., Cengage Learning C2005															
R	Data Structures and program design – R. L Kruse (Prentice Hall of India),C2001															
<b>COURSE PRE-REQUISITES:</b>																
MCA103																
<b>COURSE OBJECTIVES:</b>																
1. To introduce the concept of linear and nonlinear data structures. 2. To implement the concepts using arrays and linked list 3. To apply it to advanced data structures.																
<b>COURSE OUTCOMES:</b>																
<b>CO. No</b>	<b>Course Outcome description</b>															
MCA205.1	To differentiate the linear and nonlinear data structures															
MCA205.2	Implement the various kinds of sorting and searching techniques.															
MCA205.3	To implement the concept of nonlinear data structures using arrays and linked list.															
MCA205.4	Familiarize the concept of advanced data structures like red black trees,avl trees etc. .															
MCA205.5	Implement the concept of balancing a tree and the rotations to do it.															
<b>CO-PO AND CO-PSO MAPPING</b>																
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4															
MCA205.1	3					1					2	2		2		
MCA205.2			3				1				2	2		2		
MCA205.3	3		2				1				2	2		2		
MCA205.4			3				1				2	2		2		
MCA205.5			2				1				2	2		2		

### C++ Lab

Course Code	MCA206	Course Title	C++ Lab
Course Type	Core	Contact Hours	4 Hours per Week
Credit	1	Domain	Computing
Syllabus			
I	Lab Cycle A		

	<ol style="list-style-type: none"> <li>1. Program to Implement Classes and Objects.</li> <li>2. Program to Implement Constructors and Destructors with array of Objects.</li> <li>3. Program to Implement Passing and returning parameters as objects by reference.</li> <li>4. Program to demonstrate Function Overloading.</li> <li>5. Program to overload different operators – ++ &amp; -- operators with post &amp; pre forms; new, delete, [], () and arithmetic operators.</li> <li>7. Program to perform pointer sort operation.</li> <li>8. Program to demonstrate friend functions and friend classes.</li> <li>9. Program using objects for String manipulation functions.</li> <li>10. Program to implement different types of inheritances like Multiple, Multilevel and Hybrid.</li> <li>11. Program to demonstrate the use of Virtual Functions</li> </ol>
<b>II</b>	<b>Lab Cycle B</b> <ol style="list-style-type: none"> <li>1. Program to demonstrate I/O streams and functions.</li> <li>2. Program to Overload &lt;&lt; and &gt;&gt; operators as a member and as a non-member operator functions.</li> <li>3. Program to create a file to store some records and search for a particular record and display it.</li> <li>4. Program to perform all possible Type Conversions. Program to create function Templates, and overload the function Templates.</li> <li>5. Program to create a generic stack class and member functions to perform stack operations.</li> <li>6. Program to implement Exception Handling with minimum 5 exception classes including two built-in exceptions (use Visual C++)</li> </ol>
<b>TEXT/REFERENCE BOOKS:</b>	
R	Object oriented Programming with c++. Balagursamy 4th edition or above
R	Deitel&Deitel, C++ How to program, Pearson Education Asia, 7th Edition, 2010.
R	Computer Science: A Structured Programming Approach Using C++, Forouzan, Thomson Learning , 2 Edn
R	C++ Programming: Malik, Thomson Learning , 3 Edn
R	K.R VenugopalRajkumar, Mastering C++ , TMH.
R	Gaddis Tony, Starting Out with C++, dreamtech Press,
R	Sotter A Nicholas and Kleper J Scott, Professional C++, Wiley Publishing Inc.
R	Schildt Herbert, The Complete Reference C++, Tata McGraw Hill, 4th Edition
<b>COURSE PRE-REQUISITES:</b>	
MCA203	
<b>COURSE OBJECTIVES:</b>	
<ol style="list-style-type: none"> <li>1. To Achieve an understanding of object oriented programming concepts using C++</li> <li>2. To apply C++ programming language to solve real world problems</li> </ol>	
<b>COURSE OUTCOMES:</b>	
<b>CO. No</b>	<b>Course Outcome description</b>
MCA206.1	To develop programs with object oriented programming concepts using C++.
MCA206.2	To implement generic programming
MCA206.3	To implement exception handling
<b>CO-PO AND CO-PSO MAPPING</b>	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA206.1	3 3 3
MCA206.2	3
MCA206.3	2 2



## Data Structures Lab

Course Code	MCA 207	Course Title	Data Structures Lab
Course Type	Core	Contact Hours	4 Hours per Week
Credit	1	Domain	Computing
Syllabus			
I	<div><div><div>1.</div><div>2.</div><div>3.</div><div>4.</div><div>5.</div><div>6.</div><div>7.</div><div>8.</div><div>9.</div><div>10.</div><div>11.</div><div>12.</div><div>13.</div></div><div><div>Program to represent Searching procedures (Linear search and Binary search)</div><div>Program to represent sorting procedures (Selection,Bubble , Insertion )</div><div>Polynomial addition using array</div><div>Polynomial multiplication using array</div><div>Program to represent sparse matrix manipulation using arrays.</div><div>Program to allocate two dimensional arrays dynamically.</div><div>Program to demonstrate the use of realloc().</div><div>Represent Graph using array</div><div>Stack using array</div><div>Reverse a string using stack</div><div>Implement Queue using array</div><div>Circular Queue using array</div><div>Double ended queue using array</div></div></div>		
II	<div><div><div>1.</div><div>2.</div><div>3.</div><div>4.</div><div>5.</div><div>6.</div><div>7.</div><div>8.</div><div>9.</div><div>10.</div><div>11.</div><div>12.</div></div><div><div>Program to represent Singly Linked List.</div><div>Program to represent Doubly Linked List.</div><div>Program to represent Circular Linked List.</div><div>Polynomial addition using Linked List.</div><div>Polynomial multiplication using linked list.</div><div>Implement a linked stack</div><div>Program to represent Queue using linked list</div><div>Represent a graph using linked list.</div><div>Program for Conversion of infix to postfix.</div><div>Program for Evaluation of Expressions.</div><div>Program for binary search tree using recursion.</div><div>Program to represent Binary search Tree Traversals without recursion</div></div></div>		
TEXT/REFERENCE BOOKS:			
R	Foley J.D. ,Andries van Dam, Computer Graphics(latest) - Principles and Practice, , Addison-Wesley.		
R	Angel, Edward. Interactive Computer Graphics- A Top-down Approach with OpenGL, Addison-Wesley,1996.		
R	Computer Graphics using OpenGL F S Hill – Prentice Hall		
R	Goemetric tools for Computer Graphics – Philip J. Schneider and David H. Eberly – The Morgan Kaufman series in Compter Graphics &Modeling		
R	Tom McReynolds – David Blythe “ Advanced Graphics Programming Using OpenGL” , Elsevier, 2010		
R	Ralf Steinmetz and Klara “Multimedia Computing, Communications and applications”, Pearson Education, 2004.		
COURSE PRE-REQUISITES:			
MCA103			
COURSE OBJECTIVES:			
<div><div><div>1.</div><div>2.</div><div>3.</div></div><div><div>To develop programs to implement the concept of data structures</div><div>To implement the concepts of data structures using arrays and linked list</div><div>To implement the concepts of advanced data structures</div></div></div>			
COURSE OUTCOMES:			
CO. No	Course Outcome description		
MCA207.1	To implement the linear data structures like arrays, linked list.		
MCA207.2	To implement the various kinds of sorting and searching techniques.		
MCA207.3	To implement the concept of stacks using arrays and linked list.		
MCA207.4	To implement the concept of queues using arrays and linked list.		
MCA207.5	To implement the concept of nonlinear data structures like graphs and trees.		

**CO-PO AND CO-PSO MAPPING**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
MCA207.1	3		3				1				2	2		2		
MCA207.2	3		3				1				2	2		2		
MCA207.3	3		2				1				2	2		2		
MCA207.4	3		2				1				2	2		2		
MCA207.5			2				1				2	2		2		





<b>Course Code</b>	MCA301	<b>Course Title</b>	Design and Analysis of Algorithms
<b>Course Type</b>	Core	<b>Contact Hours</b>	4 Hours per Week
<b>Credit</b>	4	<b>Domain</b>	Professional Core
<b>Syllabus</b>			
I	<b>Introduction:</b> Algorithm, Concepts in performance analysis – space complexity and time complexity, Asymptotic Notations <b>Sorting:</b> Analysis of - Bubble sort, Selection sort and Insertion sort <b>Searching:</b> Analysis of - Linear Search, Binary Search and Interpolation Search. <b>Hashing Techniques:</b> Different hashing functions, methods for collision handling.		
II	<b>Divide And Conquer Strategy:</b> General method, Finding the maximum and minimum, Analysis of Binary search, Quick sort and Merge sort <b>Branch and Bound:</b> Travelling Sales Man Problem <b>Backtracking:</b> The 8 queen's problem, sum of subsets.		
III	<b>Dynamic Programming:</b> Introduction, Drawback of Recursion, Elements of Dynamic Programming, Matrix Chain Multiplication and Longest Common subsequence <b>Greedy Algorithms:</b> Huffman Codes, Activity Selection Problem, Elements of Greedy Strategy, 0-1 knapsack problem, fractional knapsack problem		
IV	<b>Graph Algorithms:</b> Breadth First Search, Depth First Search. DFS: Strongly Connected Components and Topological Sort Minimum Spanning tree: Kruskal and Prims algorithms, Shortest path: Single Source Shortest path (Dijkstra's Algorithm) and all pair shortest path		
V	<b>Number Theoretic Algorithms:</b> Strassen's matrix multiplication. <b>NP Hard and NP Complete Problems:</b> Basic concepts, non-deterministic algorithm, class of NP- hard and NP- complete <b>Approximation Problems:</b> Basic terminology, vertex coloring problem – different approximation algorithms, travelling sales man problem.		
<b>TEXT/REFERENCE BOOKS:</b>			
R	Introduction to Algorithms - Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest		
R	Fundamentals of algorithms – Gilles Brassard, Paul Bratley (PHI),C1996		
R	Introduction to the design and analysis of algorithms – AnanyLevitin (Pearson),2011		
R	Design & Analysis of Algorithms-A A Puntambekar		
<b>COURSE PRE-REQUISITES:</b>			
MCA205			
<b>COURSE OBJECTIVES:</b>			
1. Learn and understand the fundamental algorithms and analyze the performance. 2. Understand the fundamental algorithmic design strategies. 3. Learn how to develop efficient algorithms for simple computational tasks and reasoning about the performance and correctness of them.			
<b>COURSE OUTCOMES:</b>			
<b>CO. No</b>	<b>Course Outcome description</b>		
MCA301.1	Understand and use asymptotic notations to analyse the performance of basic algorithms		
MCA301.2	Identify, analyse and evaluate various Algorithm Design Strategies and solve Problems: Divide And Conquer, Branch and Bound, Backtracking strategies		
MCA301.3	Identify, analyse and evaluate various Algorithm Design Strategies and solve Problems: Dynamic programming, Greedy Strategy		
MCA301.4	Identify, analyse and evaluate various Graph Algorithms and Solve Problems		
MCA301.5	Understand the basic concept of Number Theory and related Algorithms, NP Hard and NP Complete Problems and Approximation Problems		
<b>CO-PO AND CO-PSO MAPPING</b>			
	PO1	PO2	PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA301.1	3	2	

MCA301.2	3	3	2
MCA301.3	3	3	2
MCA301.4	3	1	2
MCA301.5	1		2

## Data Communications and Computer Networks

Course Code	MCA 302	Course Title	Data Communications and Computer Networks
Course Type	Core	Contact Hours	4 Hours per Week
Credit	4	Domain	Professional Core
Syllabus			
I	Introduction: Data Communications, Computer Networks, Network Layering-Principles of Layering, OSI reference Model, TCP-IP Protocol Suite. Physical Layer:Data and Signals, Periodic Analog Signals, Digital Signals, Transmission Impairment, Data rate Limits. Digital-to-Digital Conversion, Analog-to-Digital Conversion, Digital-to-Analog Conversion, Analog-to-Digital Conversion		
II	Physical Layer: Transmission and Switching Transmission Modes, Transmission media- Guided, unguided media. Multiplexing, Switching-Circuit Switching, packet switching		
III	Data Link Layer: Nodes and Links, Link-Layer Addressing, error Detection and Correction- Block coding, Cyclic Codes, Checksum, Forward Error Correction, Simple, Stop-and-wait, Go-back-N, Selective Repeat, HDLC. Media Access Control: Random Access-ALOHA, CSMA, CSMA/CD, CSMA/CD, Controlled Access, Channelization-FDMA, TDMA, CDMA		
IV	Wired LANS: Ethernet Protocol- IEEE 802. Standard Ethernet- Characteristics, Addressing, Access method Network Layer: Services, Routing Algorithms: Distance Vector, Link State, Path Vector, and Unicast Routing Algorithms.		
V	Multicasting Basics: Addresses, Delivery at Data Link Layer, Multicast Forwarding, Two Approaches to Multicasting. IP Addressing, Classes, Subnetting.		
TEXT/REFERENCE BOOKS:			
R	Forouzan, "Data Communications and Networking", 5 <sup>th</sup> Edition, McGraw Hill, 2013.		
R	Andrews. Tanenbaum, "Computer Networks" , 5 <sup>th</sup> edition . Prentice-Hall.		
R	William Stallings, "Data and Computer Communication", 8 <sup>th</sup> edition		
COURSE PRE-REQUISITES:			
MCA102			
COURSE OBJECTIVES:			
<div><div>1.</div><div>To give idea of basics of Data communication and Computer Networks. The first part of the course emphasis on fundamentals of Data and Signal and Encoding Standards and detail about the physical layer and transmission modes.</div></div> <div><div>2.</div><div>To give an overview of communications switching and routing, types of communication, network congestion, network topologies, network configuration and management, network model components, layered network models (OSI reference model, TCP/IP networking architecture) and their protocols, various types of networks (LAN, MAN, WAN and Wireless networks) and their protocols.</div></div>			
COURSE OUTCOMES:			
CO. No	Course Outcome description		
MCA302.1	Build an understanding of the fundamental concepts and reference models of data communications and Computer Networks		
MCA302.2	Train the students in basics of Data communications and transmission media.		
MCA302.3	Familiarize the student with the basic taxonomy and protocols used in the Data Link layer of OSI reference Model		

MCA302.4	Introduce the student to advanced networking concepts like wired and wireless protocols, and routing algorithms															
MCA302.5	Build an understanding of IP addressing and multicasting															
CO-PO AND CO-PSO MAPPING																
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
MCA302.1	3	1			3											
MCA302.2	3	3			2											
MCA302.3	3	3			2											
MCA302.4	3	3			2											
MCA302.5	3	2			2											

### System Software

Course Code	MCA303	Course Title	System Software
Course Type	Core	Contact Hours	4 Hours per Week
Credit	4	Domain	Professional Core
Syllabus			
I	General concepts-Review of assembly and machine language programming, distinction between system software and application software, Language processors: -Introduction Language processing activities. Assemblers: - Elements of Assembly language programming, simple assembly scheme, Pass structure of assemblers, Design of two pass assemblers		
II	Macros and macro processors: - Macro definition and call, Macro expansion, Nested macro calls, advanced macro facilities, design of macro preprocessor Linker-Relocation and linking concepts-self relocating programs. Loader-Types of loaders, Editor-Types of editors-Components of editor-Debug monitor		
III	Introduction to compiling:- Compilers, Analysis of a source program, the phases of a compiler, Lexical analysis:-The role of the lexical analyzer, Input buffering, specification of tokens Recognition of tokens, Basics of Finite automata, Conversion of an NFA to DFA, From a regular expression to an NFA		
IV	Syntax analysis:- the role of the parser, Context free grammars, writing a grammar, ambiguity in grammar, Top down parsing, Bottom up parsing, syntax directed translation-syntax directed definition, Construction of Syntax Tree, LL parsers, Operator precedence grammar, LR(0) , SLR parser		
V	Intermediate code generation-postfix notation, syntax tree, three-address code, basic blocks and flow graph, Back patching, Code optimization: - The principal sources of optimization, optimization of basic blocks, loops in flow graphs, Peephole optimization Code Generations:- Issues in the design of a code generator		
TEXT/REFERENCE BOOKS:			
R	System Programming and operating Systems- D.M.Dhamdhare Tata McGraw Hill (Modules 1& 2)		
R	Compilers Pinciples, Techniques and Tools- Alfred VAho, Ravi Sethi, Jeffrry D Ullman (Modules 3, 4 & 5 )		
R	Systems programming- John J Donovan		
R	System Software- Leland L Beck, Addison Wesley Publishing Company		
COURSE PRE-REQUISITES:			
MCA103			
COURSE OBJECTIVES:			
To understand the design and implementation of assemblers, linkers, loaders, and compilers.			
COURSE OUTCOMES:			
CO. No	Course Outcome description		
MCA303.1	To operationalise the relationship between system software and machine architecture.		
MCA303.2	To Distinguish the design and implementation of assemblers, linkers and loaders.		
MCA303.3	To Have knowledge of the design of compilers		

MCA303.4	To implement automata theory															
MCA303.5	To apply the design and implementation of parsers.															
CO-PO AND CO-PSO MAPPING																
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
MCA303.1	3	1		2												
MCA303.2	3	1		2												
MCA303.3	2	1		3												
MCA303.4	2	1		3												
MCA303.5	2	1		3												

## Java Programming

Course Code	MCA 304	Course Title	Java Programming
Course Type	Core	Contact Hours	4 Hours per Week
Credit	4	Domain	Computing
Syllabus			
I	Basics of Java: Java - What, Where and Why?, History and Features of Java, Internals of Java Program, Difference between JDK,JRE and JVM, Internal Details of JVM, Variable and Data Type, Unicode System, Naming Convention. OOPS Concepts: Advantage of OOPs, Object and Class, Method Overloading, Constructor, static variable, method and block, this keyword, Inheritance (IS-A), Aggregation and Composition(HAS-A), Method Overriding, Covariant Return Type, super keyword, Instance_INITIALIZER block, final keyword, Runtime Polymorphism, static and Dynamic binding, Abstract class and Interface, Downcasting with instanceof operator ,Package and Access Modifiers, Encapsulation, Object class, Object Cloning, Java Array, Call By Value and Call By Reference		
II	Core java Features: String Handling, Exception Handling, Nested classes, Packages and Interfaces Multithreaded Programming – synchronization, Input/Output – Files – Directory , Utility Classes, Generics, Generic Class, Generic methods.		
III	Serialization: Serialization & Deserialization, Serialization with IS-A and Has-A, Transient keyword Networking: Socket Programming, URL class, Displaying data of a web page, InetAddress class, DatagramSocket and DatagramPacket, Two way communication		
IV	JDBC: - Overview, JDBC implementation, Connection class, Statements, Catching Database Results, handling database Queries. Error Checking and the SQLExceptionClass , The SQLWarning Class, JDBC Driver Types, ResultSetMetaData, Using a Prepared Statement, Parameterized Statements, Stored Procedures, Transaction Management Collection: Collection Framework, ArrayList class, LinkedList class, ListIterator interface, HashSet class		
V	Introducing AWT: Working with Windows Graphics and Text. Using AWT Controls, Layout Managers, adapter classes and Menus. Swing: Basics of Swing, JButton class, JRadioButton class, JTextArea class, JComboBox class, JTable class, JColorChooser class, JProgressBar class, JSlider class, Displaying Image, JMenu for Notepad, Open Dialog Box Java applets- Life cycle of an applet – Adding images to an applet – Adding sound to an applet. Passing parameters to an applet. Event Handling.		
TEXT/REFERENCE BOOKS:			
R	JAVA The Complete Reference- Patrick Naughton and Herbert Schidt.- fifth Edition Tata McGraw Hill.		
R	The Complete reference J2SE - Jim Keogh – Tata McGraw Hills		
R	Programming and Problem Solving With Java, Slack, Thomson Learning, 1Edn.		
R	Java Programming Advanced Topics, Wigglesworth, Thomson Learning, 3Edn.		
R	Java Programming, John P. Flynt , Thomson Learning, 2Edn.		

R	Ken Arnold and James Gosling, The Java Programming language, Addison Wesley, 2nd Edition, 1998
R	Patrick Naughton and Herbert Schidt. The Complete Reference, JAVA fifth Edition Tata McGraw Hill.
R	Maydene Fisher, Jon Ellis, Jonathan Bruce; JDBC API Tutorial and Reference, Third Edition, Publisher: Addison-Wesley
R	Thinking java – Bruce Eckel – Pearson Education Association
<b>COURSE PRE-REQUISITES:</b>	
MCA203	
<b>COURSE OBJECTIVES:</b>	
1. To understand and comprehend object oriented programming concepts using Java 2. To provide a comprehensive coverage of Internet programming using java. 3. To achieve the designing of platform independent applications	
<b>COURSE OUTCOMES:</b>	
<b>CO. No</b>	<b>Course Outcome description</b>
MCA304.1	Ability to solve problems using only pure object oriented concepts
MCA304.2	Make decision to solve a problem using package, library and threads Handling Errors and Exceptions
MCA304.3	Able to develop networking applications
MCA304.4	Ability to design and develop database applications
MCA304.5	Design and develop software solutions
<b>CO-PO AND CO-PSO MAPPING</b>	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA304.1	2 2 1 2 2 2 2 2 2 2 2 2 2 2
MCA304.2	2 2 1 2 2 2 2 2 2 2 2 2 2 2
MCA304.3	2 2 2 2 2 2 2 2 2 2 2 2 2 2
MCA304.4	2 2 2 2 2 2 2 2 2 2 2 2 2 2
MCA304.5	2 2 2 2 2 2 2 2 2 2 2 2 2 2

### Computer Graphics and Multimedia

Course Code	MCA305	Course Title	Computer Graphics & Multimedia
Course Type	Core	Contact Hours	4 Hours per Week
Credit	4	Domain	Computing
Syllabus			
<b>I</b>	Introduction: Applications of Computer graphics- Display Methods-Standard Graphics pipeline-drawing primitives. Basic raster graphics algorithms-line drawing, circle drawing algorithms, filling algorithms, clipping-line clipping, polygon clipping.		
<b>II</b>	Transformations: Basic 2D transformations –Translation, rotation, Scaling, Reflection, Shear, Composite Transformations. Window to viewport transformation-changing coordinate systems. Projection: 3D Geometric transformations- Translation, Scaling, Rotation. Perspective parallel Matrix representation – 3D viewing – 3D clipping		
<b>III</b>	Representations of 3D Objects :Representation of curves and surfaces –Parametric, Quadric- Bezier, B-Splines, Constructive solid geometry.		
<b>IV</b>	Illumination models- concepts, Visible surface detection methods- Object space methods and image space methods, Shading models- Flat Gouraud and Phong. Comparison of different shading methods-Ray tracing.		
<b>V</b>	Multimedia basics: Introduction to Multimedia – Components – Hypermedia – Authoring – Authoring tools – File formats – Color models – Digital Audio representation – Transmission – Audio signal processing – Digital music making – MIDI – Digital video – Video compression techniques – Video performance measurements – Multimedia Databases – Animation – Key frames and tweening techniques – Principles of animation – Virtual reality – Multimedia for portable devices		



<b>TEXT/REFERENCE BOOKS:</b>	
R	Foley J.D. ,Andries van Dam, Computer Graphics(latest) - Principles and Practice, , Addison-Wesley.
R	Angel, Edward. Interactive Computer Graphics- A Top-down Approach with OpenGL, Addison-Wesley,1996.
R	Computer Graphics using OpenGL F S Hill – Prentice Hall
R	Goemetric tools for Computer Graphics – Philip J. Schneider and David H. Eberly – The Morgan Kaufman series in Comptner Graphics &Modeling
R	Tom McReynolds – David Blythe “ Advanced Graphics Programming Using OpenGL” , Elsevier, 2010
R	Ralf Steinmetz and Klara “Multimedia Computing, Communications and applications”, Pearson Education,2004.
<b>COURSE PRE-REQUISITES:</b>	
MCA103	
<b>COURSE OBJECTIVES:</b>	
1. Implement the basic output primitives of graphics using Open GL. 2. Apply transformations to the basic graphics primitives. 3. Be familiar with the multimedia concepts of audio and video compression techniques.	
<b>COURSE OUTCOMES:</b>	
CO. No	Course Outcome description
MCA305.1	Provide a platform to plot the basic graphics primitives like points , lines , polygons, curves etc.
MCA305.2	Facilitate to apply both two dimensional and three dimensional transformations to images drawn.
MCA305.3	Display an image by removing all unwanted, invisible parts using clipping techniques for lines and polygons.
MCA305.4	Create 3D objects and represent those using parametric curves.
MCA305.5	Ability to develop graphics applications using Open GL and Learn the concepts of audio and video compression in multimedia.
<b>CO-PO AND CO-PSO MAPPING</b>	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA305.1	3
MCA305.2	3
MCA305.3	3
MCA305.4	3
MCA305.5	3

### Java Lab

Course Code	MCA306	Course Title	Java Lab
Course Type	Core	Contact Hours	4 Hours per Week
Credit	4	Domain	Computing
<b>Syllabus</b>			
<b>I</b>	<ul style="list-style-type: none"> <li>Program to illustrate class, objects and constructors</li> <li>Program to implement overloading, overriding, polymorphism etc.</li> </ul>		
<b>II</b>	<ul style="list-style-type: none"> <li>Program to implement the usage of packages</li> <li>Program to create user defined and predefined exception</li> <li>Program for handling file operation</li> <li>Directory manipulation in java</li> </ul>		
<b>III</b>	<ul style="list-style-type: none"> <li>Implement the concept of multithreading and synchronization</li> <li>Program to implement Generic class and generic methods</li> <li>Socket programming to implement communications</li> <li>Broadcasting program using UDP protocol</li> <li>Program for downloading web pages from the internet using URL.</li> </ul>		

<b>IV</b>	<ul style="list-style-type: none"> <li>Program to implement JDBC in GUI and Console Application</li> </ul>
<b>V</b>	<ul style="list-style-type: none"> <li>Applet program for passing parameters</li> <li>Applet program for loading an image and running an audio file</li> <li>Program for event-driven paradigm in Java</li> <li>Event driven program for Graphical Drawing Application</li> <li>Program that uses Menu driven Application</li> </ul>
<b>TEXT/REFERENCE BOOKS:</b>	
R	JAVA The Complete Reference- Patrick Naughton and Herbert Schidt.- fifth Edition Tata McGraw Hill.
R	The Complete reference J2SE - Jim Keogh – Tata McGraw Hills
R	Programming and Problem Solving With Java, Slack, Thomson Learning, 1Edn.
R	Java Programming Advanced Topics, Wigglesworth, Thomson Learning, 3Edn.
R	Java Programming, John P. Flynt , Thomson Learning, 2Edn.
R	Ken Arnold and James Gosling, The Java Programming language, Addison Wesley, 2nd Edition, 1998
R	Patrick Naughton and Herbert Schidt. The Complete Reference, JAVA fifth Edition Tata McGraw Hill.
R	Maydene Fisher, Jon Ellis, Jonathan Bruce; JDBC API Tutorial and Reference, Third Edition, Publisher: Addison-Wesley
R	Thinking java – Bruce Eckel – Pearson Education Association
<b>COURSE PRE-REQUISITES:</b>	
MCA206	
<b>COURSE OBJECTIVES:</b>	
<ol style="list-style-type: none"> <li>To Achieve an understanding of object oriented programming concepts using Java</li> <li>To provide a comprehensive coverage of Internet programming using java.</li> <li>To achieve the designing of platform independent applications</li> </ol>	
<b>COURSE OUTCOMES:</b>	
<b>CO. No</b>	<b>Course Outcome description</b>
MCA306.1	Ability to solve problems using only pure object oriented concepts
MCA306.2	Make decision to solve a problem using package, library and threads Handling Errors and Exceptions
MCA306.3	Able to develop networking applications
MCA306.4	Ability to design and develop database applications
MCA306.5	Design and develop software solutions
<b>CO-PO AND CO-PSO MAPPING</b>	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA306.1	2 2 1 2
MCA306.2	2 2 1 2
MCA306.3	2 2 2 1
MCA306.4	2 2 2 2
MCA306.5	2 2 2 2 1 3

### Graphics And Multimedia Lab

Course Code	MCA307	Course Title	Graphics And Multimedia Lab
Course Type	Core	Contact Hours	4 Hours per Week
Credit	4	Domain	Computing
Syllabus			
<b>I</b>	RASTER GRAPHICS ALGORITHMS: Line drawing algorithms, Circle drawing algorithms		
<b>II</b>	TWO DIMENSIONAL TRANSFORMATIONS: Display drawing primitives – Draw Polygon surfaces, filling with colours and applying simple transformations like Translation, Scaling, and Rotation and applying Composite transformations.		

<b>III</b>	CLIPPING: Line clipping. THREE DIMENSIONAL TRANSFORMATIONS: Creation of simple three dimensional objects like cube, cone and cylinder and applying simple transformations like Translation, Scaling, Rotation, Composite transformations
<b>IV</b>	VISIBLE SURFACE DETECTION: Finding out visible surfaces and removal of hidden surfaces in simple objects using object space and image space algorithms.
<b>V</b>	IMAGE EDITING: Image enhancement, Image transformation from colour to grey scale and vice versa, Imagemanipulation and Image optimization for web - Usage of editing tools, layers, filters, special effects and colour modes. Creation of simple Gif animated images with textual illustrations, Image Compression.
<b>TEXT/REFERENCE BOOKS:</b>	
R	Foley J.D. ,Andries van Dam, Computer Graphics(latest) - Principles and Practice, , Addison-Wesley.
R	Angel, Edward. Interactive Computer Graphics- A Top-down Approach with OpenGL, Addison-Wesley,1996.
R	Computer Graphics using OpenGL F S Hill – Prentice Hall
R	Goemetric tools for Computer Graphics – Philip J. Schneider and David H. Eberly – The Morgan Kaufman series in Compter Graphics & Modeling
R	Tom McReynolds – David Blythe “ Advanced Graphics Programming Using OpenGL” , Elsevier, 2010
R	Ralf Steinmetz and Klara “Multimedia Computing, Communications and applications”, Pearson Education, 2004.
<b>COURSE PRE-REQUISITES:</b>	
MCA103	
<b>COURSE OBJECTIVES:</b>	
1. Implement the basic output primitives of graphics using Open GL. 2. Implement transformations to the basic graphics primitives. 3. Implement the multimedia concepts of audio and video compression techniques.	
<b>COURSE OUTCOMES:</b>	
<b>CO. No</b>	<b>Course Outcome description</b>
MCA306.1	Plot the basic graphics primitives like points , lines , polygons, curves etc. using OpenGL
MCA306.2	Implement two dimensional and three dimensional transformations using OpenGL
MCA306.3	Eliminate all unwanted, invisible parts using Cohen Sutherland line clipping and Sutherland Hedgeman polygon clipping algorithm.
MCA306.4	Create 3D objects and represent those using parametric curves.
MCA306.5	Image editing and animation using Adobe Photoshop and Flash
<b>CO-PO AND CO-PSO MAPPING</b>	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA307.1	3
MCA307.2	3
MCA307.3	3
MCA307.4	2
MCA307.5	3





## Semester 4

### Internet Programming using Frame Work

Semester 4			
Course Code	MCA401	Course Title	Internet Programming using Frame Work
Course Type	Core	Contact Hours	4 Hours per Week
Credit	4	Domain	Computing
Syllabus			
I	.NET Framework: Introduction, Common Language Runtime (CLR) , MSIL, The .NET Framework Class Library Introduction to C#: structure of a c# program, data types, operators, decision making branching and looping, arrays. Object oriented programming Encapsulation, Inheritance, Polymorphism, Properties and indexers, Interfaces, Structures, Enumeration, Namespaces and Access specifiers, Partial classes, Partial methods, Delegates and Events, Attributes and Reflection.		
II	Advanced .NET: String Handling. Generics, Generic Class, Generic methods, Assemblies – private and shared Assemblies, GAC, exception handling, Multithreaded Programming, synchronization, Input / Output – Files –reading and writing– Directory manipulation. Data Base Connectivity: ADO.NET Architecture, Understanding the ConnectionObject, Building the Connection String, Understanding the CommandObject, Understanding DataReaders, Understanding DataSets and DataAdapters, DataTable, DataColumn, DataRow, Differences between DataReader Model and DataSet Model, Understanding the DataViewObject, Working with System.Data.OleDb, Using DataReaders, Using DataSets, Working with SQL.NET, Using Stored Procedures		
III	IO, Object serialization and Remoting: System.IO, Streams, TextWriter, TextReader, BinaryWirter, BinaryReader, Serialized Object Persistence and formatters, binary formatter, soap formatter, Remoting- Distributed Applications, COM/DCOM in Distributed Environment, Drawbacks of DCOM, .NET Remoting – New distributed environment, Advantages & Disadvantages, . Implementing a Simple Remoting Client and Server. Network programming: Socket programming, TCP/IP, UDP		
IV	Windows Programming: Using Textbox, Button, CheckBox, RadioButtons, ComboBox, GroupBox etc., Event handling, Handling mouse and keyboard events, Using menus and multiple windows, Adding a Tab-Control, Anchoring Controls, ListView and TreeView controls, Building an ImageList and add them to the ListView, Using details inside the ListView, Attaching a Context Menu, Adding a TreeView, Creating window services. DataBae: Windows Database Connectivity		
V	Web Applications: Introduction to Web Applications, Understanding architecture ASP.NET, Creating ASP.NET Pages – Web Forms, Working with web controls – Button, Textbox etc. ,PostBack and ViewState concepts, State Management – Cookies, Sessions and Applications, Validation controls, FileUpload, AdRotator, MultiView, Calendar etc. Web Database Connectivity: sqldatasource-insert, delete, update, report generation. Concept of Master pages and web services.		
TEXT/REFERENCE BOOKS:			
R	C# 2012 Programming, Covers .Net 4.5, Black Book		
R	Professional .NET programming - wrox publication		
R	Professional ASP.NET 4.5 in C# - Jason N. Gaylord (Author), Christian Wenz (Author), Pranav Rastogi (Author), Todd Miranda (Author),		
R	Professional C# Web Services: Building .NET Web Services with ASP .NET and• .NET Remoting - Zach Greenvoss and Christian Nagel		
COURSE PRE-REQUISITES:			
MCA203			
COURSE OBJECTIVES:			
1. To Achieve an understanding of the goals and objectives of the .NET Framework			
2. To provide a working knowledge of the C# programming language			
3. To achieve an understanding of how to use forms to develop GUI programs under .NET			
COURSE OUTCOMES:			

CO. No	Course Outcome description															
MCA401.1	Ability to solve problems using only pure object oriented concepts and frameworks															
MCA401.2	Ability to design and develop database applications															
MCA401.3	Able to develop networking and distributed applications															
MCA401.4	Ability to design GUI applications															
MCA401.5	Design and develop Web applications															
CO-PO AND CO-PSO MAPPING																
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
MCA401.1	2	2	1								2	2		2		
MCA401.2	2	2	1		2						2	2		2		
MCA401.3	2	2	2								2	2			1	
MCA401.4	2	2	2		2						2	2				
MCA401.5	2	2	2		2		1				2	2		3		

### Artificial Intelligence

Course Information			
Course Code	MCA402	Course Title	Artificial Intelligence
Course Type	Core	Contact Hours	4 Hours per Week
Credit	4	Domain	Professional Core
Syllabus			
I	Introduction - Overview of AI applications. Introduction to representation and search. The Propositional calculus, Predicate Calculus, Using Inference Rules to produce Predicate Calculus expressions, Application – A Logic based financial advisor.		
II	Introduction to structure and Strategies for State Space search, Graph theory, Strategies for state space search, Using the State Space to Represent Reasoning with the Predicate calculus (Sate space description of a logical system, AND/OR Graph). Heuristic Search : introduction, Hill-Climbing and Dynamic Programming, The Best-first Search Algorithm, Admissibility, Monotonicity and informedness, Using Heuristics in Games.		
III	Building Control Algorithm for Statespace search – Introduction, Production Systems, The blackboard architecture for Problem solving. Knowledge Representation – Issues, History of AI representational schemes, Conceptual Graphs, Alternatives to explicit Representation, Agent based and distributed problem solving.		
IV	Strong Method Problem Solving – Introduction, Overview of Expert System Technology, Rule Based Expert system, Model -Based, Case-Based and Hybrid Systems (Introduction to Model based reasoning, Introduction to Case Based Reasoning, Hybrid design), Introduction to Planning. Reasoning in Uncertain Situation – introduction, logic based Adductive Inference. Introduction to PROLOG , Syntax for predicate Calculus programming, ADTs, A production system example.		
V	Machine Learning: Symbol Based – Introduction, Frame –work. The ID3 Decision tree Induction algorithm. Inductive bias and Learnability, Knowledge and Learning, Unsupervised learning, Reinforcement Learning, Machine Learning : Connectionist – Introduction, foundations, Perceptron learning. Machine learning: Social and emergent: Models, The Genetic Algorithm, Artificial Life and Social based Learning.		
TEXT/REFERENCE BOOKS:			
R	George F Luger, Artificial Intelligence – Structures and Strategies for Complex probel solving, 5thEdn, pearson.		
R	E. Rich, K. Knight, S B Nair, Artificial intelligence, 3rdEdn, McGraw Hill.		
R	S. Russel and p. Norvig, Artificial intelligence – A Modern Approach, 3rdEdn, Pearson		
R	D W Patterson, introduction to Artificial Intelligence and Expert Systems, PHI, 1990		
R	Nilsson N.J., Artificial Intelligence - A New Synthesis, Harcourt Asia Pvt. Ltd.		
COURSE PRE-REQUISITES:			

MCA103 MCA301	
<b>COURSE OBJECTIVES:</b>	
1. The objective of the course is to present an overview of artificial intelligence (AI) principles and approaches. 2. Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents: Search, Knowledge representation, inference, logic, and learning	
<b>COURSE OUTCOMES:</b>	
<b>CO. No</b>	<b>Course Outcome description</b>
MCA402.1	Build an understanding of AI principles
MCA402.2	Apply the concepts of Search heuristics
MCA402.3	Understand knowledge representation
MCA402.4	To gain knowledge of Expert systems and reasoning techniques
MCA402.5	To understand machine learning algorithms
<b>CO-PO AND CO-PSO MAPPING</b>	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA402.1	3 2 3 3 1
MCA402.2	3 2 2 1
MCA402.3	3 2 3 1
MCA402.4	3 2 3 1
MCA402.5	3 2 2 1

### Information Security

Information Security			
Course Code	MCA403	Course Title	Information Security
Course Type	Core	Contact Hours	4 Hours per Week
Credit	4	Domain	Professional Core
Syllabus			
I	Mathematical Foundations of Information Security - Abstract Algebra Fundamentals of Abstract Algebra : Groups, Rings, Fields, Modular Arithmetic, Euclidean Algorithm, Finite Fields of the form GF(p),Polynomial Arithmetic, Finite Fields of the form GF(2n)		
II	Mathematical Foundations of Information Security - Number Theory Introduction to Number Theory: Prime Numbers, Fermat's and Euler's Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms		
III	Private Crypto – Systems. Introduction to Cryptography, Classical Encryption techniques, Block Ciphers and Data Encryption Standard. Advanced Encryption Standard, Multiple Encryption and Triple DES, Block Cipher Modes of operation, Stream Ciphers and RC4, Confidentiality using Symmetric Encryption,		
IV	Public Cryptosystems Public-Key Cryptography and RSA Key Management, Diffie-Hellman Key Exchange, Elliptic Curve Arithmetic, Elliptic Curve Cryptography		
V	Authentication and hash functions Authentication requirements - Authentication functions - Message Authentication Codes - Hash Functions, Security of Hash Functions and MACs - MD5 message Digest algorithm - Secure Hash Algorithm - Authentication Protocols - Digital Signature Standard		
TEXT/REFERENCE BOOKS:			
R	K.H. Rosen," Elementary Number Theory", Addison-Wesley, ISBN 0-441-57889-1		
R	Elementary Number Theory William Stein October 2005		
R	Introduction to Modern Cryptography Mihir Bellare1 Phillip ogaway May 11, 2005		
R	Handbook of applied cryptography, by A. Menezes, P. Van Oorschot, and S. Vanstone, CRC Press, 1996.		
R	Stallings, W., Cryptography and Network Security. Principles and Practice, 4th edition, Prentice Hall.		
COURSE PRE-REQUISITES:			
MCA302			
COURSE OBJECTIVES:			

1. To understand the fundamentals of Cryptography 2. To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity. 3. To understand the various key distribution and management schemes.	
<b>COURSE OUTCOMES:</b>	
<b>CO. No</b>	<b>Course Outcome description</b>
MCA403.1	Understand the basics of abstract algebra and modular arithmetic.
MCA403.2	Understand the applications of number theory in security.
MCA403.3	Encrypt and decrypt messages using block ciphers.
MCA403.4	Understand the working of RSA algorithm and Diffie-Hellman key exchange.
MCA403.5	To be familiar with authentication and hash functions.
<b>CO-PO AND CO-PSO MAPPING</b>	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA403.1	3 2 1
MCA403.2	1 3 2
MCA403.3	3 2
MCA403.4	2 3
MCA403.5	3 3

### Internet Programming Lab using Frame Work

Course Code	MCA406	Course Title	Internet Programming Lab using Frame Work
Course Type	Core	Contact Hours	4 Hours per Week
Credit	1	Domain	Computing
Syllabus			
<b>I</b>	➤ Introduction <ul style="list-style-type: none"> <li>Structure of c# program</li> <li>Compilation and execution of a c# program</li> <li>Control structures</li> <li>Array one dimensional and two dimensional implementations</li> <li>Three types of parameter passing mechanisms.</li> <li>Functions and recursions</li> </ul> ➤ Object oriented program for <ul style="list-style-type: none"> <li>Polymorphism using class and interfaces</li> <li>Inheritance</li> <li>Properties and indexes</li> <li>Delegates, events and reflections</li> <li>Partial classes and methods</li> </ul>		
<b>II</b>	➤ Threading <ul style="list-style-type: none"> <li>Creation</li> <li>Multithreading</li> <li>Synchronization</li> </ul> ➤ File handling and Directories <ul style="list-style-type: none"> <li>File reading, writing and copying</li> <li>Directory operations</li> </ul>		
<b>III</b>	➤ Assembly <ul style="list-style-type: none"> <li>Concept of dll</li> <li>Private assembly</li> <li>Shared assembly</li> </ul>		

	<ul style="list-style-type: none"><li>➤ Data base<ul style="list-style-type: none"><li>○ All operations console based</li><li>○ Using assemblies</li></ul></li></ul>															
IV	<ul style="list-style-type: none"><li>➤ Remoting and Client Server programming<ul style="list-style-type: none"><li>○ Distributed applications</li><li>○ Remoting database application</li><li>○ Client server</li><li>○ Broadcasting</li></ul></li><li>➤ Windows applications<ul style="list-style-type: none"><li>○ Forms and controls</li><li>○ Windows database connectivity</li><li>○ Windows services</li></ul></li></ul>															
V	<ul style="list-style-type: none"><li>➤ Web applications<ul style="list-style-type: none"><li>○ Post and get</li><li>○ View state, Session, cookie and application</li><li>○ Web database</li><li>○ Web service</li><li>○ Master pages</li></ul></li></ul>															
<b>TEXT/REFERENCE BOOKS:</b>																
R	C# 2012 Programming, Covers .Net 4.5, Black Book															
R	Professional .NET programming - wrox publication															
R	Professional ASP.NET 4.5 in C# - Jason N. Gaylord (Author), Christian Wenz (Author), Pranav Rastogi (Author), Todd Miranda (Author)															
R	Professional C# Web Services: Building .NET Web Services with ASP .NET and .NET Remoting - Zach Greenvoss and Christian Nagel															
<b>COURSE PRE-REQUISITES:</b>																
MCA206																
<b>COURSE OBJECTIVES:</b>																
<ul style="list-style-type: none"><li>1. Ability to solve problem using C# programming language and .NET Framework.</li><li>2. Ability to use forms to develop GUI programs under .NET.</li><li>3. Ability to use the tools available in the .NET Framework class library. (FCL)</li></ul>																
<b>COURSE OUTCOMES:</b>																
<b>CO. No</b>	<b>Course Outcome description</b>															
MCA406.1	Ability to solve problems using only pure object oriented concepts and frameworks															
MCA406.2	Ability to design and develop database applications															
MCA406.3	Able to develop networking and distributed applications															
MCA406.4	Ability to design GUI applications															
MCA406.5	Design and develop Web applications															
<b>CO-PO AND CO-PSO MAPPING</b>																
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4															
MCA406.1	2 2 1										2	2	2			
MCA406.2	2 2 1			2								2	2	2		
MCA406.3	2 2 2											2	2	1		
MCA406.4	2 2 2			2								2	2			
MCA406.5	2 2 2			2			1					2	2	3		

### Mini project Using PHP

Mini project using PHP																	
Course Code	MCA407					Course Title	Mini project using PHP										
Course Type	Core					Contact Hours	6 Hours per Week										
Credit	2					Domain	Computing										
Syllabus																	
I	PHP Basics- Syntax, Operators, Variables, Constants, Control Structures, Language Constructs and Functions. Functions- Syntax, Arguments, Variables, References, Returns, Variable Scope, Arrays- Enumerated Arrays, Associative Arrays, Array Iteration, Multi-Dimensional Arrays, Array Functions																
II	Web Features- Sessions, Forms, GET and POST data, Cookies, HTTP Headers Databases and SQL - SQL, Joins, Analyzing Queries, Prepared Statements, Transactions																
III	Object Oriented Programming- Instantiation, Modifiers/Inheritance, Interfaces, Exceptions, Static Methods & Properties, Autoload, Reflection, Type Hinting, Class Constants.																
IV	Streams and Network Programming- Files, Reading, Writing, File System Functions																
V	UML Basics, Code Ignitor Framework																
COURSE OUTCOMES:																	
CO. No	Course Outcome description																
MCA407.1	To understand and implement a requirement study and feasibility assessments of a given system.																
MCA407.2	To facilitate the preparation of an SRS detailing the project management concepts, techniques and issues related to implementation.																
MCA407.3	To describe analysis and design methodologies.																
MCA407.4	To develop a real time system with adequate software project planning and tracking																
MCA407.5	To perform adequate testing and further, implement the system using PHP																
CO-PO AND CO-PSO MAPPING																	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
MCA407.1	1	2					2					2			2		
MCA407.2	1	2					2					3			2		
MCA407.3	2	2					3					3			2		
MCA407.4	2	2					3					3			2		
MCA407.5	2	2					2					3			2		



## Semester 5

### Data Mining

Course Code	MCA501	Course Title	Data Mining
Course Type	Core	Contact Hours	4 Hours per Week
Credit	4	Domain	Professional Core
Syllabus			
I	<b>Introduction</b> Data Warehousing, Multidimensional Data Model, OLAP Operations, Introduction to KDD process, Data mining, Data mining -On What kinds of Data, Data mining Functionalities, Classification of Data Mining Systems. <b>Data Preprocessing</b> Data Cleaning, Data Integration and Transformation, Data Reduction, Data discretization and concept hierarchy generation		
II	<b>Exploring Data and Visualization Techniques</b> General Concepts, Techniques, Visualizing Higher Dimensional Data, Tools <b>Association Analysis</b> Basic Concepts, Efficient and Scalable Frequent Item set Mining Methods:Apriori Algorithm, generating association Rules from Frequent Item sets, Improving the Efficiency of Apriori. Mining Frequent item-sets without Candidate Generation, Evaluation of Association Patterns, Visualization. A Case Study on Association using Orange Tool		
III	<b>Classification</b> Introduction to Classification and Prediction, Classification by Decision Tree Induction: Decision Tree induction, Attribute Selection Measures, Tree Pruning, Bayesian Classification: Bayes' theorem, Naïve Bayesian Classification, Rule Based Algorithms: Using If - Then rules of Classification, Rule Extraction from a Decision Tree, Rule Induction Using a Sequential Covering algorithm, K- Nearest Neighbour Classifiers, Support Vector Machine. Evaluating the performance of a Classifier, Methods for comparing classifiers, Visualization. A Case Study on Classification using Orange Tool		
IV	<b>Prediction</b> Linear Regression, Nonlinear Regression, Other Regression-Based Methods <b>Cluster Analysis I:</b> Basic Concepts and Algorithms Cluster Analysis, Requirements of Cluster Analysis' Types of Data in Cluster Analysis, Categorization of Major Clustering Methods, Partitioning Methods: k-Means and k-Medoids, From K-Medoids to CLARANS A Case Study on Clustering using Orange Tool.		
V	<b>Cluster Analysis II:</b> Hierarchical Method: Agglomerative and Divisive Hierarchical Clustering. Comparison of data mining methods. Applicability of data mining methods for different scenarios. Considerations for mining unstructured data.		
TEXT/REFERENCE BOOKS:			
R	Pang-Ning Tan, Michael Steinbach, Vipin Kumar, 'Introduction to Data Mining'		
R	Data Mining Concepts and Techniques – Jiawei Han and MichelineKamber, Second Edition, Elsevier, 2006		
R	G. K. Gupta, "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.		
R	Making sense of Data: A practical guide to exploratory Data Analysis and Data Mining- Glenn J Myatt		
COURSE PRE-REQUISITES:			
MCA101, MCA 104			
COURSE OBJECTIVES:			
1. Acquire knowledge in Data mining and warehousing 2. Learn the different techniques for discovery of patterns hidden in large data sets and their Visualizations			



3. Learn data mining tasks such as classification, estimation, prediction, affinity grouping and clustering.

**COURSE OUTCOMES:**

CO. No	Course Outcome description
MCA501.1	To introduce the students, the basic concepts and techniques of Data mining and Warehousing and data pre-processing.
MCA501.2	Understand association mining algorithms for discovery of frequent item patterns in large data sets and their Visualizations
MCA501.3	Understand classification analysis algorithms for discovery and generation of rules in large data sets and their Visualizations
MCA501.4	Understand basic and advanced clustering analysis algorithms and Visualizations in Data Mining.

**CO-PO AND CO-PSO MAPPING**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
MCA501.1	3	2		1									2			
MCA501.2	1	1		1									1			
MCA501.3	1	1		1									1			
MCA501.4	1	1		1									1			

**Linux Administration, Management And Networking**

Course Code	MCA502	Course Title	Linux Administration, Management And Networking
Course Type	Core	Contact Hours	4 Hours per Week
Credit	4	Domain	Computing
Syllabus			
<b>I</b>	Installation and Configuration Duties of System Administrator, Standard Installation: Exploring Components, checking supported Hardware, Creating the Boot Disk, Starting the Installation, Partitioning the Hard Disk, Using Disk Druid, Configuring the Installation, Package Installation. System Start-up and Shutdown: Examining the boot process, Exploring Run-levels, Starting Programs at System Boot, Shutting down the System, GRUB Configuration. The File System Explained: Understanding File System Structure, Working with Linux File System, Memory and Virtual File System, Linux Disk Management, Linux Commands-Basic commands, redirection, filters.		
<b>II</b>	Shell Scripting- introduction to shells, editors, programming constructs, variables. Scripting. Expanding the System -Installing and Upgrading Software Packages: Using Package Manager, Checking versions, Obtaining newer software, Installing software from source. Hardware Device Installation, Device Information, udev, Device Files		
<b>III</b>	Linux Management -I Configuring System at the Command Line: Managing Processes, Maintaining the File System, Time Keeping, Automating Scripts using at and cron jobs. Administering Users and Groups: Administering User Accounts, Working with Group Accounts, Understanding the Root Account, Implementing Sudo, Using File System Quotas		
<b>IV</b>	Linux Management-II Backing Up and Restoring the File System: Creating a Backup Plan, Choosing Media for backup Understanding Backup Methods, Using Backup Tools – Command line tools, Performance Monitoring: Tools, Measuring Memory Usage, Viewing Running Tasks using ps and top, Monitoring I/O Activity, Using sar.		
<b>V</b>	Networking Network File System: NFS Overview, NFS, Installation, Configuring NFS Server, Configuring NFS Client, Using Auto mount Services. Network Information System: Understanding, Planning and Configuring NIS Server and NIS Client. Installing Samba, Creating Samba Users, Starting Samba Server and Connecting to Samba Client. Configuring BIND: DNS-Understanding DNS, configuring server files, Checking the configuration. Configuring Sendmail. Configuring FTP Services.		

<b>TEXT/REFERENCE BOOKS:</b>	
R	Linux Bible, 9th Edition, Christopher Negus, 2015
R	Collings Terry and Wall Kurt, Red Hat Linux Networking & System Administration, Wiley Indian, 3rd Edition, reprint 2009.
R	Petersen Richard, The Complete Reference: Fedora 7 & Red Hat Enterprise Linux, Tata McGraw Hill Edition, 2007.
R	Richard Peterson, Redhat 6: Desktop and Administration, Surfing Turtle press, 2010.
R	Soyinka Wale, Linux Administration: A Beginner's Guide, 5th Edition, 2008.
R	Linux – A practical Approach – B. Mohammed Ibrahim – Firewall Media Publications.
<b>COURSE PRE-REQUISITES:</b>	
MCA202	
<b>COURSE OBJECTIVES:</b>	
To provide students with concepts of Linux administration, management, and networking.	
<b>COURSE OUTCOMES:</b>	
CO. No	Course Outcome description
MCA502.1	To introduce the configuration and file system of a Linux OS
MCA502.2	To Design and implement programs with shell scripts
MCA502.3	To Familiarize with Linux administrative roles and settings
MCA502.4	To check and monitor performance of Linux systems
MCA502.5	To introduce Linux networking
<b>CO-PO AND CO-PSO MAPPING</b>	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA502.1	1 3 2
MCA502.2	1 3 2
MCA502.3	1 2 3
MCA502.4	1 2 3
MCA502.5	1 2 3

### Parallel Programming

Course Code	MCA503	Course Title	Parallel Programming
Course Type	Core	Contact Hours	4 Hours per Week
Credit	4	Domain	Professional Core
<b>Syllabus</b>			
<b>I</b>	Parallel Architectures Interconnection Networks- 2D Mesh-Binary Tree-Hyper Tree-Butterfly Network-Hyper Cube Network-Shuffle- Exchange Network, Processor Arrays, Multiprocessors- Centralized- Distributed, Multicomputers- Asymmetrical- Symmetrical, Flynn's Taxonomy- SISD, SIMD, MISD, MIMD. Pipelining, Multi Core Architectures.		
<b>II</b>	Parallel Algorithm Design Task/Channel Model, Foster's Design Methodology, Boundary Value Problem, Finding the maximum, n-body problem, Parallelism- Data Level, Instruction level, Thread Level, Cache Coherence-Directory based Protocol.		
<b>III</b>	Shared Memory Model in parallel Programming, Fork- Join Concept, OpenMP- Pragma- Parallel for-private-firstprivate-lastprivate-critical-reduction-inverting loop- conditionally executing loop-scheduling loop- single-nowait-section, omp_get_thread_num, omp_get_num_threads Sieve of Eratosthenes, Floyd's algorithm, matrix vector multiplication		
<b>IV</b>	Message passing Model, MPI, MPI_Init, MPI_Finalize, MPI_comm_rank, MPI_comm_Size, MPI_reduce, MPI_Wtime, MPI_Circuit satisfiability. Performance Analysis- Speedup and efficiency, Amdahl's Law, Gustafson-Barsis's Law, Karp-Flat Metric, Isoefficiency Metric		
<b>V</b>	Basics of CUDA- introduction to GPU, heterogeneous computing, Introduction to CUDA Threads.		

<b>TEXT/REFERENCE BOOKS:</b>	
R	Shameem Akhter and Jason Roberts, "Multi-core Programming", Intel Press, 2006.
R	Michael J Quinn, Parallel programming in C with MPI and OpenMP, Tata Macgraw Hill, 2003.
R	John L. Hennessey and David A. Patterson, "Computer architecture – A quantitative approach", Morgan Kaufmann/Elsevier Publishers, 4th. Edition, 2007.
R	David E. Culler, Jaswinder Pal Singh, "Parallel computing architecture: A hardware/software approach", Morgan Kaufmann/Elsevier Publishers, 1999.
R	Parallel Programming with MPI By Peter S. Pacheco
R	Using MPI: Portable Parallel Programming with the Message-Passing Interface, By William Gropp, Ewing Lusk, Anthony Skjellum
Web R	<a href="https://www.tutorialspoint.com/cuda/index.htm">https://www.tutorialspoint.com/cuda/index.htm</a>
Web R	<a href="https://www.nvidia.com/docs/IO/116711/sc11-cuda-c-basics.pdf">https://www.nvidia.com/docs/IO/116711/sc11-cuda-c-basics.pdf</a>
<b>COURSE PRE-REQUISITES:</b>	
MCA102, MCA103	
<b>COURSE OBJECTIVES:</b>	
To give an overview of 1. modern parallel computer architectures and parallel processing techniques and their applications from basic concepts to state-of-the-art computer systems. 2. fundamentals, design complexity, power, and reliability at all levels 3. basic parallel programming concepts using OpenMP, MPI and CUDA	
<b>COURSE OUTCOMES:</b>	
CO. No	Course Outcome description
MCA503.1	To comprehend the working of the parallel architectures
MCA503.2	To parallel solve complex problems using task/channel model
MCA503.3	To implement shared memory model in parallel programs
MCA503.4	To implement Message passing model in parallel programs.
MCA503.5	To learn and implement Basic programs in CUDA
<b>CO-PO AND CO-PSO MAPPING</b>	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA503.1	1 2
MCA503.2	2 3
MCA503.3	2
MCA503.4	3 3
MCA503.5	3

### Linux Lab

Course Code	MCA506	Course Title	Linux Lab
Course Type	Core	Contact Hours	4 Hours per Week
Credit	4	Domain	Computing
Syllabus			
I	Installation and Configuration of Linux, Linux Commands- Basic commands, redirection, filters.		
II	Shell Scripting- introduction to shells, editors, programming constructs, variables. Scripting .		
III	Automating Scripts using at and cron jobs.Administering Users and Groups: Implementing Sudo		
IV	Backing Up and Restoring the File System Viewing Running Tasks using ps and top, Monitoring I/O Activity, Using sar.		
V	Network File System: NFS Overview, NFS, Installation		
TEXT/REFERENCE BOOKS:			
R	Linux Bible, 9th Edition, Christopher Negus, 2015		
R	Collings Terry and Wall Kurt, Red Hat Linux Networking & System Administration, Wiley Indian, 3rd Edition, reprint 2009.		

R	Petersen Richard, The Complete Reference: Fedora 7 & Red Hat Enterprise Linux, Tata McGraw Hill Edition, 2007.
R	Richard Peterson, Redhat 6: Desktop and Administration, Surfing Turtle press, 2010.
R	Soyinka Wale, Linux Administration: A Beginner's Guide, 5th Edition, 2008.
<b>COURSE PRE-REQUISITES:</b>	
MCA202	
<b>COURSE OBJECTIVES:</b>	
To provide students with practical concepts of Linux administration, management, and networking.	
<b>COURSE OUTCOMES:</b>	
<b>CO. No</b>	<b>Course Outcome description</b>
MCA506.1	To introduce the configuration and file system of a Linux OS. Command knowledge
MCA506.2	To Design and implement programs with shell scripts
MCA506.3	To Familiarize with Linux administrative roles and settings
MCA506.4	To check and monitor performance of Linux systems
MCA506.5	To introduce Linux networking
<b>CO-PO AND CO-PSO MAPPING</b>	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA506.1	3 1 2
MCA506.2	3 2 2
MCA506.3	1 2 2 3
MCA506.4	1 2 1 3
MCA506.5	1 2 1 3

### Data Mining Using R

Data Mining Using R			
Course Code	MCA507	Course Title	Data Mining Using R
Course Type	Core	Contact Hours	4 Hours per Week
Credit	4	Domain	Computing
Syllabus			
I	Introduction to R, Familiarization of R Studio, Basic components in R Studio. R Syntax and programming - Variables & Operators, Vectors, List, Matrices & Arrays, Factors, Data Frames & Functions Reading data using R - Basic read write operations. Understanding exploratory functions to cover Summary & Structure of data, data behavioural description using measures of central tendency and measures of dispersion.		
II	Random samples: How to generate random numbers. Study how to select a random sample with replacement from normal and uniform distribution. Probability Distributions: Demonstration of CDF and PDF uniform and normal, binomial Poisson distributions.		
III	Functions used for cleaning data - handling messy data and missing data -Components of a good visualization, objective of visualizations, Basic charts and their purpose - pie, bar and histogram. Boxplot and its importance, Scatterplot and its importance. Understanding ggplot2 package, functions in ggplot2 and usage of quickplot and ggplot2 functions.		
IV	Data visualization (ggplot2 package), shiny package with examples		
V	Description of supervised modelling technique. Family of Regressions SLR, BLR, MLR Modelling- Decision Tree- Random Forest. Description of unsupervised modelling techniques, Clustering Concept – K Means Clustering, Association Rules- ARM Concept – Apriori.		
TEXT/REFERENCE BOOKS:			
R	Dr. Mark Gardener, "Beginning R: The Statistical Programming Language", Wiley (2013)		
R	Gnuu PSPP Team, "GNU PSPP Reference Manual", Samurai Media Limited (2015)		
R	Jared P Lander, "R for everyone", Pearson education, 1st Edition (2014).		
COURSE PRE-REQUISITES:			
MCA103 MCA 501			





## Specialization Tracks

## Data Science

### Data Warehousing

Course Code	MCA411	Course Title	Data Warehousing
Course Type	Specialization	Contact Hours	4 Hours per Week
Credit	4	Domain	Knowledge Engineering track
Syllabus			
I	Introduction to Data Warehouse: Basic elements of the Data Warehouse: Source System-Data staging Area-Presentation Server-Dimensional Model-Business process-Data Mart-Data warehouse. Data Warehouse Design: The case for dimensional modelling – Putting Dimensional modelling together: the data warehouse bus architecture – Basic dimensional modelling techniques.		
II	Data Warehouse Architecture: The value of architecture – An architectural framework and approach – Technical architecture overview – Back room data stores – Back room services. Back Room Services. Data Staging: Data staging overview – Plan effectively – Dimension Table staging – Fact Table loads and warehouse operations – Data quality and cleansing – issues.		
III	Metadata: Metadata, metadata interchange initiative, metadata repository, metadata management, implementation examples, metadata trends, reporting and query tools and applications- tool categories, the need for applications. OLAP: Operational Data Store-OLAP: ROLAP, MOLAP and HOLAP. Need for OLAP, multidimensional data model, OLAP guidelines, multidimensional versus multi relational OLAP, categorization of OLAP tools.		
IV	Building a data warehouse: Business considerations, Design considerations, technical considerations, implementation considerations, integrated solutions, benefits of data warehousing, Relational data base technology for data warehouse, database architectures for parallel processing, parallel RDBMS features, alternative technologies		
V	DBMS schemas for decision support :Data layout for best access, multidimensional data model, star schema, STARjoin and STARindex, bitmapped indexing, column local storage, complex data types, Data extraction, clean up and transformation tools-tool requirements, vendor approaches, access to legacy data, vendor solutions, transformation engines		
TEXT/REFERENCE BOOKS:			
R	Kimball Ralph,Reeves,Ross,Thronthwaite ,”The Data warehouse lifecycle toolkit”, Wiley India, 2nd Edition, 2006.		
R	Berson Alex, Stephen J Smith, “Data Warehousing, Data Mining and OLAP”,TATA McGraw-Hill, 13th reprint 2008.		
R	SoumendraMohanty,” Data Warehousing design,development and Best practices”,TATA McGraw-Hill, 4th reprint 2007.		
COURSE PRE-REQUISITES:			
MCA104			
COURSE OBJECTIVES:			
To understand the fundamentals, architecture, design and building of a data warehouse.			
COURSE OUTCOMES:			
CO. No	Course Outcome description		
MCA411.1	Understand the fundamentals of data warehouse and its elements		
MCA411.2	Understand the basic architecture of a data warehouse and data staging		
MCA411.3	Understand metadata and its management and Multidimensional data models, operations, OLAP, ROLAP, MOLAP.		
MCA411.4	Understand designing and building of data warehouse		
MCA411.5	Understand data layout for best access in multidimensional data model and data pre-processing tools.		
CO-PO AND CO-PSO MAPPING			
	PO1	PO2	PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4



MCA411.1	1	3
MCA411.2	2	3
MCA411.3	3	3
MCA411.4	3	3
MCA411.5	3	3

### Digital Image Processing

Course Code	MCA412	Course Title	Digital Image Processing
Course Type	Specialization	Contact Hours	4 Hours per Week
Credit	4	Domain	Knowledge Engineering track
Syllabus			
I	Fundamentals of Image Processing: Introduction – Elements of visual perception, Steps in Image Processing Systems, image Acquisition – Sampling and Quantization – Pixel Relationships – Colour Fundamentals and Models, File Formats. Introduction to the Mathematical tools.		
II	Image Enhancement and Restoration : Spatial Domain Gray level Transformations Histogram Processing Spatial Filtering – Smoothing and Sharpening. Frequency Domain: Filtering in Frequency Domain – DFT, FFT, DCT, Smoothing and Sharpening filters – Homomorphic Filtering., Noise models, Constrained and Unconstrained restoration models.		
III	Image Segmentation and Feature Analysis: Detection of Discontinuities – Edge Operators – Edge Linking and Boundary Detection – Thresholding – Region Based Segmentation – Motion Segmentation, Feature Analysis and Extraction.		
IV	Multi Resolution Analysis and Compressions: Multi Resolution Analysis: Image Pyramids – Multi resolution expansion – Wavelet Transforms, Fast Wavelet transforms, Wavelet Packets. Image Compression: Fundamentals – Models – Elements of Information Theory – Error Free Compression – Lossy Compression – Compression Standards – JPEG/MPEG.		
V	Applications of Image Processing: Representation and Description, Image Recognition- Image Understanding – Image Classification – Video Motion Analysis – Image Fusion – Steganography – Colour Image Processing.		
TEXT/REFERENCE BOOKS:			
R	Rafael C.Gonzalez and Richard E.Woods, “Digital Image Processing”, Third Edition,		
R	Pearson Education, 2008.		
R	Milan Sonka, Vaclav Hlavac and Roger Boyle, “Image Processing, Analysis and		
R	Machine Vision”, Third Edition, Third Edition, Brooks Cole, 2008.		
R	Anil K.Jain, “Fundamentals of Digital Image Processing”, Prentice-Hall India, 2007.		
R	Madhuri A. Joshi, ‘Digital Image Processing: An Algorithmic Approach”, Prentice-		
R	Hall India, 2006.		
R	Rafael C.Gonzalez , Richard E.Woods and Steven L. Eddins, “Digital Image		
R	Processing Using MATLAB”, First Edition, Pearson Education, 2004.		
COURSE PRE-REQUISITES:			
Degree level mathematics, Basics of digital signal processing			
COURSE OBJECTIVES:			
1. To study the image fundamentals and mathematical transforms necessary for image processing			
2. processing.			
3. To study the image enhancement techniques			
4. To study image restoration techniques.			
5. To study the image compression procedures.			
6. To study various applications of digital image processing			
COURSE OUTCOMES:			
CO. No	Course Outcome description		
MCA412.1	Review the fundamental concepts of a digital image processing system and Analyze images in the frequency domain using various transforms.		



MCA412.2	Evaluate the techniques for image enhancement and image restoration.															
MCA412.3	Categorize various compression techniques and Interpret Image compression standards.															
MCA412.4	Interpret imagesegmentation and representation techniques.															
MCA412.5	Understand various image processing applications															
CO-PO AND CO-PSO MAPPING																
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
MCA412.1	3			3									3			
MCA412.2	2			3									3			
MCA412.3	2			3									3			
MCA412.4	2			3									3			
MCA412.5	2			3									3			
MCA412.6					3											

## Soft Computing

Soft Computing																
Course Code	MCA 413	Course Title	Soft Computing													
Course Type	Specialization	Contact Hours	4 Hours per Week													
Credit	4	Domain	Knowledge Engineering Track													
Syllabus																
I	Fuzzy Logic: Crisp set and Fuzzy set, Basic concepts of fuzzy sets, membership functions. Basic operations on fuzzy sets, Properties of fuzzy sets, Fuzzy relations.															
II	Propositional logic and Predicate logic, fuzzy If – Then rules, fuzzy mapping rules and fuzzy implication functions, Applications.															
III	Neural Networks: Basic concepts of neural networks, Neural network architectures, Learning methods, Architecture of a back propagation network, Applications.															
IV	Genetic Algorithms: Basic concepts of genetic algorithms, encoding, genetic modelling.															
V	Hybrid Systems: Integration of neural networks, fuzzy logic and genetic algorithms.															
TEXT/REFERENCE BOOKS:																
R	S. Rajasekaran and G.A.VijaylakshmiPai.. Neural Networks Fuzzy Logic, and Genetic Algorithms, Prentice Hall of India.															
R	K.H.Lee.. First Course on Fuzzy Theory and Applications, Springer-Verlag.															
R	J. Yen and R. Langari.. Fuzzy Logic, Intelligence, Control and Information, Pearson Education.															
COURSE PRE-REQUISITES:																
Degree Level Mathematics																
COURSE OBJECTIVES:																
To introduce the concepts in soft computing such as Fuzzy logic based systems, Artificial Neural Networks, genetic algorithm based systems and their hybrids																
COURSE OUTCOMES:																
CO. No	Course Outcome description															
MCA413.1	Learn about soft computing techniques and their applications															
MCA413.2	Define the fuzzy systems															
MCA413.3	Analyse various neural network architectures															
MCA413.4	Understand the genetic algorithm concepts and their applications															
MCA413.5	Identify and select a suitable soft-computing technology to solve a problem, construct a solution and implement a soft-computing solution															
CO-PO AND CO-PSO MAPPING																
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
MCA413.1	3			3									3			
MCA413.2	2			3									3			

MCA413.3	2	3	3
MCA413.4	2	3	3
MCA413.5	2	3	3

## Big Data Analytics

Big Data Analytics			
Course Code	MCA 511	Course Title	Big Data Analytics
Course Type	Specialization	Contact Hours	4 Hours per Week
Credit	4	Domain	Knowledge Engineering Track
Syllabus			
I	INTRODUCTION TO BIG DATA Introduction to BigData Platform – Traits of Big data -Challenges of Conventional Systems - Web Data – Evolution Of Analytic Scalability - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions – ReSampling - Statistical Inference - Prediction Error.		
II	DATA ANALYSIS Regression Modelling - Multivariate Analysis - Bayesian Modelling - Inference and Bayesian Networks - Support Vector and Kernel Methods - Analysis of Time Series: Linear Systems Analysis - Nonlinear Dynamics - Rule Induction - Neural Networks: Learning And Generalization - Competitive Learning - Principal Component Analysis and Neural Networks - Fuzzy Logic: Extracting Fuzzy Models from Data - Fuzzy Decision Trees - Stochastic Search Methods.		
III	MINING DATA STREAMS Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.		
IV	FREQUENT ITEMSETS AND CLUSTERING Mining Frequent Itemsets - Market Based Model – Apriori Algorithm – Handling Large Data Sets in Main Memory – Limited Pass Algorithm – Counting Frequent Itemsets in a Stream – Clustering Techniques – Hierarchical – K-Means – Clustering High Dimensional Data – CLIQUE And PROCLUS – Frequent Pattern based Clustering Methods – Clustering in Non Euclidean Space – Clustering for Streams and Parallelism.		
V	FRAMEWORKS AND VISUALIZATION MapReduce – Hadoop, Hive, MapR, Hadoop Distributed File Systems – Visualizations - Visual Data Analysis Techniques - Interaction Techniques; Systems and Analytics Applications - Analytics using Statistical packages-Approaches to modeling in Analytics – correlation, regression, decision trees, classification, association intelligence from unstructured information-Text analytics		
TEXT/REFERENCE BOOKS:			
R	Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.		
R	AnandRajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.		
R	Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.		
R	Glenn J. Myatt, “Making Sense of Data”, John Wiley & Sons, 2007		
R	Pete Warden, “Big Data Glossary”, O’Reilly, 2011.		
COURSE PRE-REQUISITES:			
MCA501			
COURSE OBJECTIVES:			
1. To introduce students, the concept and challenge of big data (3 V’s: volume, velocity, and variety). 2. To teach students in applying skills and tools to manage andanalyse the big data.			
COURSE OUTCOMES:			
CO. No	Course Outcome description		

MCA511.1	Understand the concept and challenge of big data and whyexisting technology is inadequate to analyse the big data;															
MCA511.2	Collect, manage, store, query, and analyse various form of bigdata															
MCA511.3	Gain hands-on experience on large-scale analytics to solvesome open big data problems by understanding and mining data streams															
MCA511.4	Understand the impact of big data for business decisions andstrategy using advanced clustering techniques															
MCA511.5	Understand the concepts of frameworks and techniques to visualize the output															
CO-PO AND CO-PSO MAPPING																
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
MCA511.1	1	2		3	3								3			
MCA511.2	1	2		3	3								3			
MCA511.3	1	2		3	3								3			
MCA511.4	1	2		3	3								3			
MCA511.5	1	2		3	3								3			

### Information Retrieval Techniques

Information Retrieval Techniques			
Course Code	MCA 512	Course Title	Information Retrieval Techniques
Course Type	Specialization	Contact Hours	4 Hours per Week
Credit	4	Domain	Knowledge Engineering Track
Syllabus			
I	INTRODUCTION Basic Concepts – Retrieval Process – Modelling – Classic Information Retrieval – Set Theoretic, Algebraic and Probabilistic Models – Structured Text Retrieval Models – Retrieval Evaluation –Word Sense Disambiguation		
II	QUERYING Languages – Key Word based Querying – Pattern Matching – Structural Queries – Query Operations – User Relevance Feedback – Local and Global Analysis – Text and Multimedia languages		
III	TEXT OPERATIONS AND USER INTERFACE Document Preprocessing – Clustering – Text Compression – Indexing and Searching –inverted files – Boolean Queries – Sequential searching – Pattern matching – User Interface and Visualization – Human Computer Interaction – Access Process – Starting Points –Query Specification – Context – User relevance Judgment – Interface for Search		
IV	MULTIMEDIA INFORMATION RETRIEVAL Data Models – Query Languages – Spatial Access Models – Generic Approach – One Dimensional Time Series – Two Dimensional Color Images – Feature Extraction		
V	APPLICATIONS Searching the Web – Challenges – Characterizing the Web – Search Engines – Browsing – Meta-searchers – Online IR systems – Online Public Access Catalogs – Digital Libraries – Architectural Issues – Document Models, Representations and Access – Prototypes and Standards. Case study - Google search engine		
TEXT/REFERENCE BOOKS:			

R	Ricardo Baeza-Yate, Berthier Ribeiro-Neto, "Modern Information Retrieval: The Concepts and Technology behind Search", Pearson Education, 2011.
R	G.G. Chowdhury, "Introduction to Modern Information Retrieval", Neal-Schuman Publishers; 2nd edition, 2003.
R	Daniel Jurafsky and James H. Martin, "Speech and Language Processing", Pearson Education, 2000
R	David A. Grossman, Ophir Frieder, "Information Retrieval: Algorithms, and Heuristics", Academic Press, 2000
R	C. Manning, P. Raghavan, and H. Schütze, "Introduction to Information Retrieval", Cambridge University Press, 2008.
R	Anand Rajaraman and Jeffery D. Ullman, "Mining the Massive", Cambridge University Press, 2008.
<b>COURSE PRE-REQUISITES:</b>	
MCA501, Linear Algebra	
<b>COURSE OBJECTIVES:</b>	
To present the basic concepts in information retrieval and more advance techniques of multimodal based information systems.	
<b>COURSE OUTCOMES:</b>	
<b>CO. No</b>	<b>Course Outcome description</b>
MCA512.1	Apply information retrieval principles to locate relevant information in large collections of data
MCA512.2	Understand and deploy efficient techniques for the indexing of document objects that are to be retrieved
MCA512.3	Implement features of retrieval systems for web-based and other search tasks
MCA512.4	Analyse the performance of retrieval systems using test collections
MCA512.5	Make practical recommendations about deploying information retrieval systems in different search domains, including considerations for document management and querying
<b>CO-PO AND CO-PSO MAPPING</b>	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA512.1	1 2 3
MCA512.2	1 2 3
MCA512.3	2 3
MCA512.4	2 3
MCA512.5	2 3

### Social Media Mining

<b>Course Code</b>	MCA 513	<b>Course Title</b>	Social Media Mining
<b>Course Type</b>	Specialization	<b>Contact Hours</b>	4 Hours per Week
<b>Credit</b>	4	<b>Domain</b>	Knowledge Engineering Track
<b>Syllabus</b>			
<b>I</b>	Introduction-New Challenges for Mining, Graph basics- Graph Representation , Types of Graphs, Connectivity in Graphs, Special Graphs, graph algorithms,		

	Network measures-centrality, transitivity and reciprocity, balance and status, similarity, Network Models -Properties of Real-World Networks, Random Graphs, Small-World Model , Preferential Attachment Model
<b>II</b>	Data Mining Essentials- Data, Data Pre-processing, Data Mining Algorithms, Supervised Learning, Unsupervised Learning
<b>III</b>	Communities and Interactions- Community Analysis, Community Evolution, Community Evaluation Information Diffusion in Social Media- Herd Behavior, Information Cascades , Diffusion of Epidemics
<b>IV</b>	Influence and Homophily- Measuring Assortativity, Influence, Homophily , Distinguishing Influence and Homophily Recommendation in Social Media- Challenges , Classical Recommendation Algorithms, Recommendation Using Social , Evaluating Recommendations
<b>V</b>	Behaviour Analytics- Individual Behaviour, Individual Behaviour Analysis, Individual Behaviour Modelling, Individual Behaviour Prediction, Collective Behaviour
<b>TEXT/REFERENCE BOOKS:</b>	
R	Social Media Mining- An Introduction, Reza Zafarani, Mohammad Ali Abbasi. Huan. Cambridge University Press, 2014
R	Mining of Massive Datasets, Jure Leskovec, Anand Rajaraman, Jeffrey D. Ullman,
<b>COURSE PRE-REQUISITES:</b>	
MCA 501	
<b>COURSE OBJECTIVES:</b>	
To understand Computational approaches for social media analysis, data processing and machine learning techniques for extracting information from social media datasets	
<b>COURSE OUTCOMES:</b>	
<b>CO. No</b>	<b>Course Outcome description</b>
MCA513.1	Understand the essentials like graph, Network measures and models for simulating social media models
MCA513.2	Understand data mining essentials for social media mining.
MCA513.3	Find and analyze communities in social media.
MCA513.4	Understand the concept of Influence and Homophily. Analyze and perform recommendations in Social Media
MCA513.5	Understand Behaviour Analytics in social Media
<b>CO-PO AND CO-PSO MAPPING</b>	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA513.1	3 3
MCA513.2	2 3
MCA513.3	3 3
MCA513.4	3 3
MCA513.5	3 3

## Advanced Programming

### J2EE

Course Code	MCA 421	Course Title	J2EE
Course Type	Specialization	Contact Hours	4 Hours per Week
Credit	4	Domain	Advanced Programming
Syllabus			
I	Web Technology: HTML, CSS, JavaScript Basics of Servlet: Servlets: Servlet Overview and Architecture, Interface Servlet and the Servlet Life Cycle, Handling HTTPGET Requests, Handling HTTPPOST Requests, Redirecting Requests to Other Resources, Session Tracking, Cookies, GenericServlet, HttpServlet, ServletRequest, Servlet Collaboration, ServletConfig, ServletContext Session Tracking: Session, Cookies, Application. Servlet data base connectivity		
II	JSP Technologies: Understanding the Client-Server Model, Handling JSP Errors, JSP Translation Time Errors, JSP Request Time Errors, Creating a JSP Error Page, Implicit Objects, Scripting, Standard Actions, Directives, Custom Tag Libraries Session Tracking: Session, Cookies, Application. JSP Database connectivity, Java bean using JSP		
III	RMI: RMI Architecture, Designing RMI application, Executing RMI application Common Object Request Broker Architecture (CORBA): Technical/Architectural Overview, CORBA Basics, CORBA services JNI: Java Native Interfaces		
IV	Introduction to J2EE: j2ee Components, j2ee clients, web components, j2ee SDK Tools. EJB: Types of Enterprise Java beans- Session Bean, Entity Bean and Message Driven Beans, Features of Session Bean, Life-cycle of State full Session Bean, Features of Entity Bean, Life-cycle of Entity Bean, Persistence: Bean managed Persistence and Container Managed Persistence ,		
V	Java Messaging Services: topic, Queue. Enterprise JavaBeans Query Language: Syntax, simple finder queries, Full Queries, EJBQL Restrictions. Transactions: Introduction, Container-managed Transactions, Bean-managed Transactions		
TEXT/REFERENCE BOOKS:			
R	JAVA The Complete Reference- Patrick Naughton and Herbert Schidt.- fifth Edition Tata McGraw Hill.		
R	The Complete reference J2SE - Jim Keogh – Tata McGraw Hills		
R	Programming and Problem Solving With Java, Slack, Thomson Learning, 1Edn.		
R	Java Programming Advanced Topics, Wigglesworth, Thomson Learning, 3Edn.		
R	Ken Arnold and James Gosling, The Java Programming language, Addison Wesley, 2nd Edition, 1998		
R	Patrick Naughton and Herbert Schidt.- The Complete Reference, JAVA fifth Edition Tata McGraw Hill.		
R	Maydene Fisher, Jon Ellis, Jonathan Bruce; JDBC API Tutorial and Reference, Third Edition, Publisher: Addison-Wesley Professional, 2003		
R	Java Servlets IInd edition Karl Moss Tata McGraw Hills		
R	Professional JSP – Wrox		
R	Thinking java – Bruce Eckel – Pearson Education Association		
R	JavaScript: A Beginner's Guide, Second Edition By John Pollock, McGraw-Hill Professional – Publisher		
R	J2EE Unleashed – Joseph j. Bambara, Paul R.Allen (Techmedia)		
R	Professional J2EE Projects - Jain , Siddiqui		
COURSE PRE-REQUISITES:			
MCA 304			
COURSE OBJECTIVES:			



1. To equip the students with the advanced feature of contemporary java which would enable them to handle complex programs relating to managing data and processes over the network.
2. To provide the necessary knowledge to design and develop dynamic, database-driven application using J2EE.
3. To understand how to connect to any JDBC-compliant database, and perform hands on practice with a database to create database-driven connectivity

**COURSE OUTCOMES:**

CO. No	Course Outcome description
MCA421.1	To understand and develop web applications using Servlets and Implement a code in JDBC to communicate with database
MCA421.2	To learn and comprehend the JSP Technologies
MCA421.3	To learn RMI architectures
MCA421.4	Build Enterprise Applications using Session Bean, Entity Bean and MDB
MCA421.5	To learn Bean based queries, transactions

**CO-PO AND CO-PSO MAPPING**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
MCA421.1	1													3		
MCA421.2	2													3		
MCA421.3		2												2		
MCA421.4		2												3		
MCA421.5														2		

**AngularJS FrameWork**

Course Code	MCA 422	Course Title	AngularJS FrameWork
Course Type	Specialization	Contact Hours	4 Hours per Week
Credit	4	Domain	Advanced Programming
Syllabus			
I	Introduction: Angular JS, MVC Architecture, Conceptual Overview, Setting up the Environment, First Application and Understanding ng attributes. Expressions and Data Biding: Number and String Expressions, Object Binding and Expressions, Working with Arrays, Forgiving Behavior and Understanding Data binding		
II	Working with Directives: Conditional Directives, Styles Directives, Mouse and Keyboard Events Directives Controllers: Understanding Controllers, Programming Controllers & \$scope object, Adding Behavior to a Scope Object, Passing Parameters to the Methods, Having Array as members in Controller Scope, Nested Controllers and Scope Inheritance, Multiple Controllers and their scopes		
III	Filters: Built-In Filters, Uppercase and Lowercase Filters, Currency and Number Formatting Filters, OrderBy Filter, Filter Filter, Creating Custom Filter Forms: Using Simple Form, Working with Select and Options, Input Validations, Using CSS classes, Form Events, Custom Model update triggers, Custom Validations		
IV	Modules: Introduction, Module Loading and Dependencies, Recommended Setup of Application and Creation vs Retrieval Services: Understanding Services, Developing Creating Services, Using a Service, Injecting Dependencies in a Service		
V	Ajax in AngularJS: \$http Service, \$q Service, Ajax Impl using \$http and \$q Service Routing: Introduction to SPA, Creating HTML Templates and Configuring Route Provider. Animation: ngAnimate Module, CSS transforms, CSS transitions, Applying animations, and Directives supporting animation		
TEXT/REFERENCE BOOKS:			
R	AngularJS By Brad Green, Shyam Seshadri Publisher: O'Reilly Media		
R	Professional Angularis : A Concise Approach (Valeri Karpov, Diego Netto)		



R	AngularJS Directives (Alex Vanston)
R	Ng-Book - The Complete Book on Angularjs (Ari Lerner)
Web R	<a href="https://www.w3schools.com/angular/">https://www.w3schools.com/angular/</a>
Web R	<a href="https://www.tutorialspoint.com/angularjs/index.htm">https://www.tutorialspoint.com/angularjs/index.htm</a>
<b>COURSE PRE-REQUISITES:</b>	
MCA304	
<b>COURSE OBJECTIVES:</b>	
To give an overview of	
<ol style="list-style-type: none"> <li>1. Reduce the amount of code you write to build rich user interface applications.</li> <li>2. Increase the reliability and maintainability of UI by using data binding.</li> <li>3. Retrieve data from back end server, manipulate it and display it with ease.</li> <li>4. Modularize your code with the custom services and directives.</li> <li>5. Providing two ways binding of data.</li> <li>6. Create Single Page Applications (SPA).</li> </ol>	
<b>COURSE OUTCOMES:</b>	
<b>CO. No</b>	<b>Course Outcome description</b>
MCA423.1	To implement applications using AngularJS frame Work
MCA423.2	Applying the frame work in real applications
MCA423.3	To implement filters in applications
MCA423.4	To apply the services and modules in applications
MCA423.5	Applying the framework to solve complex problems
<b>CO-PO AND CO-PSO MAPPING</b>	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA422.1	2 2 2 2 2 2 2 2 2 2 2 2 3
MCA422.2	2 2 2 2 2 2 2 2 2 2 2 2 3
MCA422.3	2 2 2 2 2 2 2 2 2 2 2 2 3
MCA422.4	2 2 2 2 2 2 2 2 2 2 2 2 3
MCA422.5	2 2 2 2 2 2 2 2 2 2 2 2 3

### Android

<b>Course Code</b>	MCA 423	<b>Course Title</b>	Android
<b>Course Type</b>	Specialization	<b>Contact Hours</b>	4 Hours per Week
<b>Credit</b>	4	<b>Domain</b>	Advanced Programming
<b>Syllabus</b>			
<b>I</b>	Mobile Computing & Development Introduction: Mobile system architecture and development challenges The Android Platform: Android SDK Features, Introduction to the development Framework, Android Development Tools, Android Application Life Cycle, Activity, Service, Intent, MVC and User Interfaces Application Structure: AndroidManifest.xml, uses-permission & uses-sdk, Resources & R.java, Assets, Layouts & Drawable Resources, Activities and Activity lifecycle		
<b>II</b>	Android Graphical User Interface: Linear Layout, Relative Layout, Table Layout, Grid View, Tab Layout, List View, Custom List View Element, Fragments, Time and Date, Images and media, Composite, AlertDialogs , Toast, Popup Menus:- Option menu , Context menu, Sub menu, menu from xml, menu via code, Application Menu, ActionBar, ActionBar& Tabs, View Pager, Action Bar & View Pager		
<b>III</b>	Intents – Explicit Intents, Implicit intents, intents and broadcast receivers, intent filters, Adapters and Widgtes:-ArrayAdapters, BaseAdapters, ListView and ListActivity, Custom listview, GridView using adapters, Gallery using adapters Notifications: Broadcast Receivers, Services and notifications, AlarmsThreads:- Threads running on UI thread (runOnUiThread), Worker thread, Handlers & Runnable, AsyncTask (in detail)		

<b>IV</b>	Databases and Content Providers:- SQLite Databases: Basics of SQLite DB, Various Data Types, SQLite Queries, Adding / Updating / Deleting Contents of SQLite Content Providers:- SQLite Programming, SQLiteOpenHelper, SQLiteDatabase, Cursor, Content providers, Defining and using content providers, Example- Sharing database among two different applications using content providers Reading and updating Contents, Reading bookmarks
<b>V</b>	Advanced Features: Live Folders, Using sdcards, XML Parsing, JSON Parsing, Maps, GPS, Location based Services, Accessing Phone services (Call, SMS, MMS), Network connectivity services Hardware Sensors:- Sensors and Sensor Managers, Monitoring device movement and orientation, Environmental sensors
<b>TEXT/REFERENCE BOOKS:</b>	
R	Professional Android 4 application development – Reto Meier
R	Android Wireless Application Development By Lauren Darcey and Shane Conder, Pearson Education, 2nd ed.
R	Beginning Android Application Development By Wei-Meng Lee, Wrox Publication
R	Unlocking Android Developer's Guide By Frank Ableson and Charlie Collins and Robi Sen, Manning Publication Co.
<b>COURSE PRE-REQUISITES:</b>	
MCA104, MCA304	
<b>COURSE OBJECTIVES:</b>	
<ol style="list-style-type: none"> <li>1. To create apps based on android platforms</li> <li>2. To create apps based on multimedia and internet application</li> <li>3. To achieve the designing of platform independent applications</li> <li>4. To access and work with databases under the Android operating system</li> </ol>	
<b>COURSE OUTCOMES:</b>	
<b>CO. No</b>	<b>Course Outcome description</b>
MCA423.1	Able to develop simple apps
MCA423.2	Able to develop apps based on different types of menus
MCA423.3	Make decision to solve a problem using package, library and threads Handling Errors and Exceptions
MCA423.4	Ability to design and develop database applications
MCA423.5	Able to design and develop mobile applications works with internet applications
<b>CO-PO AND CO-PSO MAPPING</b>	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA423.1	1 3 2 2
MCA423.2	1 3 2 2
MCA423.3	2 2 1
MCA423.4	2 3 2 3
MCA423.5	2 3 2 3

### Struts And Hibernate

Course Code	MCA 521	Course Title	Struts And Hibernate
Course Type	Specialization	Contact Hours	4 Hours per Week
Credit	4	Domain	Advanced Programming
<b>Syllabus</b>			
<b>I</b>	Introduction to Struts MVC Architecture - Framework Application Flow, Components Model, View and Controller, Building a simple web application using struts. Struts Validator - Introduction to validator plugin, Using different types of validators, Configuring the application, Applying validators, Building custom validators, Declarative exception handling Framework - Struts Tiles Framework, Introduction to tiles framework, Building tiles configuring struts-config.xml file creating the template page		

	Struts2 Action - Action Interface, ActionSupport class
II	Basics of Hibernate - Hibernate Introduction, Hibernate Architecture, Understanding First Hibernate application Hibernate Application - Hibernate with annotation, Hibernate Web application, Hibernate Generator classes, Hibernate Dialects Hibernate Logging - Hibernate with Log4j 1, Hibernate with Log4j 2 Inheritance Mapping - Table per Hierarchy, Table per Hierarchy using Annotation, Table Per Concrete, Table Per Concrete using Annotation, Table Per Subclass, Table Per Subclass using Annotation
III	Collection Mapping - Mapping List, One-to-many by List using XML, Many to Many by List using XML, One To Many by List using Annotation, Mapping Bag, One-to-many by Bag, Mapping Set, One-to-many by Set, Mapping Map, Many-to-many by Map, Bidirectional Lazy Collection Component Mapping, Association Mapping - One-to-one using Primary Key, One-to-one using Foreign Key
IV	Transaction Management HQL, HCQL, Named Query Hibernate Caching - First Level Cache, Second Level Cache Integration - Hibernate and Struts, Hibernate and spring
V	Basics of Spring - What is Spring, Spring Modules, Spring Application IOC container Dependency Injection - Constructor Injection, CI Dependent Object, CI with collection, CI with Map, CI Inheriting Bean, Setter Injection, SI Dependent Object, SI with Collection, SI with Map, CI vs SI, Auto wiring, Factory Method Spring with ORM- Spring with Hibernate, Spring with JPA SpEL- SpEL, Operators in SpEL, variable in SpEL ,Web Integration- Spring with Struts2
TEXT/REFERENCE BOOKS:	
R	Beginning Apache Struts - Arnold Doray
R	Struts: The Complete Reference Book
R	Mastering Jakarta Struts
R	Struts in Action - Ted Husted, Cedric Dumoulin, George Franciscus, David Winterfeld
R	Just Spring Integration - MadhusudhanKonda
R	Spring Data - Mark Pollack, Oliver Gierke
COURSE PRE-REQUISITES:	
MCA 304	
COURSE OBJECTIVES:	
1. To acquire knowledge in MVC architecture 2. To develop enterprise applications using Frameworks 3. To familiarize with Hibernate and Transactions in SQL	
COURSE OUTCOMES:	
CO. No	Course Outcome description
MCA521.1	Facilitate understanding of the Model-View-Controller (MVC) design pattern and how it is best applied to Java Web application development with respect to a scenario.
MCA521.2	Ability to map entities and attributes using modern tools
MCA521.3	Create different types of persistent classes and Map java inheritance hierarchy with database tables using various mapping techniques
MCA521.4	Fetch data effectively from database using traditional SQL and Hibernate Query Language
MCA521.5	Ability to provide computational solutions for real life problems
CO-PO AND CO-PSO MAPPING	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA521.1	1 2 2
MCA521.2	3
MCA521.3	2
MCA521.4	1 2
MCA521.5	3 2 2 3

## Open Source Lab - Python

Course Code	MCA 522	Course Title	Open Source Lab – Python
Course Type	Specialization	Contact Hours	4 Hours per Week
Credit	4	Domain	Advanced Programming
Syllabus			
I	<b>Data Types and Data Structures</b> Introduction to Python: - using the Python interpreter, Overview of programming in Python, Expressions and Variables-String Operations. Python Data Structures: lists & Tuple –Sets -Dictionaries. Programming Fundamentals: Conditions and Branching-Loops-Functions: formal arguments, variable-length arguments.		
II	<b>Classes, files and modules</b> Introduction to Classes and Objects: -classes, class attributes, instances, instance attributes, binding and method invocation, inheritance, polymorphism, Built-in functions for classes and instances. Files and input/output, reading and writing files, methods of file objects, using standard library functions, dates and times Exceptions, detecting and handling exceptions.		
III	<b>Database and web programming</b> Python database application programmer’s interface (DB- API), connection and cursor objects, Type objects and constructors, python database adapters. Creating simple web clients, introduction to CGI, CGI module, building CGI applications.		
IV	<b>Introduction to Data Science using Python</b> Python libraries: Numpy- Scikit- Pandas-Matplotlib. - Data Visualization. Importing Datasets: Importing and Exporting Data in Python- Basic Insights from Datasets. Data cleansing and pre-processing: Identify and Handle Missing Values. Summarizing the Data Frame: Descriptive Statistics- Basic of Grouping- ANOVA- Correlation		
V	<b>Model Development and Evaluation</b> Regression Models: Linear Regression (SLR & MLR) - Logistic Regression-Decision Tree- Random Forest. Clustering Techniques: K means clustering – Apriori algorithm. Model Evaluation: Over-fitting, Under-fitting.		
TEXT/REFERENCE BOOKS:			
R	Core Python Programming by Wesley J. Chun, 2nd Edition , Pearson Education		
R	An Introduction to Python by Guido Van Russom, Fred L.Drake, Network Theory Limited.		
R	Beginning Python: From Novice To Professional By Magnus Lie Hetland, Second Edition Apress		
R	Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython ,2nd edition, Wes McKinney, O’Reilly Media (2017)		
R	Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems ,Aurélien Géron, O’Reilly Media (2017)		
R	Data Science from Scratch: First Principles with Python, Joel Grus, O’Reilly Media (2015)		
COURSE PRE-REQUISITES:			
Nil			
COURSE OBJECTIVES:			
1. To provide an understanding of programming concepts using Python			
2. To provide a comprehensive coverage of database and web programming using Python.			
COURSE OUTCOMES:			
CO. No	Course Outcome description		
MCA522.1	Understand the data types in python		
MCA522.2	Ability to understand object oriented programing concepts and write programs in python. Handling Errors and Exceptions		

MCA522.3	Ability to design and develop database applications															
MCA522.4	Ability to design and develop web pages/ applications															
CO-PO AND CO-PSO MAPPING																
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
MCA522.1	3												1			
MCA522.2			2		3								1	3		
MCA522.3			2											3		
MCA522.4			2		3									3		

## PhoneGap Framework

Course Code	MCA 523	Course Title	PhoneGap Framework
Course Type	Specialization	Contact Hours	4 Hours per Week
Credit	4	Domain	Advanced Programming
Syllabus			
I	Introduction to PhoneGap, Advantages of PhoneGap, Introduction of HTML, CSS, java script, Downloading and installing PhoneGap, Setting up the environment, Hello world, PhoneGap build - Basic config file how to write it, Platform independent properties, iOS only properties, Android properties, Adding icons, Adding splash screen, Writing preferences, Adding features, Adding plugins		
II	GUI Designing - Introduction to jQuery Mobile, making fantastic GUI using HTML, CSS and jQuery mobile, Adding GUI components using JQUERY Controls - Buttons, Grids, Forms, Color themes in GUI		
III	Database management – storage, Database using SQLite, how to uses SQLite web API, adding tables, Insert data, querying data/read data, Deleting table, Updating data, Basic Queries Media and Files - Basic media systems, Directories and les Contacts - Accessing device contacts, Adding and editing contacts		
IV	Networking - Connection interfacing, Checking for network, Network information Device Information and Notification - Getting information from device, Notifications and Alerts Splash Screen and Events - Splash screen, Event listener and device ready functions		
V	Hardware APIs - Introduction to hardware interfacing using JavaScript, Hardware APIs available in PhoneGap, Camera - Getting to know about camera API, Accessing device camera, Accelerometer - Getting to know about accelerometer API, Accessing device accelerometer using the accelerometer object, Captures device motion in the x, y, and z direction		
TEXT/REFERENCE BOOKS:			
R	Mastering Phonegap Mobile Application Development ( Kerri Shotts)		
R	Instant PhoneGap (GustavoDeLaVegaAlvarez)		
R	PhoneGap Essentials : Building Cross Platform Mobile Apps 1st Edition (John M. Wargo)		
R	20 RECIPES FOR PROGRAMMING PHONEGAP (MUNRO)		
Web R	<a href="https://www.tutorialspoint.com/phonegap/">https://www.tutorialspoint.com/phonegap/</a>		
Web R	<a href="https://code.tutsplus.com/tutorials/phonegap-from-scratch-introduction--mobile-9171">https://code.tutsplus.com/tutorials/phonegap-from-scratch-introduction--mobile-9171</a>		
COURSE PRE-REQUISITES:			
MCA423			
COURSE OBJECTIVES:			
To give an overview of			
1. Mobile applications tool set.			
2. Simulation of iPhone and android applications.			
3. Implementing different data storage			

4. Create Generalized Mobile Applications.																
COURSE OUTCOMES:																
CO. No		Course Outcome description														
MCA523.1		To enable the different tool set in mobile application development														
MCA523.2		Applying the frame work in real applications														
MCA523.3		To implement different data storage														
MCA523.4		To apply the use of API and plugins														
MCA523.5		Applying the framework to implement mobile applications														
CO-PO AND CO-PSO MAPPING																
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
MCA523.1		1			3						2			2		
MCA523.2		1			3						2			2		
MCA523.3		2									2			1		
MCA523.4		2			3						2			3		
MCA523.5		2			3						2			3		

3



## Advanced Software Engineering

### Software Requirements Engineering

Software Requirements Engineering			
Course Code	MCA 431	Course Title	Software Requirements Engineering
Course Type	Specialization	Contact Hours	4 Hours per Week
Credit	4	Domain	Advanced Software Engineering track
Syllabus			
I	Requirements Engineering Basics, definition, importance, place of requirements engineering in development process, types of requirements: Functional, non-functional, quality attributes, main requirements engineering activities, documents and processes.		
II	Requirements Elicitation Requirements inception and elicitation-product vision and project scope, traditional elicitation approaches (interviews, stakeholders study, workshops, ...),scenario/use case approaches, prototyping, requirements negotiation and risk management.		
III	Requirements analysis Requirements analysis and specification - modeling techniques ,inception vs. specification, techniques for writing high-quality requirements, documentation standards (e.g., IEEE 830-1998),goal-oriented modeling, Structured analysis and other techniques, UML v2 and URN notations, external qualities management, contract specification		
IV	Requirements verification Requirements verification, and validation, detection of conflicts and inconsistencies, completeness, techniques for inspection, verification and validation, feature interaction analysis and resolution		
V	Requirements management Requirements management-traceability, priorities, changes, baselines ,tool support (e.g., DOORS),Examples of requirements approaches in typical development processes, requirements for various types of systems: embedded systems, consumer systems, web-based systems, business systems, systems for scientists and other engineers		
TEXT/REFERENCE BOOKS:			
R	Ian K. Bray, An Introduction to Requirements Engineering, Addison Wesley, 2002		
R	Ian F. Alexander, Richard Stevens, Writing better requirements, Addison-Wesley, 2002 - for the topic of how to write requirements		
R	Elizabeth Hull, Ken Jackson, Jeremy Dick, Requirements Engineering, Springer-Verlag, 2004 - for the topic of tracability and an introduction to the DOORS tool		
R	Karl E. Wiegers, Software Requirements, Microsoft Press, 2003		
R	Axel van Lamsweerde, Requirements Engineering: From System Goals to UML Models to Software Specifications, Wiley, 2009.		
R	Ian Alexander and LjerkaBeus-Dukic, Discovering Requirements: How to Specify Products and Services, Wiley, 2010,		
R	Klaus Pohl, Requirements Engineering - Fundamentals, Principles, and Techniques, Springer, 2010 (to be published), ISBN 978-3-642-12577-5		
COURSE PRE-REQUISITES:			
MCA204			
COURSE OBJECTIVES:			



1. Develop effective functional and non-functional requirements that are complete, concise, correct, consistent, testable and unambiguous.
2. Select the appropriate requirements elicitation techniques to identify requirements.
3. Effectively analyse requirements and prioritize accordingly.
4. Perform requirements engineering in the context of the most common software development life cycles and processes.
5. Create a requirements specification to communicate requirements to a broad set of stakeholders.
6. Utilize various requirements validation techniques to critically evaluate their requirements to identify defects.
7. Understand effective requirements management techniques

**COURSE OUTCOMES:**

CO. No	Course Outcome description
MCA 431.1	To identify and understand the different categories of requirements in an effective manner
MCA 431.2	To gain knowledge in the various elicitation techniques ,elicitation process
MCA 431.3	To understand requirements specification process and the various modelling techniques
MCA 431.4	To become well versed in the requirements verification process.
MCA 431.5	To gain knowledge in requirements management.

**CO-PO AND CO-PSO MAPPING**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
MCA431.1		3							2		2				2	
MCA431.2		2	2		3				2						2	
MCA431.3		2	2						2						2	
MCA431.4		2			2				2		2				2	
MCA431.5		2							3		2				2	

**Software Design and architecture**

Course Code	MCA 432	Course Title	Software Design and architecture
Course Type	Specialization	Contact Hours	4 Hours per Week
Credit	4	Domain	Advanced Software Engineering track
Syllabus			
<b>I</b>	Software Design Meaning of Software Design ,Goals of software design-correctness , sufficiency, modularity and readability etc , other design goals, Need for a software design notation, Key design principles and heuristics and trade-offs between these. "Bad smells" and refactoring.		
<b>II</b>	Design Patterns Introduction to design patterns, history, principles and expectations. Ways of using patterns. Detailed study of a number of representative patterns, Example Application-Applying a design pattern, Summary of design pattern by type-Creational, structural and behavioral .		
<b>III</b>	Software Architecture Meaning of software architecture ,Goals for architecture and modularization, Importance of architecture ,Using Façade design pattern, Classical architectural styles such as pipe and filter, data abstraction or OO based, event-based, etc.		
<b>IV</b>	Frameworks Meaning and usage of frameworks, goals of framework, framework usages, frameworks as reusable chunks of architecture, the framework lifecycle, development using frameworks, detailed study of some well-known frameworks (e.g. HotDraw).		
<b>V</b>	Automated evaluation and analysis Major approaches to automated evaluation and analysis: dynamic analysis (e.g. testing, debugging, model inference, and visualisation) and static analysis (e.g. call and control		

	graph extractions, metrics calculation, dataflow analysis, type systems, model checking, symbolic execution), and their application and limitations. Construction of tools to support such analysis.
<b>TEXT/REFERENCE BOOKS:</b>	
R	Software Design: From Programming to Architecture. Eric Braude.
R	Head First Design Patterns. O'Reilly, Freeman and Freeman.
R	Design Patterns. Erich Gamma, Richard Helm, Ralph Johnson and John Vlissides, . Addison-Wesley, 1995
R	An Introduction to Software Architecture. David Garlan and Mary Shaw.
R	Refactoring: Improving the Design of Existing Code. Martin Fowler.
R	Software Architecture - Foundations, Theory and Practice. Taylor, Medvidovic, Dashofy. Wiley 2009.
<b>COURSE PRE-REQUISITES:</b>	
MCA204	
<b>COURSE OBJECTIVES:</b>	
To introduce the concept of software design and pattern .The need for software architecture and use of frameworks along with the automated evaluation and analysis is covered in detail.	
<b>COURSE OUTCOMES:</b>	
<b>CO. No</b>	<b>Course Outcome description</b>
MCA431.1	Learn the goals of software design and the patterns for designing the software.
MCA431.2	Know the need and use of software architecture such as classical , event based etc
MCA431.3	Introduce framework and the methods for automated and dynamic analysis .
<b>CO-PO AND CO-PSO MAPPING</b>	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA431.1	3 2
MCA431.2	3
MCA431.3	3

### Software Testing

Course Code	MCA 433	Course Title	
Course Type	Specialization	Contact Hours	4 Hours per Week
Credit	4	Domain	Advanced Software Engineering track
Syllabus			
I	Introduction: Human and errors, Error, Fault, Failure, Incident, Test Cases, Software Quality , Testing and Debugging, Psychology of Testing, General Principles of Testing, Test Metrics.		
II	Testing Activities: Unit Testing, Levels of Testing, Integration Testing, System Testing, Debugging, Domain Testing.Object Oriented Testing: Issues in Object Oriented Testing, Class Testing, GUI Testing, Object Oriented Integration and System Testing.		
III	Functional Testing: Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique. Structural Testing: Path testing, DD-Paths, Cyclomatic Complexity, Graph Metrics, Data Flow Testing, Mutation testing.		
IV	Test Management Test Organization ,Test teams, tasks and Qualifications ,Test Planning ,Quality Assurance Plan, Test Plan, Prioritization Plan, Test Exit Criteria ,Cost and Economy Aspects.		
V	Testing Tools: Static Testing Tools, Dynamic Testing Tools, Characteristics of Modern Tools. Case Study –Testing Tool		
TEXT/REFERENCE BOOKS:			
R	William Perry, “Effective Methods for Software Testing”, John Wiley & Sons, New York, 1995.		

R	CemKaner, Jack Falk, Nguyen Quoc, "Testing Computer Software", Second Edition, Van Nostrand Reinhold, New York, 1993.
R	Boris Beizer, "Software Testing Techniques", Second Volume, Second Edition, Van Nostrand Reinhold, New York, 1990.
R	Louise Tamres, "Software Testing", Pearson Education Asia, 2002
R	Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Fifth Edition, McGraw-Hill International Edition, New Delhi, 2001.
R	Boris Beizer, "Black-Box Testing – Techniques for Functional Testing of Software and Systems", John Wiley & Sons Inc., New York, 1995.

**COURSE PRE-REQUISITES:**

MCA 204

**COURSE OBJECTIVES:**

1. To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
2. To discuss various software testing issues and solutions in software unit test; integration, regression, and system testing.
3. To learn how to planning a test project, design test cases and data, conduct testing operations, manage software problems and defects, generate a testing report.
4. To expose the advanced software testing topics, such as object-oriented software testing methods, and component-based software testing issues, challenges, and solutions.
5. To gain knowledge about different testing tools.

**COURSE OUTCOMES:**

CO. No	Course Outcome description
MCA 433.1	To gain a basic knowledge in testing.
MCA 433.2	To understand different levels of testing and their issues
MCA 433.3	To gain knowledge about testing methods.
MCA 433.4	To understand test management
MCA 433.5	To gain knowledge about different testing tools

**CO-PO AND CO-PSO MAPPING**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
MCA433.1		2							2						2	
MCA433.2		2	3						2						2	
MCA433.3		2	3						2						2	
MCA433.4		2	3						2						2	
MCA433.5		2	2		3				2						2	

**Software Project Management**

Course Code	MCA 531	Course Title	Software Project Management
Course Type	Specialization	Contact Hours	4 Hours per Week
Credit	4	Domain	Advanced Software Engineering track
Syllabus			
I	Introduction, Project planning and evaluation-Introduction to software project management: importance, activities, categorization, stakeholders. Stepwise overview of project planning. Program management and project evaluation: allocation of resources, cost benefit analysis, evaluation techniques, risk evaluation.		
II	Activity Planning -Activity Planning: objectives, projects and activities, sequencing and scheduling activities, network planning models, formulating a network model, forward pass, backward pass, identifying critical path, activity float. Resource Allocation: Identifying resource, requirements, scheduling resources, creating critical paths, cost schedule.		
III	Monitoring, Control -Monitoring and Control: creating framework, collecting data, visualizing progress, cost monitoring, earned value analysis, priority monitoring, change control, Project Closure-role of Closure analysis, performing closure analysis, closure analysis report.		

<b>IV</b>	Risk Management-Risk management: categories, risk identification, assessment, planning, management, applying PERT techniques, Monte Carlo simulation, critical chain concepts.
<b>V</b>	Project Management-Introduction, Project plan, Milestone checklist, Gantt chart, Project Management tools, Project reviews, Delivery reviews, Scorecards, Certification standards –CMM, PCMM, SIX SIGMA, PMP
<b>TEXT/REFERENCE BOOKS:</b>	
R	Software Project Management: Bob Hughes& Mike Cotterell. 4th Edition, TataMcGrawHill.
R	Software Project Management A Unified Framework: Walker Royce, Pearson Education
R	Software Project Management: Pankaj Jalote, Pearson Education
R	Software Project Management –S A Kelkar .Prentice Hall India
R	Information Technology and Project Management, Schwalbe, Thomson Learning
<b>COURSE PRE-REQUISITES:</b>	
MCA 204	
<b>COURSE OBJECTIVES:</b>	
To understand the fundamental principles of Software Project management & to have a good knowledge of responsibilities of a project manager.	
<b>COURSE OUTCOMES:</b>	
<b>CO. No</b>	<b>Course Outcome description</b>
MCA531.1	To conduct project planning activities that accurately forecast project costs, and resources
MCA531.2	To impart knowledge on activity planning and resource allocation
MCA531.3	To perform monitoring, control and project closure successfully
MCA531.4	To be specialized in risk management concepts
MCA531.5	To be familiar with project management tools and certifications
<b>CO-PO AND CO-PSO MAPPING</b>	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA531.1	
MCA531.2	
MCA531.3	
MCA531.4	
MCA531.5	

### User Interface Design

<b>Course Code</b>	MCA 532	<b>Course Title</b>	User Interface Design
<b>Course Type</b>	Specialization	<b>Contact Hours</b>	4 Hours per Week
<b>Credit</b>	4	<b>Domain</b>	Advanced Software Engineering track
<b>Syllabus</b>			
<b>I</b>	Introduction Introduction-Importance-Human-Computer interface-characteristics of graphics interface-Direct manipulation graphical system - web user interface-popularity-characteristic & principles		
<b>II</b>	Human Computer Interaction User interface design process- obstacles-usability-human characteristics in design - Human interaction speed-business functions-requirement analysis-Direct-Indirect methods-basic business functions-Design standards-system timings - Human consideration in screen design - structures of menus - functions of menus-contents of menu-formatting -phrasing the menu - selecting menu choice- navigating menus-graphical menus.		
<b>III</b>	Windows Windows: Characteristics-components-presentation styles-types-managements-organizations-operations-web systems-device-based controls: characteristics- Screen		

	-based controls: operate control - text boxes-selection control-combination control-custom control-presentation control.
<b>IV</b>	Multimedia Text for web pages - effective feedback-guidance & assistance- Internationalization-accessibility-Icons-Image-Multimedia -colouring.
<b>V</b>	User Interface design Tools User interface design tools for Web designing, Mobile apps & Desktop applications. Case study to design user interface for Desktop/Web/Mobile using any tool
<b>TEXT/REFERENCE BOOKS:</b>	
R	Wilbent. O. Galitz, "The Essential Guide to User Interface Design", John Wiley& Sons, 2001.
R	Ben Sheiderman, "Design the User Interface", Pearson Education, 1998.
R	Alan Cooper, "The Essential of User Interface Design", Wiley – Dream Tech Ltd.,2002.
<b>COURSE PRE-REQUISITES:</b>	
MCA204	
<b>COURSE OBJECTIVES:</b>	
To understand and learn how to design, prototype, and evaluate user interfaces and applications using a variety of methods	
<b>COURSE OUTCOMES:</b>	
<b>CO. No</b>	<b>Course Outcome description</b>
MCA532.1	To gain an understanding of human computer interface and interaction
MCA532.2	To understand the user design interface process and learn direct/indirect methods
MCA532.3	To implement and use windows components in design
MCA532.4	To implement multimedia facilities in prototypes
MCA532.5	To use software and paper prototyping tools to design user interfaces that take into account human capabilities and constraints, users' needs, usability goals and user experience goals
<b>CO-PO AND CO-PSO MAPPING</b>	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA532.1	
MCA532.2	
MCA532.3	
MCA532.4	
MCA532.5	

### Software Risk Management And Maintenance

<b>Course Code</b>	MCA 533	<b>Course Title</b>	Software Risk Management And Maintenance
<b>Course Type</b>	Specialization	<b>Contact Hours</b>	4 Hours per Week
<b>Credit</b>	4	<b>Domain</b>	Advanced Software Engineering track
<b>Syllabus</b>			
<b>I</b>	DISCOVERING RISK Identifying software risk, Classification of Risks – Risk Taxonomy , Risk Mapping, Statements , Risk Reviews, Risk Ownership and stakeholder management		
<b>II</b>	RISK ASSESSMENT Risk Assessment Approach, Risk Assessment tools and techniques, Risk Probability, impact, exposure, matrix and Application Problem- Self- assessment checklist.		
<b>III</b>	RESPONDING TO RISKS AND TRACKING Special Treatment for Catastrophic risks, Constraint Risks, Risk Mitigation Plan Case Study – Contingency Plans, Implementing Risk Response, Tracking Risk Response and		

	Hazards, Trigger Levels, Tracking Project Risks and Operational Risks, Learning by Tracking and Risk, Tracker Tool.
<b>IV</b>	<b>MAINTENANCE PROCESS</b> Software Maintenance, Customer's Viewpoint- Economics of Maintenance, Issues in Maintenance, Software Maintenance Standard, Process, Activates and Categories, Maintenance Measurement, Service Measurement and Benchmarking , Problem Resolution- Reporting, Fix Distribution.
<b>V</b>	<b>ACTIVITIES FOR MAINTENANCE</b> Role of SQA for Support and Maintenance, SQA tools for Maintenance- Configuration Management and Maintenance – Maintenance of Mission Critical Systems, Global Maintenance Teams , Foundation of S3m Process Model- Exemplary Practices.
<b>TEXT/REFERENCE BOOKS:</b>	
R	C. Ravindranath Pandian, "Applied Software Risk Management: A guide for Software
R	Project Managers", Auerbach Publications, 2007.
R	John McManus, "Risk Management in Software Development Projects", Elsevier
R	Buter worth- Heineman, First Editon, 2004.
R	Alian April and Alain Abran, "Software Maintenance Management: Evaluation and
R	Continuous Improvement", John Wiley & Sons Inc, 2008.
R	Gopalaswamy Ramesh and Ramesh Bhatiprolu, "Software Maintenance: Effective
R	Practices for Geographically Distributed Environments", Second Reprint, Tata McGraw-Hill, 2009.
<b>COURSE PRE-REQUISITES:</b>	
MCA204	
<b>COURSE OBJECTIVES:</b>	
To identify software risk and to classify them so that risk can be assessed using tools. The response to risk is covered in detail and the maintenance needed in such cases and activities for maintenance.	
<b>COURSE OUTCOMES:</b>	
<b>CO. No</b>	<b>Course Outcome description</b>
MCA533.1	Learn the basics of software risk and to classify them.
MCA533.2	Familiarize the assessment of risks using tools.
MCA533.3	Introduce the response to risk and the activities for maintenance.
<b>CO-PO AND CO-PSO MAPPING</b>	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA533.1	2 3
MCA533.2	3
MCA533.3	2 3



## Information Security

### Ethical Hacking

<b>Course Code</b>	MCA 441	<b>Course Title</b>	Ethical Hacking
<b>Course Type</b>	Specialization	<b>Contact Hours</b>	4 Hours per Week
<b>Credit</b>	4	<b>Domain</b>	Information Security Track
<b>Syllabus</b>			
<b>I</b>	<b>Hacking Concepts</b> Hacking vs. Ethical Hacking, Effects of Hacking on Business, Who is a Hacker? Hacker Classes, Hacktivism, Hacking Phases. Types of Attacks-Types of Attacks on a System, Operating System Attacks, Misconfiguration Attacks, Application-Level Attacks, Examples of Application-Level Attacks, Shrink Wrap Code Attacks. Footprinting <b>Concepts-Footprinting Terminology</b> , What is Footprinting?, Why Footprinting?, Objectives of footprinting, WHOIS Footprinting- WHOIS Lookup, WHOIS Lookup Result Analysis, WHOIS Lookup Tool: SmartWhois, WHOIS Lookup Tools, WHOIS Lookup Online Tools. DNS Footprinting, Extracting DNS Information, DNS Interrogation Tools, Network Footprinting, Locate the Network Range, Determine the Operating System. Traceroute- Traceroute Analysis, Traceroute Tools.		
<b>II</b>	<b>Enumerations and System Hacking</b> Enumeration Concepts- What is Enumeration? Techniques for Enumeration, Services and Ports to Enumerate. NetBIOS Enumeration-NetBIOS Enumeration, NetBIOS Enumeration Tool: SuperScan, Hyena, Enumerating User Accounts, Enumerate Systems Using Default Passwords System Hacking: Goals-CEH Hacking Methodology (CHM),CEH System Hacking Steps, Cracking Passwords- Password Cracking, Password Complexity, Password Cracking Techniques, Types of Password Attacks, Passive Online Attack: Passive Online Attack: Eavesdropping, Passive Online Attacks: Man-in-the-Middle and Replay Attack		
<b>III</b>	<b>Trojan, Virus and Worms</b> Trojan Concepts- What is a Trojan? Communication Paths: Overt and Covert Channels Purpose of Trojans, What DTrojan Creators Look For? Indications of a Trojan Attack, Windows Services Monitoring Tool: Windows Service Manager (SrvMan), Windows8 Startup Registry Entries, Startup Programs Monitoring Tool: Starter, Startup Programs Monitoring Tool: Security AutoRun, Startup Programs Monitoring Tools Virus Concepts- Introduction to Viruses, Virus and Worm Statistics, Stages of Virus Life, Working of Viruses: Infection Phase, Working of Viruses: Attack Phase, Why Do People Create Computer Virus, Indications of Virus Attack, Virus Analysis: DNSChanger, Types of Viruses Computer Worms-How Is a Worm Different from a Virus?, Worm Analysis: Stuxnet, Worm Maker: Internet Worm Maker Thing		
<b>IV</b>	<b>Web Application hacking</b> Introduction to Web Applications, Web Application Components, How Web Applications Work?, Web Application Architecture, Analyze Web Applications, Analyze Web Applications: Identify Entry Points for User Input, Analyze Web Applications: Identify Server-Side Technologies, Analyze Web Applications: Identify Server-Side Functionality, Session Attacks: Session ID Prediction/ Brute-forcing, Cookie Exploitation: Cookie Poisoning, Authorization Attack Schemes, Authorization Attack, HTTP Request Tampering, Authorization Attack: Cookie Parameter Tampering		
<b>V</b>	<b>SQL Injection and Android Hacking</b> SQL Injection Concepts-SQL Injection, SQL Injection Threats, What is SQL Injection?, SQL Injection Attacks SQL Injection Tools: BSQLHacker,SQL Injection Tools: Marathon Tool Android Vulnerabilities, Android Rooting, Rooting Android Phones using SuperOneClick, Rooting Android Phones Using Superboot, Android Rooting Tools, Session Hijacking Using DroidSheep, Android-based Sniffer: FaceNiff, Securing Android Devices, Google Apps Device Policy		



<b>TEXT/REFERENCE BOOKS:</b>	
R	ABCD OF HACKING: The Beginner's guide by Shashank Pai K
R	Computer Hacking Beginners Guide: How to Hack Wireless Network, Basic Security and Penetration Testing, Kali Linux, by Alan T. Norman
R	Hacking: The Art of Exploitation, by Jon Erickson
R	The Hacker Playbook 2: Practical Guide To Penetration Testing by Peter Kim Hash Crack: Password Cracking Manual (v2.0) 2nd Edition, by Joshua Picolet
R	The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws 2nd Edition by Dafydd Stuttard, Marcus Pinto
<b>COURSE PRE-REQUISITES:</b>	
MCA 403	
<b>COURSE OBJECTIVES:</b>	
<ol style="list-style-type: none"> <li>1. Identify and analyse the stages an ethical hacker requires to take in order to compromise a target system.</li> <li>2. Identify tools and techniques to carry out a Hacking</li> <li>3. Critically evaluate security techniques used to protect system and user data.</li> <li>4. Demonstrate systematic understanding of the concepts of security at the level of policy and strategy in a computer system.</li> </ol>	
<b>COURSE OUTCOMES:</b>	
CO. No	Course Outcome description
MCA441.1	Understand and apply concepts of Ethical hacking and footprinting
MCA441.2	To know the basics of System hacking and enumerations
MCA441.3	Differentiate the concepts of Trojans, viruses and worms
MCA441.4	To understand the vulnerabilities of web applications and monitor the hacks
MCA441.5	To understand SQL injections and Android Hacking
<b>CO-PO AND CO-PSO MAPPING</b>	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA441.1	1 1 2
MCA441.2	1 2 2
MCA441.3	1 2 1 3
MCA441.4	1 2 3
MCA441.5	1 2 3

### Web and Database Security

Web and Database Security			
Course Code	MCA 442	Course Title	Web and Database Security
Course Type	Specialization	Contact Hours	4 Hours per Week
Credit	4	Domain	Information Security Track
Syllabus			
I	Introduction to Web Applications and Security, Profiling, Hacking Web Servers, the Threats – Classes of threats, the Hacker's Workbench, Cryptography and the Web, Digital Identifications.		
II	Privacy- protecting techniques, privacy- protecting technologies, Backups and antitheft. Web Server Security – Host security for servers		
III	Securing web applications. Protecting an organization – Network layout, safe hosts in a hostile environment, Intrusion detection.		
IV	Introduction to Database, Levels of Database Security - Human level, network/user interface, database application program, database system, operating system, and physical level, Authentication and Password Security, Application Security – SQL Injection.		
V	Securing Database-to-Database Communication, Trojans, Encryption, Passwords in scripts, insider/outsider attacks, users, programmers, super users, information leakage.		
TEXT/REFERENCE BOOKS:			

R	Joel Scambray, Mike Shema, Caleb Sima, Hacking Exposed Web Applications, Second Edition
R	Simson Garfinkel, Gene Spafford, Web Security, Privacy & Commerce, Second Edition
R	Mike Shema, HackNotes(tm) Web Security Pocket Reference
R	Matt Bishop, "Computer Security: Art and Science", Pearson Education.
R	Fundamentals of Database Systems (3rd Ed.) - R.Elmasri, S. Navathe
R	An Introduction to database systems (5th Ed.) - C. J. Date
R	Database system concepts – H. Korth , A. Silberschatz
R	Implementing Database Security & Auditing – Ron Ben Vatan
R	Security of Data and Transaction- Vijay Atluri, Pierangela Samarati
R	Computer Security Lab Manual, Vincent J. Nestler, Wm. Arthur Conklin, Gregory B.
<b>COURSE PRE-REQUISITES:</b>	
MCA104	
<b>COURSE OBJECTIVES:</b>	
To understand the application of security concept to database technology and web technology.	
<b>COURSE OUTCOMES:</b>	
<b>CO. No</b>	<b>Course Outcome description</b>
MCA442.1	Learn the Web application architecture, its components and potential security weaknesses.
MCA442.2	To impart knowledge about securing web application.
MCA442.3	Learn the levels of database security and SQL injection.
MCA442.4	Understand information leakage and securing database to database communication.
<b>CO-PO AND CO-PSO MAPPING</b>	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA442.1	
MCA 42.2	1
MCA442.3	1
MCA442.4	

### Emerging Security Technologies

Course Code	MCA 443	Course Title	Emerging Security Technologies
Course Type	Specialization	Contact Hours	4 Hours per Week
Credit	4	Domain	Information Security Track
Syllabus			
<b>I</b>	<b>Introduction to Information Hiding</b> Information Hiding, Steganography, and Watermarking. History of Watermarking. History of Steganography, Importance of Digital Watermarking. Importance of Steganography, Properties of Watermarking and Steganography		
<b>II</b>	<b>Steganography</b> Introduction, Exploring Steganography, Steganalysis: Attacks against hidden data, Countermeasures to attacks, Steganography tools <b>Digital Water Marking (DWM)</b> Introduction, Applications and Properties of Watermarking Systems, Models of Watermarking, Basic Message Coding, Watermarking with Side Information		
<b>III</b>	<b>Bitcoin</b> Why use Bitcoins? Where and how to buy Bitcoins, How to store Bitcoins?, ow and where to spend Bitcoins?, Selling Bitcoins, Bitcoin transactions, How Bitcoin transactions work, Parameters that invalidate the transactions, Scripting language in Bitcoin, Applications of Bitcoin script, Nodes and network of Bitcoin		
<b>IV</b>	<b>Block Chain</b> Introduction to Blockchain, Distinction between databases and blockchain, Explaining distributed ledger, Blockchain structure, Working of Blockchain technology, Permissioned and permission-less Blockchain		
<b>V</b>	<b>Crypto Currencies</b>		

	Transformation in trading units, Cryptography and Cryptocurrency, Anonymity and Pseudonymity in Cryptocurrencies, Digital Signatures, Cryptocurrency Hash Codes
<b>TEXT/REFERENCE BOOKS:</b>	
R	Information Hiding: Steganography and Watermarking: Attacks and Countermeasures, By Neil F. Johnson, Zoran Duric, SushilJajodia. Kluwer Academic Publishers, Thirs Printing 2003.
R	Investigator's Guide to Steganography, by Gregory Kipper
R	Digital Rights Management – Protecting and monetizing content, by John Van Tassel.
R	Digital Watermarking and Steganography, Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, JessicaFridrich, and Ton Kalker. 2nd Edition, Morgan Kaufmann Publishers, 2008
R	Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction by Arvind Narayanan, Joseph Bonneau , Edward Felten , Andrew Miller
R	The Science of the Blockchain by Roger Wattenhofer
R	Blockchain Basics: A Non-Technical Introduction in 25 Steps by Daniel Drescher
<b>COURSE PRE-REQUISITES:</b>	
<b>COURSE OBJECTIVES:</b>	
1. To provide an overview of various information hiding techniques such as steganography and watermarking 2. Have an idea about digital right management	
<b>COURSE OUTCOMES:</b>	
<b>CO. No</b>	<b>Course Outcome description</b>
MCA443.1	Have an idea about various information hiding techniques and their need.
MCA443.2	Understand the concept of steganography and different methods of implementing steganography
MCA443.3	Understand the concept of watermarking
MCA443.4	Have the knowledge about digital right management
MCA443.5	Various applications of information hiding techniques
<b>CO-PO AND CO-PSO MAPPING</b>	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA443.1	3
MCA443.2	2
MCA443.3	3
MCA443.4	3
MCA443.5	3

### Network Security Architecture

<b>Course Code</b>	MCA 541	<b>Course Title</b>	Network Security Architecture
<b>Course Type</b>	Specialization	<b>Contact Hours</b>	4 Hours per Week
<b>Credit</b>	4	<b>Domain</b>	Information Security Track
<b>Syllabus</b>			
<b>I</b>	<b>Review of wired/wireless network protocols</b> The transport layer- TCP, UDP- Network layer & Routing, Wireless LAN- 802.11, HyperLAN, Bluetooth, wireless ATM, Mobile Network Layer, Mobile Transport Layer		
<b>II</b>	<b>Security in Computer Networks</b> Security, Authentication, Integrity, Key distribution, Certification, Access control, Attacks and counter measures, Security in many layers, intrusion detection systems and malicious software.		
<b>III</b>	<b>IPSecurity</b> IP security Architecture, Authentication Header, ESP, Combining Security Associations KeyManagement , IKE.		
<b>IV</b>	<b>Web Security</b>		

	SSL/TLS, network management security, wireless security.
<b>V</b>	<b>Email Security</b> MIME ,SMIME, Security services for email , establishing keys , privacy, authentication of source , message integrity , non-repudiation , message flow confidentiality , names and Addresses., PEM, PGP . Comparison of PEM, PGP,& X.400.
<b>TEXT/REFERENCE BOOKS:</b>	
R	C. Kaufman, R. Perlman and M. Speciner, Network Security: Private Communication in a public World, 2/e, Prentice Hall, 2002.
R	Kurose J. F. & Ross K. W., Computer Networking: A Top-Down Approach Featuring the Internet, Pearson Education Asia, 3/e, 2005.
R	Schiller J., Mobile Communications, Pearson Education Asia,2/e, 2004.
R	W. Stallings, Cryptography and Network Security Principles and practice, 3/e, Pearson Education Asia, 2003.
<b>COURSE PRE-REQUISITES:</b>	
MCA302	
<b>COURSE OBJECTIVES:</b>	
To learn various security mechanisms involved in computer networks.	
<b>COURSE OUTCOMES:</b>	
<b>CO. No</b>	<b>Course Outcome description</b>
MCA541.1	To be familiar with wired and wireless network protocols.
MCA541.2	Have a working knowledge of intrusion detection and malicious software.
MCA541.3	To Know the working of IPsec.
MCA541.4	To be familiar with web security.
MCA541.5	Understand the email security protocols like PGP, S/MIME and PEM.
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA541.1	1 1 2
MCA541.2	1 1 1 2
MCA541.3	1 2
MCA541.4	1 2
MCA541.5	1 1 2
MCA541.6	3

### Wireless Security

Course Code	MCA 542	Course Title	Wireless Security
Course Type	Specialization	Contact Hours	4 Hours per Week
Credit	4	Domain	Information Security Track
Syllabus			
I	Review of Wireless fundamentals- Wireless network protocols, Wireless Application Protocol (WAP) - Comparison of the TCP/IP, OSI, WAP model, How WAP works, the security status of WAP.		
II	Viruses, Authorization, Non-repudiation, Authentication, secure sessions, security products, WAP security Architecture, Marginal Security, Wireless access to the Internet, Wireless Middleware WEP security , RC4 Encryption , Threats- Cracking WEP , Securing the WLAN		
III	An Introduction to RFID, The case for RFID, The eras of RFID, Application type, RFID Architecture, tags, Middleware , privacy and security A confluence of Technologies, Key functionalities, RFID system components, Architecture guidelines, System Management.		
IV	Wireless Hacking techniques, Wireless Attacks		
V	Mobile Security, Securing Wi-Fi , WiMAX , Bluetooth Security, Quality of Service (QoS)		
TEXT/REFERENCE BOOKS:			
R	Russel Dean Vines,“Wireless Security Essentials: Defending Mobile from Data		
R	Piracy”, John Wiley & Sons,First Edition – 2002.		
R	Cyrus, Peikari, Seth Fogie, “Maximum Wireless Security”, SAMS Publishing 2002.		

R	RFID essentials By Bill Glover, Himanshu Bhatt
R	Lawrence Harte, "Introduction to WIMAX", Althos Publishing, 2005
R	Guide to Wireless Network Security, by Vacca
R	Network Security: Current Status and Future Directions, by Douligeris and Serpanos
R	Security for Wireless Sensor Networks, by Liu and Ning
R	Security and Cooperation in Wireless Networks, by Buttyan and Hubaux
<b>COURSE PRE-REQUISITES:</b>	
MCA302	
<b>COURSE OBJECTIVES:</b>	
To understand the security threats and risks associated with wireless network.	
<b>COURSE OUTCOMES:</b>	
<b>CO. No</b>	<b>Course Outcome description</b>
MCA502.1	Understand the concept of wireless network protocols.
MCA502.2	To impart knowledge about Viruses, WAP and WEP.
MCA502.3	Learn the RFID technology and its applications.
MCA502.4	Understand wireless hacking techniques and mobile security.
<b>CO-PO AND CO-PSO MAPPING</b>	
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 PSO4
MCA442.1	
MCA442.2	
MCA442.3	1 1
MCA442.4	

## Cyber Forensics

Cyber Forensics			
Course Code	MCA 543	Course Title	Cyber Forensics
Course Type	Specialization	Contact Hours	4 Hours per Week
Credit	4	Domain	Information Security Track
Syllabus			
I	Over View of Computer Forensics Technology- Computer Forensics Fundamentals- Type of Computer Forensics Technology- Type of Vendor and Computer Forensics Services		
II	Duplication and preservation of Digital Evidence-Computer image verification and Authentication		
III	Computer Forensics Analysis- Discovery of Electronic Evidence- Identification of data Reconstructing Past events		
IV	Investigating Network Intrusions and Cyber Crime, Network Forensics and Investigating logs, investigating network Traffic, Investigating Web attacks, Router Forensics. Cyber forensics tools and case studies		
V	Counter measure: Information warfare- Surveillance tool for Information warfare of the Future-Advanced Computer Forensics		
TEXT/REFERENCE BOOKS:			
R	Computer Forensics: Computer Crime Scene Investigation (Networking Series) By John R. Vacca-Charles River Media.		
R	Hacking Exposed Computer Forensics, Second Edition : Computer Forensics Secrets & Solutions By Aaron Philipp, David Cowen, Chris Davis- McGraw-Hill Osborne Media		
R	Kenneth C.Brancik “Insider Computer Fraud” Auerbach Publications Taylor & Francis Group–2008.		
R	Christof Paar, Jan Pelzl, Understanding Cryptography: A Textbook for Students and Practitioners, 2nd Edition, Springer’s, 2010		
R	Ali Jahangiri, Live Hacking: The Ultimate Guide to Hacking Techniques & Countermeasures for Ethical Hackers & IT Security Experts, Ali Jahangiri, 2009		

