

# **SHRI GURU RAM RAI UNIVERSITY**

[Estd. by Govt. of Uttarakhand, vide Shri Guru Ram Rai University Act no. 03 of 2017 & recognized by UGC u/s (2f) of UGC Act 1956]

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## **SYLLABUS**

### **FOR**

**Master of Computer Application (MCA)**

**Under CBCS PATTERN**

**School of Computer Application &  
Information Technology**

**(w.e.f. 2022-2023)**

**Master of Computer Application (MCA)  
OUTCOME BASED EDUCATION**

**Programme outcome (POs)**

Students will be able to

PO1	Acquire knowledge of Computing Fundamentals, Basic Mathematics, Computing Specialization and Domain Knowledge of proper computing models from defined problems.
PO2	Identify, formulate and analyze complex engineering problems reading substantiated conclusions using first principles mathematics, computer science and relevant domains.
PO3	Ability to design efficient solution for complex, real-life problem, system software or process as per needs and specifications.
PO4	Use research-based knowledge and research methods including design of experiments, analysis & interpretation of data & synthesis of information to provide valid conclusions.
PO5	Ability to demonstrate skills to use modern technologies and tools to analyse problems.
PO6	Ability to perform professional practices in an ethical way, keeping in the mind cyber regulations & laws, responsibilities and norms of professional computing practices.
PO7	Ability to develop confidence for self-education and life-long learning in the broadest context of technological change
PO8	Ability to demonstrate knowledge & understanding of the engineering and management principles and apply them as a member & as a leader in a team to manage multidisciplinary projects.
PO9	Ability to effectively communicate with the technical community and with the society about complex computing activities in both verbal and written form, design documentation, make effective presentations.
PO10	Ability to understand the impact of IT solutions in a global and societal context.
PO11	Ability to work multi-disciplinary team both as a member and leader, as per need.
PO12	Ability to apply innovation to a suitable opportunity to create value and wealth for the betterment of the individual and society at large.

**Program Specific Outcome (PSOs)**

<b>PSO1</b>	To prepare students who will create systems through software development to solve problems in Industry domain areas.
<b>PSO2</b>	To Prepare students who will contribute to societal growth through research in their chosen field.
<b>PSO3</b>	To prepare students who will perform both as an individual and in a team through good analytical, design and implementation skills.
<b>PSO4</b>	To prepare students who will be lifelong learners through continuous professional development.

**Eligibility for admission:**

Passed B.C.A/ B.Sc. (Computer Science)/ B.Sc. (IT) / B.E. (CSE)/ B.Tech. (CSE) / B.E. (IT) / B.Tech. (IT) or equivalent Degree.

OR

Passed any graduation degree (e.g.: B.E. / B.Tech. / B.Sc / B.Com. / B.A./ B. Voc./ etc.,) preferably with Mathematics at 10+2 level or at Graduation level Obtained at least 50% marks (45% marks in case of candidates belonging to reserved category) in the qualifying examination. (For students having no Mathematics background compulsory **bridge course** will be framed by the respective University/ Institution and additional bridge courses related to computer subjects as per the norms of the concerned University).

**Duration of the Programme: 2 years**

**Examination Scheme:**

<b>Components</b>	<b>Internal</b>	<b>Assignment &amp; Teacher Assessment</b>	<b>External (ESE)</b>
<b>Weightage (%)</b>	<b>20</b>	<b>20</b>	<b>60</b>

**STUDY & EVALUATION SCHEME**  
**Choice Based Credit System**  
**Master of Computer Application (MCA)**

**First Semester**

S. No.	Course Category	Course Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	C	Sessional (Internal)	External (ESE)	
<b>Theory</b>										
1	Core	MCA101	Problem Solving using 'C' Language	3	0	0	3	40	60	100
2	Core	MCA102	Web Programming	3	0	0	3	40	60	100
3	Core	MCA103	Discrete Mathematics	3	0	0	3	40	60	100
4	Core	MCA104	Operating System	3	0	0	3	40	60	100
5	Core	MCA105	Cyber Security	3	0	0	3	40	60	100
6	Core	MCA106	Professional Communications	2	1	0	3	40	60	100
<b>Practical</b>										
7	Core	MCAP11	C Programming Lab	-	-	2	1	40	60	100
8	Core	MCAP12	Web Programming Lab	-	-	2	1	40	60	100
9	Core	MCAP14	Linux Lab	-	-	2	1	40	60	100
	Core	MCAP16	Communication Seminar	-	-	2	1	100	-	100
<b>Total</b>				<b>17</b>	<b>1</b>	<b>8</b>	<b>22</b>	<b>460</b>	<b>540</b>	<b>1000</b>

## Second Semester

S. No.	Course Category	Course Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	C	Sessional (Internal)	External (ESE)	
<b>Theory</b>										
1	Core	MCA201	Data Structure using 'C'	3	0	0	3	40	60	100
2	Core	MCA202	Java Programming	3	0	0	3	40	60	100
3	Core	MCA203	DBMS	3	0	0	3	40	60	100
4	Core	MCA204	Software Engineering	3	0	0	3	40	60	100
5	Core	MCA205	Artificial Intelligence	3	0	0	3	40	60	100
6	Core	MCA206	Statistics	3	0	0	3	40	60	100
<b>Practical</b>										
7	Core	MCAP21	Data Structure Lab	-	-	2	1	40	60	100
8	Core	MCAP22	Java Programming Lab	-	-	2	1	40	60	100
9	Core	MCAP23	SQL Lab	-	-	2	1	40	60	100
10	Core	MCASM24	Seminar and Presentation	-	-	2	1	100	-	100
<b>Total</b>				<b>18</b>	<b>0</b>	<b>8</b>	<b>22</b>	<b>460</b>	<b>540</b>	<b>1000</b>

## Third Semester

S. No.	Course Category	Course Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	C	Sessional (Internal)	External (ESE)	
<b>Theory</b>										
1	Elective	MCA301.1	Advance Java	3	0	0	3	40	60	100
		MCA301.2	Python							
		MCA301.3	PL/ SQL							
2	Elective	MCA302.1	PHP Programming	3	0	0	3	40	60	100
		MCA302.2	C# Dot Net							
3	Core	MCA303	Algorithm Analysis & Design	3	0	0	3	40	60	100
4	Core	MCA304	Network Security & Cryptography	3	0	0	3	40	60	100
5	Core	MCA305	Computer Network	3	0	0	3	40	60	100
6	Core	MCA306	Research Methodology	3	0	0	3	40	60	100
<b>Practical</b>										
7	Elective	MCAP31.1	Advance Java Lab	-	-	2	1	40	60	100
		MCAP31.2	Python Lab							
		MCAP31.3	PL/ SQL Lab							
8	Elective	MCAP32.1	PHP Programming Lab	-	-	2	1	40	60	100
		MCAP32.2	C# Dot Net Lab							
9	Core	MCARBP	Project / Research Based Project	-	-	4	2	40	60	100
<b>Total</b>				<b>18</b>	<b>0</b>	<b>8</b>	<b>22</b>	<b>360</b>	<b>540</b>	<b>900</b>

## Fourth Semester

S. No.	Course Category	Course Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	C	Sessional (Internal)	External (ESE)	
<b>Theory</b>										
1	Elective	MCA401.1	Android Programming	3	0	0	3	40	60	100
		MCA401.2	Data Science in Python							
2	Elective	MCA402.1	Mobile Computing	3	0	0	3	40	60	100
		MCA402.2	Blockchain Technology							
		MCA402.3	Cloud Computing							
3	Core	MCA403	Research Publication & Ethics	3	0	0	3	40	60	100
<b>Practical</b>										
4	Elective	MCAP41.1	Android Lab	-	-	2	1	40	60	100
		MCAP41.2	Data Science in Python Lab							
5	Core	MCASM42	Seminar and Presentation	-	-	4	2	100	-	100
6	Core	MCARP	Research project	-	-	20	10	100	100	200
<b>Total</b>				<b>9</b>	<b>0</b>	<b>26</b>	<b>22</b>	<b>360</b>	<b>340</b>	<b>700</b>

**FIRST SEMESTER**

<b>Course code</b>	<b>: MCA101</b>			
<b>Course Name</b>	<b>: PROBLEM SOLVING USING 'C'</b>			
<b>Semester /Year</b>	<b>: Ist Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives: The objectives of this course are**

1. Understand the basics of Programming Paradigms,
2. To learn the basic concepts and syntax of C programming.
3. To be able to develop logics which help them to create programs and applications using C language.
4. To learn the use of C libraries functions in C language.
5. To learn the file handling and basic memory allocation concepts in C language.
6. After learning the C programming they can easily switch over to any other language

**COURSE CONTENTS****UNIT I - Introduction To 'C' Language****[No. of Hours: 10]**

History of 'C' language, Programming paradigms: Top-down and Bottom-up, Structure of a C program, Character sets, Constants and variables, Identifiers and keywords. Data types. operators and expressions, Precedence and associativity of operators in 'C'. Type conversion and type casting. Symbolic constants. Input-output library functions -getchar(), putchar() ,scanf(), printf(), gets(), puts() etc. C Library- commonly used header files. Conditional control statements- if, if-else, nested if-else, else-if ladder, multiple branching control statements, switch-case. Loop control statements- while, do-while, for, nested loops. Jump control statements- break and continue. goto, exit and return statements.

**UNIT II - Arrays and Functions****[No. of Hours: 8]**

Arrays: defining an array, passing array to a function, two-dim and multi-dim array, matrix addition and multiplication, multi-dimensional arrays. Strings in 'C'- operations and functions of strings. Storage classes. Functions: Syntax, return value; parameter passing - call by value, call by reference; return statement, calling a function, recursion basics,library functions.

**UNIT III - Pointers and preprocessor directives****[No. of Hours: 8]**

Pointers- address-of operator, value-at operator, pointer declaration and its use. Passing pointer to a function. Various operations on pointers. pointers and arrays, array of pointers. C-pre-processor- basics, #include, #define, #undef, conditional compilation directive- #if, #else, #elif, #ifdef and #ifndef, #error. Command line arguments in C.

**UNIT IV – Structure & Union****[No. of Hours: 7]**

Defining a structure, pointer to structures, structure within structure. Array of structures, structure variable and structure pointer. Union- similarity and difference between structure and unions. Dynamic memory management functions- malloc(),calloc(), free(), realloc() etc.



**UNIT V - File Handling and Related Functions****[No. of Hours:****8]**

FILE data structure. File opening modes- read, write, append and others. Operations on file-open, read, write and close. Appending contents in a binary and text file, unformatted data files. Various library functions- fopen(),read() ,write(), fprintf() and fscanf() ,fseek(), ftell() etc.

**Text Books:**

**TB1.** Pointers in C, Kanetkar Y.P. , BPB Publications

**TB2.** Kanetkar Y.P., Let us C, BPB Publications

**Reference Books:**

**RB1.** The C programming language, Kernighan and Ritchie, PHI

**RB2.** The Spirit of C, Cooper Mullish, Jaico Publishing House, Delhi

**Course Outcomes (CO):**

*After completion of the course, a student will be able to*

CO#	Detailed Statement of the CO
CO1	Able to understand the basic concepts of C programming language & improve the understanding, remembering of using data types, variables and arithmetic operations in C programming.
CO2	Able to understand Array String, Functions concepts and implement array and string using functions.
CO3	Able to understand the concept of pointer & preprocessor directives. In addition, resolve real world problems and able to design and develop various programming problems using C programming concepts.
CO4	Able to Implement advance C programming concepts like structure and union & dynamic memory allocation by using malloc and calloc function etc.
CO5	Able to analyze, understand the file handling using C Programming language.
CO6	Create & design file handling using C Programming language.

**CO-PO Mapping:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	2	2	1	1	1						2	1		1
CO2	2	2	1	1	1	1	1						2			1
CO3	1	2	2	2	1	1	1	1					3	1	1	2
CO4	1	2	2	2	1	1	1						2		1	1
CO5	2	1	1		1	1	1	2					2	1		1
CO6	1	1	1		1	1	1						2			1
AVG	1.5	1.5	1.5	1.1	1	1	1	0.5	0	0	0	0	2.1	0.5	0.3	1.1

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

<b>Course code</b>	<b>: MCA102</b>			
<b>Course Name</b>	<b>: WEB PROGRAMMING</b>			
<b>Semester /Year</b>	<b>: I<sup>st</sup> Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

L - Lecture T – Tutorial P – Practical C – Credit

### Course Objectives:

1. To learn the basic concepts of world wide web.
2. To learn the basic concepts and syntax of HTML and CSS programming.
3. To be able to develop logics which help them to create programs and applications using HTML & CSS language.
4. To use the types of CSS and CSS Overriding in a web site.
5. To learn the skills that will help the students in creating websites with great look and feel using CSS.

## COURSE CONTENTS

### Unit-I: Introduction

[No. of Hours: 6]

Introduction to the internet, introduction to html terminology. Designing webpages: design considerations and planning. Basic tags and document structure, html tags- head, title, body, metadata etc.

### Unit II: Web Page Formatting

[No. of Hours: 12]

Paragraph operations- creating and appending paragraphs, line breaks, preformatted text, changing a page's background color, div element. Text items and objects: headings, comments, block quotes, horizontal lines. Inserting special characters- <, >, blank spaces etc. Using various lists- Numbered (ordered) lists, bulleted (unordered) lists, nested lists, definition lists etc. Type of links- Text and image links. Opening a page in a new window and new tab. Linking to a specific area in the same page (bookmarks), linking to an e-mail address, linking to other types of files. Images: Adding images using <img> tag, resizing an image, using alternative text, image labels etc. Inserting a table, table borders, table headers, colspan and rowspan. Iframe- Inserting iframes, setting height and width, using an iframe for a link target.

### Unit III: Forms and Audio-Video controls

[No. of Hours: 10]

Forms- Form elements, input tag, text box, text area, check box, menu list, radio button, submit button, reset button etc. Adding audio and video on webpage, linking to audio and video files, using YouTube to display video.

### Unit IV: Cascading Style Sheets

[No. of Hours: 12]

CSS and its Types- inline, internal and external, Structure of each CSS type. Working with CSS- Creating CSS, Adding Comments, Using id and class. Text in CSS- Emphasizing text (bold and italic), decoration, indentation, transformation, text alignment. Backgrounds in CSS- Colors, Images, Fixed Images. Images in CSS- Opacity, floating images, image galleries etc. Box Model in CSS- Margin, Padding, Border, Outline. Navigation Bar- Vertical navigation bar, horizontal

navigation bar- inline and floating. Tables in CSS- Borders, cell width and height, color, text element and table padding.

**Unit V: JavaScript**

[No. of Hours: 10]

JavaScript and Browsers. Client-side scripting. JavaScript development tools. JavaScript case sensitivity and comments. Variables, datatypes, reserve words, Operators, Control statements- if-else, loops, break, continue and labels, functions and event handling, Dialog boxes- alert, confirm and prompt. JavaScript library functions- string, arrays, date, math. Introduction to advanced JavaScript- RegEx, DOM, ImageMaps, Form validation.

**Text Books:**

- TB1. HTML & CSS: The Complete Reference, Fifth Edition, Thomas A. Powell.
- TB2. Ivan Bayross, "Web Technologies Part-I" BPB Publications

**Reference Books:**

- RB1. Sharma & Sharma, "Developing E-Commerce Sites" Addison Wesley
- RB2. Burdman, "Collaborative Web Development", Addison Wesley

**Course Outcomes (COs):**

*After completion of the course, a student will be able to*

CO#	Detailed Statement of the CO
CO1	Knowledge of Internet, and the principles of web design.
CO2	Understand and interpret the language of the web HTML: Basic tags and program and media tags to make program effective.
CO3	Discover web pages by applying the HTML and CSS features with different layouts as per need of applications.
CO4	Analyse and illustrate the types of style sheet which is suitable to use in particular case by relate the inline, internal and external type of CSS.
CO5	Evaluate and design the websites with professional look and feel using both HTML and CSS.
CO6	Create and design the dynamic web pages by using the JavaScript concepts.

**CO-PO Mapping:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	1		1	1	1	1			1	1	1	1
CO2	2	2	3	1	1	1	1	1	1	1	1	1	3	2	2	3
CO3	3	3	3	1	3	2	3	2	2	3	3	3	3	2	2	2
CO4	2	3	3	1	3	2	3	2	2	3	3	3	3	2	2	3
CO5	3	3	1	3	3	3	3	3	3	3	3	3	3	2	2	3
CO6	3	3	1	3	3	3	3	3	3	3	3	3	3	2	2	3
AVG	2.6	2.6	2	1.6	2.3	1.8	2.3	2	2	2.3	2.1	2.1	2.6	1.8	1.8	2.5

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

<b>Course code</b>	<b>: MCA103</b>			
<b>Course Name</b>	<b>: DISCRETE MATHEMATICS</b>			
<b>Semester /Year</b>	<b>: I<sup>st</sup> Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

L - Lecture T – Tutorial P – Practical C – Credit

### **Course Objectives:**

#### **The objective of this course is to:**

1. Familiarize the students with the basic mathematical concepts and numerical methods.
2. To understand the concepts and results in Mathematical logic, Number theory, Group theory and Numerical methods.

### **COURSE CONTENTS**

#### **Unit I: Proposition and Logic**

**[No. of Hours: 10]**

Propositions and Compound Propositions, Logical Operations, Truth tables, Tautologies and Contradictions, Logical Equivalence, Algebra of propositions, Conditional and Biconditional Statements Arguments, Logical Implications. Quantifiers, Negation of Quantified Statements, Basic Counting Principles, Factorial, Binomial Coefficient, Permutations, Combinations Pigeonhole Principle

#### **Unit-2 Mathematical Induction**

**[No. of Hours: 10]**

Order and inequalities, Mathematical Induction, Division Algorithm, Divisibility, Euclidean Algorithm Fundamental theorem of Arithmetic, Congruence relation, Congruence Equations, Semigroups, Groups, Subgroups, Normal subgroups, Homomorphisms, Rings, Integral Domains, Fields, Polynomials over a Field.

#### **Unit-3 Recurrence Relations**

**[No. of Hours: 8]**

Towers of Hanoi, Iterations, Homogeneous linear equations with constant coefficients, particular solution, difference table, finite order differences, Line in a plane in general position

#### **Unit-4 Graph Theory**

**[No. of Hours: 6]**

paths, connectivity, subgraphs, isomorphism, trees, complete graphs, bipartite graphs, matching colourability, planarity, digraphs;

#### **Unit-5 Classification of Languages**

**[No. of Hours: 6]**

Overview of Formal Languages: Representation of regular languages and grammars, finite state Machines

### **Text Books:**

- TB1. Seymour Lipschutz and Marc Lipson– Discrete Mathematics– Second Edition – Tata McGraw Hill Edition– 2002.
- TB2. Schaums Series – Discrete Mathematics – 2nd Edition.

**Course Outcomes (CO):**

*After completion of the course, a student will be able to*

CO#	Detailed Statement of the CO
CO1	Solve an argument using logical notation like propositional logic and determine if the argument is or is not valid. Learn about permutation and combination and also Pigeonhole Principle.
CO2	Illustrate the basic principle of mathematical induction and also understand the algebraic structure related to the groups, and elementary properties of Rings and Fields.
CO3	Evaluate the problem using recurrence relations and Homogenous and Non homogenous equation, Line in a plane in general position and tower of Hanoi problem.
CO4	Design and learn about basic concepts of graph, connectivity, subgraphs, isomorphism, trees, complete graphs, bipartite graphs, matching colourability, planarity, digraphs.
CO5	To understand algorithm Fundamental theorem of Arithmetic, Congruence relation, Congruence Equations.
CO6	To understand the overview of Formal Languages: Representation of regular languages and grammars, finite state Machines

**CO-PO Mapping:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	1	2	1	2	2	1	2	1	1	1	1	1	1	1
CO2	2	1	1	2	1	1	2	1	2	2	1	1	1	1	1	1
CO3	1	2	2	2	2	1	2	1	2	2	2	1	1	1	1	1
CO4	2	1	1	2	2	2	2	1	2	2	2	2	2	1	2	1
CO5	1	2	2	2	2	2	1	2	2	2	1	1	3	2	2	2
CO6	2	3	3	1	2	2	2	1	2	2	1	1	3	3	1	1
AVG	1.6	1.6	1.6	1.8	1.6	1.6	1.8	1.1	2	1.8	1.3	1.1	1.8	1.5	1.3	1.1

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : MCA104

<b>Course Name</b>	<b>: OPERATING SYSTEM</b>			
<b>Semester /Year</b>	<b>: I<sup>st</sup> Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

L - Lecture T – Tutorial P – Practical C – Credit

### Course Objectives:

1. To study types of Operating System and functions performed by operating system
2. To know Process & Process Management.
3. To learn CPU Scheduling and Process Synchronization.
4. To study Deadlock and its prevention and avoidance.
5. To study Memory management, Virtual Memory.
6. To learn File Management & Disk Management.

## COURSE CONTENTS

### UNIT 1: Introduction to Operating System

[No. of Hours: 8]

Definition, Types of OS- Simple batch system, Time sharing systems, Real time systems, Multiprocessor systems, Distributed systems, Network based operating system.

System components - OS Services, System Calls, Utility programs

### UNIT 2: Process concepts

[No. of Hours: 8]

Process, Process States, Process Transition, PCB, CPU Scheduling Algorithms(preemptive and Non preemptive(FCFS, SJF, RR ,Priority Scheduling), Co-operating process, IPC(Pipes, Signal, Message passing) , Threads- Overview, Benefits, User & Kernel Threads.

### UNIT 3: Process Synchronization Deadlock

[No. of Hours: 8]

Critical Section problem, Critical Regions, Synchronization hardware, Classic Problems of Synchronization.

Semaphores, Monitor, swap Instruction, Test and Set Instruction.

**Deadlocks:** Deadlock and its necessary conditions, Methods for Handling Deadlocks, Deadlock prevention, RA Graph, Deadlock Avoidance, Banker Algorithm, Deadlock Detection and Recovery from Deadlock.

### UNIT 4: Memory Management

[No. of Hours: 8]

Logical vs. Physical address space, Contiguous memory allocation, Non-Contiguous memory allocation- Paging, Segmentation, Swapping, Segmentation with paging.

**Virtual Memory:** Demand paging - Performance, Page replacement, Page replacement algorithms (FCFS, LRU, Optimum), Allocation of frames, Thrashing.

### UNIT 5: File Systems and Directory Management

[No. of Hours: 8]

File concept, access methods, Allocation methods-contiguous, linked and index allocation, File protection, File permission, Directory **System** – single level, tree structured, Absolute path and Relative path.

**Disk Management:** Disk structures, Disk Scheduling, Disk Performance Parameter.

**Text Books:**

TB1. Abraham Silberschatz, Peter Baer Galvin & Greg Gagne , “Operating System Concepts”, Sixth Edition, John Wiley & Sons, Inc.

**Reference Books:**

RB1. Milankovic M “Operating System concepts and Design”, 2nd edition, Tata Mcgraw hill.  
 RB2. Deitel H.M. “An Introduction to Operating Sysems” ,2nd edition, Pearson Education.

**Course Outcomes (COs):**

*After completion of the course, a student will be able to*

CO#	Detailed Statement of the CO
CO1	Explain the types of operating system and ability to create threads and perform interposes communication.
CO2	Understand process management, resource management, memory management, Disk management problems.
CO3	Apply issues surrounding process management, resource management, memory management, Disk management problems.
CO4	Analyse issue pertaining to process management, resource management, memory management, Disk management problems
CO5	Be able to evaluate to process management, resource management, memory management, Disk management problems.
CO6	To create design and develop algorithms related to process management, resource management, memory management, Disk management problems

**CO-PO Mapping:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	3	1	1	2	1						2			1
CO2	3	1		2		1	2	1					2	1		1
CO3	3	2	1	1		2	1						2	2		1
CO4	2	1	2	2	1	2	3	1			1	1	2	1		1
CO5	1	2	1	3	2	2	2				1		2	1		1
CO6						2						1				
AVG	2.2	1.4	1.4	1.8	0.8	1.83	1.8	0.4	0	0	0.4	1	2	1	0	1

<b>Course code</b>	<b>: MCA105</b>			
<b>Course Name</b>	<b>: CYBER SECURITY</b>			
<b>Semester /Year</b>	<b>: Ist Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

L - Lecture T – Tutorial P – Practical C – Credit

### **Course Objectives: The objectives of this course are**

1. Learn the foundations of Cyber Security and threat landscape.
2. To equip students with the technical knowledge and skills needed to protect and
3. defend against cyber threats.
4. To develop skills in students that can help them plan, implement, and monitor
5. cyber security mechanisms to ensure the protection of information technology assets.
6. To expose students to governance, regulatory, legal, economic, environmental,
7. social and ethical contexts of Cyber Security.
8. To expose students to responsible use of online Social media network.
9. To systematically educate the necessity to understand the impact of cybercrimes
10. and threats with solutions in a global and societal context.
11. To select suitable ethical principles and commit to professional responsibilities and human values and contribute value and wealth for the benefit of the society

## **COUSE CONTENTS**

### **UNIT I - Overview of Cyber Security**

**[No. of Hours: 8]**

Cyber Security increasing threat landscape, Cyber Security terminologies- Cyberspace, attack, attack vector, attack surface, threat, risk, vulnerability, exploit, exploitation, hacker., Non-state actors, Cyber terrorism, Protection of end user machine, Critical IT and National Critical Infrastructure, Cyberwarfare, Case studies

### **UNIT II - Arrays and Functions**

**[No. of Hours: 10]**

Cybercrimes targeting Computer systems - data diddling attacks, spyware, logic bombs, DoS, DDoS, APTs, virus, Trojans, ransomware, data breach., Online scams and frauds - email scams, Phishing, Vishing, Smishing, Online job fraud, Online sextortion, Debit/credit card fraud, Online payment fraud, Cyberbullying, website defacement, Cyber-squatting, Pharming, Cyber espionage, Cryptojacking, Darknet- illegal trades, drug trafficking, human trafficking., Social Media Scams & Frauds - impersonation, identity theft, job scams, misinformation, fake news.

Cybercrime against persons- cyber grooming, child pornography, cyber stalking., Social Engineering attacks, Cyber Police stations, Crime reporting procedure, Case studies

### **UNIT III - Cyber Law**

**[No. of Hours: 8]**

Cybercrime and legal landscape around the world, IT Act,2000 and its amendments. Limitations of IT Act, 2000. Cybercrime and punishments, Cyber Laws and Legal and ethical aspects related to new technologies - AI/ML, IoT, Blockchain, Darknet and Social media, Cyber Laws of other countries, Case studies



**UNIT IV – Data Privacy and Data Security****[No. of Hours: 7]**

Defining data, meta-data, big data, non -personal data. Data protection, Data privacy and data security, Personal data protection bill and its compliance, Data protection principles, Big data security issues and challenges, Data protection regulations of other countries- General Data Protection Regulations(GDPR),2016 Personal Information Protection and Electronic Documents Act (PIPEDA)., Social media- data privacy and security issues

**UNIT V - Cyber Security Management, Compliance and Governance****[No. of Hours: 7]**

Cyber Security Plan- Cyber Security policy, cyber crises management plan., Business continuity, Risk assessment, Types of security controls and their goals, Cyber Security audit and compliance, National Cyber Security policy and strategy.

**Text Books:**

- TB1. Cyber Crime Impact in the New Millennium, by Marine R. C, Auther Press.
- TB2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd.

**Reference Books:**

- RB1. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform.
- RB2. Electronic Commerce by Elias M. Awad, Prentice Hall of India Pvt Ltd.
- RB3. Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant Publishers.
- RB4. Network Security Bible, Eric Cole, Ronald Krutz, James W. Conley, 2nd Edition, Wiley India Pvt. Ltd.
- RB5. Fundamentals of Network Security by E. Maiwald, McGraw Hill.

**Course Outcomes (CO):**

*After completion of the course, a student will be able to*

CO#	Detailed Statement of the CO
CO1	Define a deeper understanding and familiarity with various types of cyberattacks, cybercrimes, vulnerabilities and remedies thereto.
CO2	Understand and evaluate existing legal framework and laws on Cyber Security.
CO3	Illustrate the security aspects of social media platform and ethical aspects associated with use of social media.
CO4	Analyse and evaluate the digital payment system security and remedial measures against digital payment frauds.
CO5	Analyse and evaluate the cyber security risks.
CO6	Create National Cyber Security policy and strategies and types of Security controls and their goals.

**CO-PO Mapping:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3		1	1	1	1	2		1	2			1	2		2
CO2	2						2		1	1						2
CO3	2	1			2	3	2		1	1			2	1		2
CO4	2	1			2	1	2			2			2	1		2
CO5				1			2		1	1				1		2
CO6	2	1			1		1		1	1						
AVG	1.8	0.6	0.2	0.3	1	0.8	1.8		0.8	1.3			1	1		2

Course code	: MCA106
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<b>Course Name</b>	<b>: PROFESSIONAL COMMUNICATION</b>			
<b>Semester /Year</b>	<b>: Ist sem</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>2</b>	<b>1</b>	<b>0</b>	<b>3</b>

L - Lecture T – Tutorial P – Practical C – Credit

### Course Objective:

1. Enhance the Employability and Career Skills of students
2. Orient the students towards grooming as a professional.
3. Make them Employable.
4. Develop their confidence and help them attend interviews successfully and achieve growth by acquiring professionalism as a habit.

## COURSE CONTENTS

### UNIT I

[No. of Hours: 10]

Introduction to Soft Skills– Hard skills & soft skills – employ-ability and career Skills— Grooming as a professional with values—Time Management—Conflict management, Anger Management-Stress Management

### UNIT II

[No. of Hours: 05]

Self-Introduction-organizing the material – Written communication -Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice— presenting the visuals effectively – 5-minute presentations

### UNIT III

[No. of Hours: 10]

Introduction to Group Discussion— Participating in group discussions – understanding group dynamics – brainstorming the topic – questioning and clarifying –Group discussion strategies-activities to improve Group discussion skills

### UNIT IV

[No. of Hours: 05]

Social etiquette, Interview etiquette – dress code – body language

### UNIT V

[No. of Hours: 10]

Interview, types attending job interviews– telephone/online interview -one to one interview & panel interview –CV writing, Job application, FAQs related to job interviews

### Text Books:

- TB1. Effective Communication and soft skills Author Nitin Bhatnagar and Mamta Bhatnagar, publisher Pearson
- TB2. Basic Communication skills for technology **Author**-Rutherford, **Publisher** -Pearson Publication
- TB3. Business Communication **Author** N Gupta, **Publisher** -Sathya Bhawna Publication
- TB4. Comprehension and communication skills **Author**-Varinder Kumar. **Publisher** Kalyani

**Reference Books:**

- RB1. English communication **Author** Amit Ganguly, **Publisher** -SBPD publication  
 RB2. The art and science of business communication fourth edition, **Author** -PD Chaturvedi Mukesh Chaturvedi, **Publisher** Pearson

**Course outcomes (COs):**

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO 1	Associating knowledge, skills, and judgment with human communication that facilitate their ability to work.
CO 2	Categorizing the sub-skills of listening and speaking and be able to deliver effectively in the real time contexts.
CO 3	Imbibing the mechanics of writing professional testimonies and will help the students to construct effective paragraphs which benefit in a longer composition.
CO 4	Expressing the different forms of written communication techniques to make effective internal and external business correspondence.
CO 5	Displaying etiquette to work collaboratively with others considering various hindrances that occur and how to abolish them by being articulate and professional.
CO6	Apply the knowledge of communication to enhance employability skills

**CO-PO Mapping**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2			2	3	1		3	3	3	2	1	1	2	2
CO2	2	3			2	3	1	2	3	2	3	2	1		1	
CO3	1	3			3	3	1	2	3	3	3	2		2		2
CO4	2	2			3	3	1	2	3	3	3	2		2	1	2
CO5	1	3			2	3	1	2	3	2	3	3			3	
CO6	2	2			2	2	1	2	3				1	1		2
AVG	1.7	2.5			2.3	2.8	1.0	2.0	3.0	2.6	3.0	2.2	1.0	1.5	1.8	2.0

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	: MCAP11
Course Name	: C PROGRAMMING LAB
Semester /Year	: Ist Semester

	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives: The objectives of this course are**

1. To understand basic concepts of C programming, operators and expressions.
2. To learn the Concept of Various Decision Control statements and loops.
3. To understand the Concept of Arrays and String Operations.
4. To understand Concept of Functions, Pointers, Structure, Union and Enumeration.
5. To understand Concept of File Handling

**COURSE CONTENTS**

- Simple Program based on operators
- Simple Program based on Loops
- Program based on arrays
- Program based on strings
- Program based on function
- Program based on pointers
- Program based on structure & union
- Program based on File handling

**Course Outcomes (CO):**

*After completion of the course, a student will be able to*

<b>CO#</b>	<b>Detailed Statement of the CO</b>
<b>CO1</b>	Simple programs to understand & create the concepts of data types, operations and expressions.
<b>CO2</b>	By analyze and applying conditional and control statements.
<b>CO3</b>	Implementing Concept of array and String to solve problem.
<b>CO4</b>	Analyze and Implementation of functions, pointers, operation on pointers and dynamic storage allocation.
<b>CO5</b>	Defining, applying and handling structures, array of structures, union and processing data
<b>CO6</b>	Create & design file handling using C Programming language.

**CO-PO Mapping:**

<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO2</b>	<b>PSO4</b>
<b>CO1</b>	2	1	3	2	3	2	1						3	1	1	1
<b>CO2</b>	2	2	3	2	3	1	2	1					3	1	1	1
<b>CO3</b>	1	3	3	2	2	1	1	1			1		3	1	1	1

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<b>CO4</b>	1	2	3	2	2	1	2	1			1		3	1	1	1
<b>CO5</b>	3	1	2	2	2	1	2	1					3	1	1	1
<b>CO6</b>	2	1	2	2	2	1	2	1					3	1	1	1
<b>AVG</b>	<b>1.8</b>	<b>1.6</b>	<b>2.6</b>	<b>2</b>	<b>2.3</b>	<b>1.1</b>	<b>1.5</b>	<b>0.8</b>	<b>0</b>	<b>0</b>	<b>0.4</b>	<b>0</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>1</b>

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlat

<b>Course code</b>	<b>: MCAP12</b>			
<b>Course Name</b>	<b>: WEB PROGRAMMING LAB</b>			
<b>Semester /Year</b>	<b>: I<sup>st</sup> Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

L - Lecture T – Tutorial P – Practical C – Credit

### Course Objectives:

1. To implement the HTML to develop webpages.
2. To write the websites using HTML and CSS programming altogether.
3. To be able to apply logics for better look and feel for websites.
4. To use the types of CSS and CSS Overriding in a web site.
5. To learn the skills that will help the students in creating websites with great look and feel using CSS.

### Course Outcomes (COs):

*After completion of the course, a student will be able to*

CO#	Detailed Statement of the CO
CO1	Illustrate the HTML programs and thereby website.
CO2	Interpret the programming solutions using CSS programming concepts.
CO3	Articulate the concepts like changing look-n-feel of the multiple web pages from single source using CSS.
CO4	Analyse and relate which type of style sheet is suitable to use in particular case by the inline, internal and external type of CSS.
CO5	Evaluate and reframe the websites with professional look and feel.
CO6	Create and design the dynamic web pages using java script.

### CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	1	1		1						3			1
CO2	2	3	2	1			1					1	3	1	2	1
CO3	1	3	3										3	1	1	1
CO4	2	3	3										3	1	2	1
CO5	3	2	2							2		1	3	2	3	1
CO6	3	2	2	1	1	1	1	1	1	1	1	1	1	2	2	2
AVG	2.3	2.5	2.3	0.3	0.3	0.1	0.5	0.1	0.1	0.5	0.1	0.4	2.2	1.1	1.6	1.1

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

<b>Course code</b>	<b>: MCA14</b>			
<b>Course Name</b>	<b>: LINUX LAB</b>			
<b>Semester /Year</b>	<b>: I<sup>st</sup> Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

L - Lecture T – Tutorial P – Practical C – Credit

### Course Objectives:

The objectives of this course are

1. To learn basic knowledge about architecture of Linux and different basic Commands of Linux
2. To learn how to use process management.
3. To learn basic structure and various commands of LINUX system.
4. To learn the importance of system administration tasks.
5. To learn the shell programming.
6. To learn basics of filter commands and Tools of LINUX system

### COURSE CONTENTS:

- How to apply basic commands of LINUX
- How to apply filter commands.
- How to apply LINUX system administration commands
- Unix shell program based on conditional statements
- Unix shell program based on loops
- Unix shell program based on filters
- Unix shell program based on arrays

### Course Outcomes (COs):

*After completion of the course, a student will be able to*

<b>CO#</b>	<b>Detailed Statement of the CO</b>
<b>CO1</b>	Able to acquire knowledge and remember basic commands of LINUX and shell programming constructs
<b>CO2</b>	Able to understand basic commands of LINUX and shell programming constructs.
<b>CO3</b>	To apply basic commands of LINUX and shell programming constructs.
<b>CO4</b>	To analyse difference between basic commands of LINUX and shell programming constructs
<b>CO5</b>	Able to evaluate expressions using basic commands of LINUX and shell programming constructs.
<b>CO6</b>	Able to create applications/software using shell programming constructs



**CO-PO Mapping:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
<b>CO1</b>	3	1	1		1			1					3			1
<b>CO2</b>	3	1	2	1		2	1						3			1
<b>CO3</b>	1	1	3		1		2		2				2		1	1
<b>CO4</b>	2	1	1	1		2				1	2		3			1
<b>CO5</b>	2	1	2		1		1					2	3			1
<b>CO6</b>		1				2						2				
<b>AVG</b>	<b>2.2</b>	<b>1</b>	<b>1.8</b>	<b>0.4</b>	<b>0.6</b>	<b>1</b>	<b>0.8</b>	<b>0.2</b>	<b>0.4</b>	<b>0.2</b>	<b>0.4</b>	<b>0.66</b>	<b>2.8</b>	<b>0</b>	<b>0.2</b>	<b>1</b>

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : MCAP16

<b>Course Name : COMMUNICATION SEMINAR</b>				
<b>Semester /Year : I<sup>st</sup> Sem</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

L - Lecture T – Tutorial P – Practical C – Credit

### Course Objective:

1. Enhance the Employability and Career Skills of students
2. Orient the students towards grooming as a professional.
3. Make them Employable.
4. Develop their confidence and help them attend interviews successfully and achieve growth by acquiring professionalism as a habit.

### Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO 1	Associating knowledge, skills, and judgment with human communication that facilitate their ability to work.
CO 2	Categorizing the sub-skills of listening and speaking and be able to deliver effectively in the real time contexts.
CO 3	Imbibing the mechanics of writing professional testimonies and will help the students to construct effective paragraphs which befit in a longer composition.
CO 4	Expressing the different forms of written communication techniques to make effective internal and external business correspondence.
CO 5	Displaying etiquette to work collaboratively with others considering various hindrances that occur and how to abolish them by being articulate and professional.
CO6	Apply the knowledge of communication to enhance employability skills

### CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2			2	3	1		3	3	3	2	1	1	2	2
CO2	2	3			2	3	1	2	3	2	3	2	1		1	
CO3	1	3			3	3	1	2	3	3	3	2		2		2
CO4	2	2			3	3	1	2	3	3	3	2		2	1	2
CO5	1	3			2	3	1	2	3	2	3	3			3	
CO6	2	2			2	2	1	2	3				1	1		2
AVG	1.7	2.5			2.3	2.8	1.0	2.0	3.0	2.6	3.0	2.2	1.0	1.5	1.8	2.0

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

### SECOND SEMESTER

<b>Course code</b>	<b>: MCA201</b>			
<b>Course Name</b>	<b>: DATA STRUCTURE USING C</b>			
<b>Semester /Year</b>	<b>: IInd Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives: The objectives of this course are**

1. To learn basic knowledge about data structure and arrays.
2. To learn how to create and use linked list and its applications.
3. To learn the importance of static and dynamic use of stack and queues.
4. To learn the basic terminology of trees.
5. To learn basics of sorting and searching techniques

## **COURSE CONTENTS**

### **Unit –I**

**[No. of Hours: 10]**

**Introduction:** Basic Terminology, Elementary Data Organization, Structure operations, algorithm Complexity and time-Space trade-off, **Arrays& Linked list:** Array Definition, Representation and Analysis, Single and Multidimensional, Sparse Matrices, Recursive definition and processes, recursion in C, example of recursion, Tower of Hanoi, Representation and Implementation of Singly Linked Lists, Two-way Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to/from Linked Lists, Insertion and deletion Algorithms, Doubly linked list, Linked List in Array

### **Unit – II**

**[No. of Hours: 8]**

**Stacks:** Array Representation and Implementation of stack, Operations on Stacks: Push & Pop, Array Representation of Stack, Linked Representation of Stack, Operations Associated with Stacks, Application of stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack. **Queues:** Array and linked representation and implementation of queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, D-queues and Priority Queues.

### **Unit – III**

**[No. of Hours: 8]**

**Trees:** Basic terminology, Binary Trees, Binary tree representation, algebraic Expressions, Complete Binary Tree, Extended Binary Trees, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees, path length algorithm. Huffman Algorithm. Binary Search Tree (BST), Insertion and Deletion in BST.

### **Unit – IV**

**[No. of Hours: 8]**

**Sorting:** Selection sort, Bubble sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort.

**Searching and Hashing:** Sequential search, binary search, comparison and analysis, Hash Table, Hash Functions, Collision Resolution Strategies.

**Unit – V****[No. of Hours: 7]**

**Introduction to Graphs:** Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Sequential Representations of Graphs, Adjacency Matrices, Traversal, **File Structures:** Physical Storage Media File Organization, Organization of records into Blocks, Sequential Files, Indexing and Hashing.

**Text Books:**

TB3. Lipschutz, “Data Structure”, TMH

**Reference Books:**

RB1. Horowitz and Sahani, “Fundamentals of data Structures”, Galgotia

RB2. R. Kruse etal, “Data Structures and Program Design in C” Pearson Education

**Course Outcomes (COs):**

*After completion of the course, a student will be able to*

CO#	Detailed Statement of the CO
CO1	Able to understand and remember basics of C programming language and arrays & able to apply basic concepts of linked list & its types
CO2	Able to understand and apply basic concepts of stack and queues through array and linked list
CO3	To understand and apply the basic knowledge of Binary trees & its representation, traversing in BST, Threaded binary tree, Huffman algorithm etc.
CO4	Able to understand the concepts of sorting.
CO5	To understand & apply searching & Hashing techniques
CO6	Create the structure of different types of graphs

**CO-PO Mapping:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	1		1								1			1
CO2	2	2	1		1		1						1			1
CO3	2	1	2		2		1						2	1		1
CO4	2	1	1	1		1	1						1	2		
CO5	2	1		1		2	1						2	2	1	1
CO6	2	2											1	2		
AVG	2	1.1	.8	0.3	0.6	0.5	0.6						1.3	1.1	0.1	0.6

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlate

<b>Course code</b> : MCA202				
<b>Course Name</b> : JAVA PROGRAMMING				
<b>Semester /Year</b> : II <sup>nd</sup> Semester				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	3	0	0	3

L - Lecture T – Tutorial P – Practical C – Credit

### **Course Objectives: The objectives of this course are**

In this course, you will learn about:

1. Understand the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc. and exception handling mechanisms.
2. To understand streams and efficient user interface design techniques.
3. Understand the principles of inheritance, packages and interfaces.

## **COURSE CONTENTS**

### **UNIT-I**

**[No. of Hours: 10]**

Features of Java, Byte Code and Java Virtual Machine, JDK, Data types, Operator, Control Statements – If, else, nested if, if-else ladders, Switch, while, do-while, for, for-each, break, continue. Single and Multidimensional Array, String class, String Buffer class, Operations on string, Command line argument, Use of Wrapper Class.

### **UNIT-II**

**[No. of Hours: 15]**

Class, Object, Object reference, Constructor, Constructor Overloading, Method Overloading, Passing and Returning object form Method, new operator, this and static keyword, finalize() method, Access control, modifiers, Nested class, Inner class, Anonymous inner class, Abstract class. Use of Inheritance, Inheriting Data members and Methods, constructor in inheritance, Multilevel Inheritance – method overriding Handle multilevel constructors – super keyword, Stop Inheritance - Final keywords, Creation and Implementation of an interface, Interface reference, instance of operator, Interface inheritance, Dynamic method dispatch, Understanding of Java Object Class.

### **UNIT-III**

**[No. of Hours: 5]**

Package, Import statement, Exception Handling, Exception and Error, Use of try, catch, throw, throws and finally, Built in Exception, Custom exception, Throwable Class. Multithreaded Programming, Use of Multithread programming, Thread class and Runnable interface, Thread priority, Thread synchronization.

### **UNIT-IV**

**[No. of Hours: 5]**

Introduction to Stream, Byte Stream, Character stream, Readers and Writers, File Class, File InputStream, File Output Stream, InputStreamReader, OutputStreamWriter, FileReader, FileWriter, Buffered Reader, Collection Classes List, ArrayList, Enumeration, Vector, Properties, Introduction to Java.util package.

**UNIT V****[No. of Hours: 5]**

Java Applet, Applet Life Cycle, invoking java applet, applets tags, using Graphics, Color, Font classes, applet textfield, Introduction to AWT, GUI components Button, TextField, ComboBox, Panel etc. Event Handling.

**Text Books:**

- TB1. Core Java Volume-I Fundamentals, Eight Edition, Horstmann & Cornell, Pearson Education.  
 TB2. Introduction to Java Programming (Comprehensive Version), Daniel Liang, Seventh Edition, Pearson.

**Reference Books:**

- RB1. Programming in Java, Sachin Malhotra & Saurabh Chaudhary, Oxford University Press.  
 RB2. Murach's Beginning Java 2, Doug Lowe, Joel Murach and Andrea Steelman, SPD  
 RB3. The Complete Reference, Java 2 ( Fourth Edition ), Herbert Schild, TMH.  
 RB4. Java Programming, D. S. Malik, Cengage Learning.  
 RB5. Big Java, 3rd Ed., Horstmann, Wiley-India.

**Course Outcomes (CO):**

On completion of the course the student should be able to:

CO#	Detailed Statement of the CO
CO1	Understanding the syntax and semantics of java programming language, basic concepts of OOP implementation and use of a variety of basic control structures including selection and repetition, classes and objects.
CO2	Knowledge about primitive and reference data types including composition; basic AWT components; file-based I/O; and arrays.
CO3	Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.
CO4	Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes
CO5	Design event driven GUI and web related applications like Applets which mimic the real word scenarios.
CO6	Plan Files handling program

**CO-PO Mapping:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	1		1		3		1		1		3	1		1
CO2	3	2	2	1	2	1	3	2	2	2	3	1	3	1		1
CO3	3	2	2	1	2	1	3	2	2	2	3	3	3	1	1	1
CO4	3	2	3	2	2	1	3	2	2	3	3	3	3			1
CO5	3	2	2	1	3	1	3	2	3	2	2	2	3	3	2	2
CO6	1	1	1	1	1	1	1						1	1	2	
AVG	2.5	1.66	1.83	1	1.83	0.83	2.66	1.6	2	1.8	2.4	2	2.66	1	0.83	1

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

<b>Course code</b>	<b>: MCA203</b>			
<b>Course Name</b>	<b>: DBMS</b>			
<b>Semester /Year</b>	<b>: IInd Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives: The objectives of this course are**

1. Develop a broad understanding of database concepts and database management system software, data models, schemas and instances, data constraints, relational algebra and calculus.
2. Acquire Knowledge to model an application's data requirements using conceptual modeling tools like ER diagrams and design database schemas based on the conceptual model.
3. Be able to write SQL commands to create and manipulate database objects.
4. Be able to discuss importance of normalization and improve the database design by applying various normal forms.
5. Get in depth knowledge of concurrency control mechanisms, transaction management techniques and database security.

**COURSE CONTENTS**

**UNIT I – Basic concepts**

**[No. of Hours: 10]**

Database, Characteristics of the Database, Approach & advantages of using DBMS. Data Models, Schemas & Instances. Database abstraction & Data Independence. Overall structure of Database, Data Dictionary, Database Users, Role of DBA. Data Modeling using the Entity-Relationship Model -Entity types, Entity Sets, Attributes and Keys, Relationship & its Types, Enhanced ER Model- Specialization, Generalization, Aggregation.

**UNIT II –Relational Model, Languages & Systems**

**[No. of Hours: 10]**

Relational Data Model Concepts and Constraints. Relational Algebra, select, project & join operations. Overview of keys (primary, composite, foreign, alternate, candidate), relational Calculus. **SQL:** DDL statements, DML statements, Views, sequence, synonyms, sub queries, joins, transaction commands, specifying constraints, Indexes in SQL.

**UNIT III – Relational Data Base Design**

**[No. of Hours: 10]**

Function Dependencies & Normalization, Normal forms (1NF, 2NF, 3NF & BCNF). Lossless join & Dependency preserving, decomposition, multivalued dependencies, join dependencies (4NF & 5NF).

**UNIT IV – Transactions, Concurrency Control, Recovery Techniques [No. of Hours: 5]**

Basic concept, Transaction state and execution, ACID properties, Transaction Log, Schedules, Serializable schedule, serializability, conflict serializability, view serializability

**UNIT V – Concurrency Control and Recovery Techniques****[No. of Hours: 5]**

Concurrency control, Problems of concurrency control, **concurrency control protocols:** Lock-Based Protocols, Two Phase Locking Protocol, Timestamp-Based Protocols, Validation-Based Protocols, **Database Recovery:** Types of database failure, Types of database recovery, Recovery Techniques, log based recovery, checkpoints.

**Text Books:**

- TB1. Elmsari and Navathe, “Fundamentals of Database Systems”, Pearson Education, 7<sup>th</sup> Edition, 2016  
 TB2. Korth, Silberschatz, “Fundamentals of Database System Concepts”, TMH, 6<sup>th</sup> Edition, 2010.  
 TB3. Ivan Bayross, “SQL, PL/SQL the Programming language of Oracle”, BPB publications, 2010.  
 TB4. Desai B., “An Introduction to Database Concepts”, Galgotia Publications, New Delhi.

**Reference Books:**

- RB1. Ullman J. D., “Principals of Database Systems”, Galgotia Publications, 2<sup>nd</sup> Edition, 1999.  
 RB2. C.J.Date, A. Kannan, S. Swamynathan “An Introduction to Database Systems”,  
 RB3. Pearson Education, 8<sup>th</sup> Edition, 2006.

**Course outcomes (COs):****Upon successful completion of the course a student will be able to**

CO #	Detailed Statement of the CO
CO1	Describe the various database components, models, DBMS architecture and Database Security, transactions processing and concurrency control.
CO2	Understanding the basic concepts of DBMS, relational model, languages used to define relation, database designing, transactions and methods to controlling its execution.
CO3	Apply normalization and functional dependency on database.
CO4	Analyse the transaction processing and serializability for transaction processing.
CO5	Evaluate the concurrency control techniques and recovery in databases.
CO6	Design the database.

**CO-PO Mapping**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	2	1	1	1	2						3	1		1
CO2	2		1	2	2		1						3	2	1	1
CO3	3	1	2		2	1	2	1					3			2
CO4	2	1	1	1	1		1						3	1		1
CO5	2	2		2	1	1		1					3	2	1	2
CO6		3	3	1	1	1	1						3	2	2	2
AVG	2.4	1.6	1.8	1.4	1.3	1.0	1.4	1.0					3.0	1.6	1.3	1.5

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated



<b>Course code</b>	<b>: MCA204</b>			
<b>Course Name</b>	<b>: SOFTWARE ENGINEERING</b>			
<b>Semester /Year</b>	<b>: IInd Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

L - Lecture T – Tutorial P – Practical C – Credit

### **Course Objectives: The objectives of this course are**

1. To understand the nature of software development and software life cycle.
2. Explain methods for capturing specifying, visualizing analyzing software requirement.
3. To know basic of testing and understanding concept of software quality assurance.
4. To understand the concept of software cost model.
5. To develop good quality software and able to maintain quality of software
6. To develop knowledge of tools available for software development.

## **COURSE CONTENTS**

### **Unit I Introduction to Software Engineering**

**[No. of Hrs.:**

**6]**

Introduction Evolution of Software Engineering, Software Engineering: A layered technology, process frame work and software engineering paradigms, Software process technology, Software Requirements Analysis, Analysis Principles, Modeling the system architecture, Software prototyping and specification.

### **Unit II Software Design**

**[No. of**

**Hrs:8]**

Software Design Process, Concepts, Principles, Architectural Design, Data Design, Mapping requirements into Software Architecture, Effective modular design, Procedural Design, Interface design.

### **Unit III Software Cost Model**

**[No. of Hrs:8]**

Software Quality Planning and Project Management Evaluation of individual projects: Technical assessment, cost-benefit analysis (Evaluation Techniques), and Risk evaluation, Concept of Software Project Management and its importance, software cost estimation techniques, different types of project metrics, Models for cost estimation (COCOMO, Putnam's, function point), Introduction to project scheduling, project schedules, project and activities, scheduling activities, Schedule development methods (Critical Path Method, Critical Chain Scheduling, PERT).

### **Unit IV Software Quality Assurance**

**[No. of Hrs:10]**

Software Quality Assurance Introduction, Quality Planning, Quality Assurance, Quality Control, Tools and Techniques of Quality Control, Pareto analysis, Six Sigma, Cost of Quality, software quality metrics (McCal's Quality Model, Boehm's Quality Model, Dromey's Quality Model), Capability maturity models.

**Unit V Project Management****[No. of Hrs:8]**

Project Management – Definitions; Factors Influencing Project Management – Project Manager, Project Management Activities, Stakeholders; Project Communication; Project Development Phases; Project Charter; Statement of Work (SoW); Project Management Associations.

**Text books:**

- TB1. Software Engineering, Rogers S.. Pressman, MH  
 TB2. Fundamentals of Software Engineering, 2nd Ed., Ghezzi, PHI  
 TB3. Software Engineering, Pankaj Jalote, PHI

**Reference Books:**

- RB1. Jalote, Pankaj, "Software Engineering Ed.2" New Delhi: Narosa 2002  
 RB2. Schaum's Series, "Software Engineering" TMH

**Course Outcomes (COs):**

After completion of this course, the learners will be able to: -

CO #	Detailed Statement of the CO
CO1	Define software engineering, process and software process models.
CO2	Explain, interpret minimum requirements, types of requirements for the development of application.
CO3	Construct, develop, build (COCOMO, Putnam's, function point), Introduction to project scheduling, project schedules, project and activities, scheduling activities, Schedule development methods (Critical Path Method, Critical Chain Scheduling, PERT).
CO4	Examine, classify, and compare efficient reliable software solutions by creating a blue print for further development.
CO5	Assess SW engineering testing and risk strategies, and develops their appropriate applications.
CO6	Design, discuss, choose various software engineering tools

**CO-PO Mapping**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1		3	2	3			3					3	1	1	1
CO2		3	1						3				1	2	1	1
CO3	2	3	2	3	3	2				3			2	2	2	1
CO4	2			1		2				3			3	2	1	1
CO5								3	3				1		1	1
CO6	1															
AVG	1	1	1	1	1	0.8	0.0	1	1	1.0	0.0	0.0	2.0	1.4	1.2	1.0

3 – Highest Correlated, 2 – Medium Correlated, 1 – Low Correlated

<b>Course code</b>	: MCA205			
<b>Course Name</b>	: ARTIFICIAL INTELLIGENCE			
<b>Semester /Year</b>	: IInd Semester			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives: The objectives of this course are**

1. To create application and understanding of both the achievements of AI and theory underlying those achievements.
2. To introduce concept search in AI with help of Heuristic search technique.
3. To introduce the concept of Natural Language Processing.
4. To introduce the concept of Knowledge Representation.

**COURSE CONTENT**

**UNIT I General Issues and overview of AI**

**[No. of Hours: 8]**

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

**UNIT II Heuristic Search Techniques**

**[No. of Hours: 8]**

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

**UNIT III Knowledge Representation**

**[No. of Hours: 8]**

First Order Predicate Calculus; Skolemisation; Resolution Principle and Unification; Inference Mechanisms Horn's Clauses; Semantic Networks; Frame Systems and Value Inheritance; Scripts; Conceptual Dependency AI Programming Languages Introduction to LISP, Syntax and Numeric Function; List manipulation functions; Iteration and Recursion.

**UNIT IV Natural Language Processing and Parsing Techniques**

**[No. of Hours: 8]**

Context – Free Grammar; Augmented Transition Nets (ATN); Semantic Analysis, Case and Logic Grammars; Planning Overview – An Example Domain: The Blocks World; Component of Planning Systems; Goal Stack Planning (linear planning).

**UNIT V Expert Systems**

**[No. of Hours: 8]**

Introduction to Expert Systems, Architecture of Expert Systems; Expert System Shells; Knowledge Acquisition; Case Studies; MYCIN.

**Text Books:**

- TB1. Elaine Rich and Kevin Knight: Artificial Intelligence – Tata McGraw Hill.  
 TB2. Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems – Prentice Hall of India.

**Reference Books:**

- RB1. Elaine Rich and Kevin Knight: Artificial Intelligence – Tata McGraw Hill.  
 RB2. Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems – Prentice Hall of India.  
 RB3. Nils J. Nilsson: Principles of Artificial Intelligence – Narosa Publication house.  
 RB4. Artificial Intelligence : A Modern Approach, Stuart Rusell, Peter Norving, Pearson Education 2nd Edition.  
 RB5. Artificial Intelligence, Winston, Patrick, Henry, Pearson Education.  
 RB6. Artificial Intelligence by Gopal Krishna, Janakiraman, Wesley, California, 2002

**Course Outcomes (COs):**

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Describe fundamental understanding of the history of AI
CO2	Apply basic principles of AI in solutions that require problem solving, inference, perception
CO3	Demonstrate awareness and a fundamental understanding of various applications of AI
CO4	Apply different search algorithms
CO5	Understand Natural Language Processing
CO6	Plan heuristic algorithm

**CO-PO Mapping**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2										1			1
CO2	2	2	2	2									3	2	1	2
CO3	2	3	3	3	3								2		2	1
CO4	2												3	2	2	2
CO5	3		3	2		2							2			2
CO6	2	1	1	2	1	1							2	2	2	1
AVG	2.33	1.33	1.83	1.5	0.66	0.5							2.16	1.0	1.16	1.5

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

<b>Course code</b>	<b>: MCA206</b>			
<b>Course Name</b>	<b>: STATISTICS</b>			
<b>Semester /Year</b>	<b>: IInd Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

L - Lecture T – Tutorial P – Practical C – Credit

### Course Objectives:

1. To study methods of collection, classification, tabulation of data.
2. To apply various statistical methods and analyses the data
3. To find correlation between the data.
4. To study probability and probability distribution to solve various real life problems
5. To test hypothesis using various statistical test.

### COURSE CONTENTS

#### UNIT 1: Data & Its Diagrammatic Representation [No. of Hours: 8]

Definition of Statistics, Data, Primary data & secondary data, classification of data, tabulation of data, individual series, Discrete frequency Distribution, continuous frequency distribution, Exclusive and inclusive continuous series, Diagrammatic representation of data, Tabular form, 1D (All Bar Diagrams), Histogram, Frequency polygon, frequency curve, Ogive.

#### UNIT 2: Measure of Central Tendency & Dispersion [No. of Hours: 8]

Mean (Arithmetic Mean, Weighted Mean, Harmonic Mean, Geometric Mean), Median, Mode, Histogram & Mode, Relationship between mean, median, mode. Definition of dispersion, Range, Quartile deviation & its coefficient, Inter Quartile deviation, Mean deviation & its coefficient, Standard deviation.

#### UNIT 3: Correlation & Regression Analysis [No. of Hours: 8]

Correlation definition, types of correlation, Karl Pearson coefficient of correlation, Spearman coefficient of correlation, repeated rank. **Regression Analysis** Regression lines, Regression line of Y on X & X on Y, Regression coefficient, Relationship between correlation & regression coefficient.

#### UNIT 4: Probability & Probability Distributions [No. of Hours: 8]

probability & probability distribution: probability, Sample space & events, types of events, conditional probability, Bayes theorem, Mathematical expectation

#### UNIT 5: Sampling, Hypothesis Testing & Statistical Test [No. of Hours: 8]

Sampling & its type, Probability & Non probability sampling, Hypothesis, Null hypothesis, Alternative hypothesis, Type I & Type II Errors, Statistical **Test**: Parametric test & non parametric test, F test, T test, ANOVA -1, ANOVA 2, Chi square test as a goodness of fit, Chi square test as test of independence.

**Text Books:**

TB1. Gerald Keller : Managerial Statistics 9th Edition.

**Reference Books:**

RB1. Richard Levin & David Rubin : Statistics for management, Prentice Hall.

RB2. Anderson, Sweeny & Williams: Statistics for Business and Economics, South W

**Course Outcomes (CO):**

*After completion of the course, a student will be able to*

CO#	Detailed Statement of the CO
CO1	To gain knowledge of statistical method like Average, Correlation, Regression, dispersion probability and probability distribution
CO2	To understand statistical method like Average, Correlation, Regression, dispersion probability and probability distribution
CO3	To apply statistical method and probability distribution
CO4	To analyze various statistical method and probability distribution
CO5	To apply statistical method probability distribution and statistical test to test the hypothesis
CO6	To create new statistical method probability distribution and statistical test

**CO –PO Mapping:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	3	1	1	2	1						2	1		1
CO2	3	1		2		1	2	1					2	1		1
CO3	3	2	1	1		2	1		2				2	1		1
CO4	2	1	2	2	1	2	3	1		2	1		2	1		1
CO5	1	2	1	3	2	2	2				1	1	2	1		1
CO6	1						2					1	2	1		1
AVG	2	1.4	1.4	1.8	0.8	1.8	1.83	0.4	0.4	0.4	0.4	0.33	2	1		1

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

<b>Course code</b>	<b>: MCAP21</b>			
<b>Course Name</b>	<b>: DATA STRUCTURE Lab</b>			
<b>Semester /Year</b>	<b>: IInd Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

L - Lecture T – Tutorial P – Practical C – Credit

### Course Objectives: The objectives of this course are

1. To learn how to design the algorithms to solve the programming problems.
2. To learn how to discriminate the usage of various structures in approaching the problem solution.
3. To learn how to use effective and efficient data structures in solving various Computer Engineering domain problems
4. To learn how to analyse the problems to apply suitable algorithm and data structure.
5. To learn how to use appropriate algorithmic strategy for better efficiency

### COURSE CONTENTS

- Program based on arrays
- Program based on strings
- Program based on Link List & types of Link List
- Program based on stack
- Program based on Queues
- Program based on Trees
- Program based on different types of sortings
- Program based on Graphs

### Course Outcomes (CO):

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
<b>CO1</b>	Analyze & understand the difference between linear and non linear DS & implement array & link list and its types
<b>CO2</b>	Understand and implement stack and queues using array and link list
<b>CO3</b>	Understand and implement BST, addition and deletion of nodes, Huffman algorithm etc.
<b>CO4</b>	To implement different sorting techniques like selection Bubble, insertion, merge quick sort etc.
<b>CO5</b>	To understand and implement linear and binary search
<b>CO6</b>	To create and implement of graphs like directed and undirected graphs etc

**CO-PO Mapping:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2				1						2	1		1
CO2	3	1	2			1	1						2	1		1
CO3	3	2	3	1	1	2	2						2	1	1	1
CO4	1	1	3	1		2	2						2	1		1
CO5	1	1	3	1		1	2						2	2	1	1
CO6	1	1	3			1	2						2	1		1
AVG	1.8	1.3	2.6	0.5	0.1	1.1	1.5						2	1	0.3	1

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlate



<b>Course code</b>	<b>: MCAP22</b>			
<b>Course Name</b>	<b>: JAVA PROGRAMMING LAB</b>			
<b>Semester /Year</b>	<b>: II<sup>nd</sup> Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	0	0	2	1

L - Lecture T – Tutorial P – Practical C – Credit

### **Course Objectives: The objectives of this course are**

1. To write programs for solving real world problems using java programming.
2. To write multithreaded programs.
3. To write GUI programs using applets in Java.
4. To demonstrate skills in writing programs using exception handling techniques and multithreading.

### **COURSE CONTENTS**

1. Write a Java program to count the letters, spaces, numbers and other characters of an input string.
2. Write a Java program to prove that Euclid's algorithm computes the greatest common divisor of two positive given integers.
3. Write a Java program to delete a specified node in the middle of a singly linked list.
4. Write a Java program to calculate the average value of array elements.
5. Write a Java program to insert an element (specific position) into an array.
6. Write a program to print the names of students by creating a Student class. If no name is passed while creating an object of Student class, then the name should be "Unknown", otherwise the name should be equal to the String value passed while creating object of Student class.
7. Create an abstract class 'Parent' with a method 'message'. It has two subclasses each having a method with the same name 'message' that prints "This is first subclass" and "This is second subclass" respectively. Call the methods 'message' by creating an object for each subclass.
8. Create a class with a method that prints "This is parent class" and its subclass with another method that prints "This is child class". Now, create an object for each of the class and call.
  - a) method of parent class by object of parent class
  - b) method of child class by object of child class
  - c) method of parent class by object of child class
9. Assign and print the roll number, phone number and address of two students having names "Sam" and "John" respectively by creating two objects of class 'Student'.
10. Write a program to print the name, salary and date of joining of 10 employees in a company. Use array of objects.
11. A person is eligible to vote if his/her age is greater than or equal to 18. Define a method to find out if he/she is eligible to vote.
12. Write a Java program that correctly implements the producer – consumer problem using the concept of inter-thread communication.

13. Develop an applet in Java that displays a simple message. b) Develop an applet in Java that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named “Compute” is clicked.
14. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,\*, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.

**Text Books:**

- TB1. Core Java Volume-I Fundamentals, Eight Edition, Horstmann & Cornell, Pearson Education.
- TB2. Introduction to Java Programming (Comprehensive Version), Daniel Liang, Seventh Edition, Pearson.

**Reference Books:**

- RB1. Programming in Java, Sachin Malhotra & Saurabh Chaudhary, Oxford University Press.
- RB2. Murach’s Beginning Java 2, Doug Lowe, Joel Murach and Andrea Steelman, SPD
- RB3. The Complete Reference, Java 2 ( Fourth Edition ), Herbert Schild, TMH.
- RB4. Java Programming, D. S. Malik, Cengage Learning.
- RB5. Big Java, 3rd Ed., Horstmann, Wiley-India.

**Course Outcome (CO):**

On completion of the course the student should be able to:

CO#	Detailed Statement of the CO
CO1	Use an integrated development environment to write, compile, run, and test simple object-oriented Java programs.
CO2	Validate input in a Java program.
CO3	Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.
CO4	Create Multithreading programs and Exception handling to develop efficient and error free codes.
CO5	Design event driven GUI and web related applications which mimic the real world scenarios using AWT.
CO6	Plan Java files programs.

**CO-PO Mapping:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	1			1	3	1			1	2	2			1
CO2	2	1	1		2		2		1		1		1			1
CO3	3	2	2	1	2	1	3	2	2	2	3	3	3	1	1	1
CO4	3	2	3	2	2	1	3	2	2	3	3	3	3	1		1
CO5	3	2	2	1	3	1	3	2	3	2	2	3	3	2	2	2
CO6	2	2	2	2	1	1	2						2	2	2	1
AVG	2.66	1.6	1.83	1	1.66	0.83	2.66	1.4	1.6	1.4	2	2.2	2.33	1.0	0.83	1.16

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

<b>Course code</b>	<b>: MCAP23</b>			
<b>Course Name</b>	<b>: SQL LAB</b>			
<b>Semester /Year</b>	<b>: IInd Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives: The objectives of this course are**

1. Working expertise of DDL and DML commands with their application on solving real time problems.
2. Ability to apply filters using where clause and nested queries, integrity constraints at table level and column level and to use built-in functions including numeric, character and date functions.
3. Adequate knowledge to fetch data from multiple tables using different types of JOIN operations.

**COURSE CONTENTS**

- Queries used for creating and managing tables i.e. Data Definition Language (DDL) e.g., create table, alter table, drop, rename table etc.
- Queries used for manipulating data i.e. Data Manipulation Language (DML) e.g., inserting rows into a table, update rows in a table, delete rows from a table,
- Writing and executing basic SQL queries
- Including constraints while creating tables.
- Queries based on restricting and sorting data
- Queries based on single row functions used in character, number and date.
- Queries based on displaying data from multiple tables.
- Aggregating data using group functions
- Queries based on subqueries.
- Describing and creating view, retrieving data through a view, alter definitions of a view, insert, delete and update data through a view, drop a view

**Course outcomes (COs):**

Upon successful completion of the course a student will be able to

CO #	Detailed Statement of the CO
CO1	Defining the databases, tables and query a database using SQL DML/DDDL commands.
CO2	Understanding the sub languages used in SQL to work with database
CO3	Demonstrate the use of constraints, relational algebra operations and Grouping.
CO4	Analyse the knowledge of SQL queries in while developing database applications.
CO5	Evaluate the concept of Views, Rollback, Commit, Grant and Revoke Permission.
CO6	Design solutions for real world problems/case studies by creating efficient database schema.

**CO-PO Mapping:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
<b>CO1</b>	1	1	3	2	3	2	1						3			1
<b>CO2</b>	2	1	2	1	2	1		1					3	1		1
<b>CO3</b>	3	1		1	1	1	2						3	1	2	2
<b>CO4</b>	1	1	3	2	1		3	1			2	1	3	2	2	1
<b>CO5</b>	1	1	2			1	2	2			3		1	1	3	1
<b>CO6</b>		3	3	1	1	1	1						3	2	2	2
<b>AVG</b>	<b>1.6</b>	<b>1.3</b>	<b>2.6</b>	<b>1.4</b>	<b>1.6</b>	<b>1.2</b>	<b>1.8</b>	<b>1.3</b>			<b>2.5</b>	<b>1.0</b>	<b>2.7</b>	<b>1.4</b>	<b>2.3</b>	<b>1.3</b>

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

<b>Course code</b>	<b>: MCASM24</b>			
<b>Course Name</b>	<b>: SEMINAR AND PRESENTATION</b>			
<b>Semester /Year</b>	<b>: IInd Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives:** The objectives of this course are

1. Identify and compare technical and practical issues related to the area of course specialization.
2. Outline annotated bibliography of research demonstrating scholarly skills.
3. Prepare a well-organized report employing elements of technical writing and critical thinking.
4. Demonstrate the ability to describe, interpret and analyze technical issues and develop competence in presenting.

**Course outcomes (COs):**

Upon successful completion of the course a student will be able to

<b>CO</b>	<b>Detailed Statement of the CO</b>
<b>CO1</b>	Defining the aim of the seminar topic.
<b>CO2</b>	Understanding the seminar topic and requirements of technical resources.
<b>CO3</b>	Apply the critical thinking on the topic of the seminar
<b>CO4</b>	Illustrate the work done in the topic with presentation.
<b>CO5</b>	Work is evaluated by a panel to boost the confidence to the student.
<b>CO6</b>	Create technical documents.

**CO-PO Mapping**

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>
<b>CO1</b>	3			2			2					2	1	1	1	2
<b>CO2</b>			3	2							2		1		1	2
<b>CO3</b>					2				3				1		2	2
<b>CO4</b>									3				1		3	
<b>CO5</b>	2						2		2					1	2	2
<b>CO6</b>	2	2	1	2	2		2		2			1	1	1	2	2
<b>AVG</b>	<b>2.3</b>	<b>2.0</b>	<b>2.0</b>	<b>2.0</b>	<b>2.0</b>		<b>2.0</b>		<b>2.5</b>		<b>2.0</b>	<b>1.5</b>	<b>1.0</b>	<b>1.0</b>	<b>1.8</b>	<b>2.0</b>

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

**THIRD SEMESTER**

<b>Course code</b>	<b>: MCA301.1</b>			
<b>Course Name</b>	<b>: ADVANCE JAVA</b>			
<b>Semester /Year</b>	<b>: IIIrd Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives: The objectives of this course are**

1. Learn how to create a GUI in Java
2. Server-side programming with the help of Servlet and JSP
3. Design and Develop Web applications
4. Database connection with the help of Java JDBC

**COURSE CONTENTS****UNIT I Graphical user interface****[No. of Hours: 8]**

**Layout managers:** flow layout, border layout, card layout grid bag layout, grid layout, AWT controls (labels, buttons, canvases, checkboxes, checkbox group, choices, textfields, textareas, lists, scrollbars, panels, split panes, Progress bar, windows, frames, menus, menu bars).

**Java Swing:** Working with JFrame, JApplet, JPanel, JTextfield, JPasswordField, JButton, Jcheckbox, Jradio button, Jlist, Jscrollpane, Jcombobox, Jmenu, Jmenubar, JMenuitem, Jpopup Menu, JTree, JTable.

**Event Handling:** Event delegation model or event class hierarchy, all classes and interfaces of event delegation model, programs related to event.

**UNIT II Java Bean****[No. of Hours: 8]**

Java Beans, preparing a Class to be a Java Bean, Creating a JavaBean, JavaBean Properties, Types of beans, Stateful Session bean, Stateless Session bean, Entity bean, JSDK

**UNIT III JDBC Connectivity****[No. of Hours: 8]**

Java Database Connectivity (JDBC): JDBC Classes and its important methods, Merging Data from Multiple Tables: Joining, Manipulating Databases with JDBC, Prepared Statements, Transaction Processing, Stored Procedures C.

**UNIT IV Servlets****[No. of Hours: 8]**

Servlet Overview and Architecture, Interface Servlet and the Servlet Life Cycle, The Javax.servlet Package, Accessing a Servlet using an HTML page, Handling HTTP get Requests, Handling HTTP post Requests, Redirecting Requests to Other Resources, Session Tracking, Cookies, Session Tracking with HTTP Session.

**UNIT V Java Server Pages (JSP)****[No. of Hours: 8]**

Introduction to JSP and webserver, Tomcat Apache, XAMP, WAMP, JavaServer Pages Overview, A First JavaServer Page Example, Implicit Objects, Scripting, Standard Actions, Directives, Custom Tag Libraries

**Text Books:**

- TB1. Herbert Schildt (2006), "The Complete Reference Java 2 (Updated to Cover J2SE 1.4)", Ed. 05, Tata McGraw-Hill .
- TB2. Cay S. Horstmann Gary Cornell, " Core Java 2 Volume-I Fundamentals", Ed-07, PEARSON Education.

**Reference Books:**

- RB1. Michael Morgan, "Java 2 for Professionals Developers", Ed. 01, SAMS, Techmedia.
- RB2. Bruce Eckel, "Thinking in Java, The Definitive Introduction to Object-Oriented Programming in the Language of World-Wide-Web", Ed-03, PEARSON Education.
- RB3. Philip Heller and Simon Roberts, "Java 2 Developer's Hand Book", BPB Publication.

**Course outcomes (COs):**

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Understand different layout managers and event handling
CO2	Understand different types of java beans
CO3	Design java JDBC with different databases
CO4	Understand java servlets
CO5	Design JSP web applications
CO6	Plan java servlet programs

**CO-PO Mapping**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	2		2	2		2				2			2
CO2					2								2			1
CO3	2			2			2						2			2
CO4			2		2								2			2
CO5		2		2		2							3	2	2	2
CO6	1	1	1	2	1	1							2	1	1	1
AVG	1	0.83	0.66	1.33	0.83	0.83	0.66	0	0.33	0	0	0	2.16	0.5	0.5	1.66

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : MCA301.2

<b>Course Name</b> : PYTHON				
<b>Semester /Year</b> : IIIrd Semester				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

L - Lecture T – Tutorial P – Practical C – Credit

### **Course Objectives: The objectives of this course are**

1. Master the core of writing Python scripts
2. Understand decision-making and functions in python
3. Interpret Object-oriented programming features in python
4. Gain knowledge of data structures in python
5. Explore file handling and database operations in python

## **COURSE CONTENTS**

### **Unit I**

[No. of Hours: 10]

Introduction: History, Features, Setting up path, Working with Python, Basic Syntax, Variable and Data Types, Operator, Conditional Statements: If, If- else, Nested if-else, Looping: For, While, Nested loops, Control Statements: Break, Continue, Pass

### **Unit II**

[No. of Hours: 11]

**String:** Accessing Strings, Basic Operations, String slices, Function and Methods. **Lists:** Introduction, Accessing list, Operations, Working with lists, Function and Methods, sorting, searching. **Tuple:** Introduction, Accessing tuples, Operations, Working, Functions and Methods **Sets:** Introduction, Accessing sets, Operations, Working, Functions and Methods. **Dictionaries:** Introduction, Accessing values in dictionaries, Working with dictionaries, Properties, Functions **Sets:** Introduction, Accessing values in sets, Working with dictionaries, Properties, Functions

### **Unit III**

[No. of Hours: 7]

Functions: Defining a function, Calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables, Python Lambda, recursion. Modules: Importing module, Math module, Random module, Packages, Composition

### **Unit IV**

[No. of Hours: 7]

**Input-Output:** Printing on screen, Reading data from keyboard, **File Handling:** Opening and closing file, Reading and writing files. **Database handling using SQLite3.** **Exception Handling:** Exception, Except clause, Try, finally clause, User Defined Exceptions

### **Unit V**

[No. of Hours: 5]

**OOPs concept:** Class and object, Attributes, Inheritance, Overloading, Overriding, Data hiding.

### **Text Books:**

TB1. Budd T A, “Exploring Python”, McGraw-Hill Education, 1<sup>st</sup> Edition, 2011.



- TB2. Mark Lutz, “Learning Python”, O’Reilly, 4<sup>th</sup> Edition, 2013.  
 TB3. Y. Daniel Liang, “Introduction to Programming Using Python”, Pearson, 1<sup>st</sup> Edition, 2013.

**Reference Books:**

- RB1. Kenneth A. Lambert, “The Fundamentals of Python: First Programs”, Cengage Learning, 1<sup>st</sup> Edition, 2011.  
 RB2. Allen Downey, “Think Python: How to Think Like a Computer Scientist”, O’Reilly, 2<sup>nd</sup> Edition, 2015.  
 RB3. Reema Thareja, “Python Programming using Problem Solving Approach”, Oxford University Press, 1<sup>st</sup> Edition, 2017.  
 RB4. Joel Grus, “Data Science from Scratch”, O’Reilly, 2<sup>nd</sup> Edition, 2019.  
 RB5. Tony Gaddis, “Starting out with Python”, Pearson, 3<sup>rd</sup> Edition, 2014.

**Course outcomes (COs):**

Upon successful completion of the course a student will be able to

CO #	Detailed Statement of the CO
CO1	Knowledge and remember the programming constructs used in python.
CO2	Understanding the facts behind the sequences, functions, modules, files, database and object oriented etc. used in Python
CO3	Apply data structure primitives like strings, lists, tuples, sets and dictionaries on various types of data with or without using functions, object-oriented concepts to the programs in Python etc.
CO4	Distinguish and analyze basic constructs of Python and how constructs can be used all together.
CO5	Evaluate the programming constructs of Python to provide verdict on findings.
CO6	Create python programs using various programming constructs of Python.

**CO-PO Mapping**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	1		1		2						1			1
CO2	3	3	3	2	1	1	2			1			1			1
CO3	1	3	3	2	1	1				1			2			1
CO4	3	3	3	2	1	1	2	1	1	1	2	1	2			1
CO5	1	3	3	2	1	1				1			3	2	2	2
CO6	3	3	3	3	1	1	1	1	1	1	1	1	3	1	1	2
AVG	2.3	2.7	2.7	2.2	1.0	1.0	1.8	1.0	1.0	1.0	1.5	1.0	2.0	1.5	1.5	1.3

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	: MCA301.3
Course Name	: PL/SQL

<b>Semester /Year : IIIrd Semester</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives: The objectives of this course are**

1. To interpret the features of PL/SQL with a general understanding of where and how this language can be used.
2. To understand the structure of PL/SQL program
3. To use expressions, operators, control structures, records and SQL within PL/SQL
4. To understand different built-in SQL Functions and how, where they can be used
5. To define different Cursor types and how they can be used in PL/SQL
6. To implement error handling in PL/SQL code
7. To create Procedures, Functions and Packages
8. To describe different types of database triggers and how they should be used

**COURSE CONTENTS**

**UNIT I SQL and Advance SQL**

**[No. of Hours: 10]**

SQL Commands and Data types, Operators and Expressions, Introduction to SQL \* Plus, Managing Tables and Data, Creating and Altering Tables (Including constraints), Data Manipulation Command like Insert, update, delete, SELECT statement with WHERE, GROUP BY and HAVING clause, ORDER BY, DISTINCT, Special operator like IN, ANY, ALL BETWEEN, EXISTS, LIKE, Join and its types (Non EuqiJoin, EquiJoin,Outer Join, Natural Join, Self Join), subqueries , Built in functions. Advance SQL: View, Synonyms, Index ,Sequence.

**UNIT II Introduction to PL/SQL & Cursors**

**[No. of Hours: 10]**

SQL v/s PL/SQL , PL/SQL Block Structure , Language construct of PL/SQL (Variables, Basic and Composite Data type, Conditions looping etc.), % TYPE and % ROWTYPE , Implicit Cursor, Cursor Attributes, Writing Explicit Cursors (Cursor function, declaring, opening, fetching data from cursor), Cursor FOR loop. Advanced Explicit Cursors (Cursor with Parameter).

**UNIT III Error handling, Transaction control & Security in PL/SQL**

**[No. of Hours: 6]**

Exception Types, Predefined Exception, User Defined Exception, Raise Application Error, Locks, Types of locks, Application of Locks, Transaction Control Statements, Commit, Rollback, Savepoint, Application of Save Point,

**UNIT IV PL/SQL Database Objects**

**[No. of Hours: 7]**

Anonymous PL/SQL and named Block, developing stored Procedures, formal and actual parameters, IN, OUT and INOUT parameters, Creating Functions, Stored Functions, User Defined Functions. Creating Packages, Component of Package, Developing Package, Overloading procedures and Functions

**UNIT V Triggers and Collection****[No. of Hours: 7]**

Triggers Types of triggers, Create DML Triggers (Row trigger, Statement triggers, Before and after triggers, using OLD and NEW qualifier), Firing (Timing), Statement Level Triggers and Row Level Triggers, Create Instead of and Disabled Triggers, Manage, Test and Remove Triggers. Collection in PL/SQL Object Types, Nested Tables, Variable Arrays, Associative Arrays/ Index by table Array.

**Text Books:**

TB1. Baron Schwartz , High Performance MySQL, O'Reilly.

TB2. Ivan Bayross ,PL/SQL Programming ,TMH.

**Reference Books:**

RB1. Vikram Vaswani , The Complete Reference MySQL , McGraw Hill Educations.

RB2. Oracle Complete Reference, Oracle Press

**Course Outcomes (COs):****Upon successful completion of the course a student will be able to**

CO #	Detailed Statement of the CO
CO1	Knowledge and remembering the SQL and programming constructs used in PL/SQL.
CO2	Understanding the PL/SQL structure, basic programming attributes, cursors, error handling, procedure & functions, packages, and triggers.
CO3	Apply data structure primitives like cursors, triggers etc. on various types of data with or without using functions or procedures. Handling the errors to make the program robust.
CO4	Analyse the effect of applying cursors, triggers, and other primitives.
CO5	Evaluate the effect on the data base after applying SQL query and PL/SQL constructs.
CO6	Create PL/SQL programs using various programming constructs of Python.

**CO-PO Mapping**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PO4
CO1	3				1	1	1		1		1		1			1
CO2	3	2	2		1		1						2			1
CO3	3	3	2	1	1	1	1						2			1
CO4	3	2	2	1									2			1
CO5	3	1	2	1									2			1
CO6	3	3	3	1	1	1	1				1		3	1	2	2
AVG	3	2.2	2.2	1	1	1	1		1		1		2	1	2	1.2

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

<b>Course code</b>	<b>: MCA302.1</b>			
<b>Course Name</b>	<b>: PHP PROGRAMMING</b>			
<b>Semester /Year</b>	<b>: III<sup>rd</sup> Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

L - Lecture T – Tutorial P – Practical C – Credit

### Course Objectives:

- To learn the advance concepts of websites.
- To learn the basic concepts and syntax of HTML and PHP programming.
- To be able to develop interactive programs using PHP.
- To use the types of CSS and CSS Overriding in a web site.
- To learn the skills that will help the students in creating websites with great look and feel using CSS.

## COURSE CONTENTS

### UNIT I Introduction to PHP

[No. of Hours: 10]

History of PHP, basic syntax, variable and constant, datatypes, operators and expressions. Decision making- if-else, switch case, loops, nesting control statements. PHP and HTML together.

### UNIT II Function in PHP

[No. of Hours: 10]

Define a function, call-by-value and call-by-reference, recursive functions, strings and its operations- searching, replacing, formatting, string library functions. PHP arrays- index based and associative arrays, array looping- index and associative based using each () and foreach(). Useful PHP library functions.

### UNIT III HTML Forms and Files

[No. of Hours: 10]

Handling Html form with PHP- capturing form, generating file uploaded form, form redirection. Working with file and directories- opening, closing, copying, renaming and deleting a file. Working with directories- creating and deleting directories. File uploading and downloading.

### UNIT IV Session and Cookies

[No. of Hours: 10]

Session handling in PHP- creating and destroying sessions, session variables. Cookies and session handling, deleting cookies.

### UNIT V Database Connectivity

[No. of Hours: 10]

Introduction to RDBMS, Connection with MySql Database, Performing basic database operation(DML) (Insert, Delete, Update, Select), Setting query parameter, Executing queryJoin (Cross joins, Inner joins, Outer Joins, Self joins) , Exception Handling Understanding Exception and error, Try, catch, throw, Error tracking and debugging.

**Text Books:**

Learning PHP, MySQL, books by ‘ O’ riley Press

**Course Outcomes (COs):**

*After completion of the course, a student will be able to*

CO#	Detailed Statement of the CO
CO1	Understand the basic concepts of PHP and write PHP programs.
CO2	Design and develop interactive websites.
CO3	Implement concepts like session handling, database operations etc.
CO4	Develop professional websites using various PHP tools such as PHP Super Global, Exception handling and other PHP programming constructs.
CO5	Serve the society by creating and evaluating the websites with professional look and feel and use these skills to build successful career.
CO6	Create the connection between PHP with MySql Database2

**CO-PO Mapping:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	1	1		1		2				3			2
CO2	2	2	3	1			1		1				3	2	2	1
CO3	1	3	3						2				3		1	1
CO4	2	3	3			2				2			3	2	2	1
CO5	3	3	1								3	1	2	3	2	2
CO6	2	2	2										2	3	1	1
AVG	2.1	2.5	2.5	0.3	0.1	0.3	0.3	0	.8	0.3	0.5	0.1	2.7	1.6	1.3	1.3

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

<b>Course code</b>	<b>: MCA302.2</b>			
<b>Course Name</b>	<b>: C# DOT NET</b>			
<b>Semester /Year</b>	<b>: IIIrd Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives: The objectives of this course are**

1. To study the features of .NET Technologies and to understand the framework and environment.
2. To learn C# programming fundamentals for console application development.
3. To learn use of C# libraries and exception handling techniques.
4. To learn ADO. NET and advance features of C#.
5. To learn .NET assemblies and attributes

**COURSE CONTENTS**

**UNIT I**

**[No. of Hours:09]**

Introduction to .NET Framework And C#.NET framework, MSIL, CLR and its components, CLS, CTS, Just in time (JIT) Compiler, Base class library, Namespaces, Assemblies, DLL -Hell Problem, Garbage Collection.

Introduction to C#, Visual studio console app, Boxing and Unboxing, loops, Array, Enumerations, structures.

**UNIT II C# Object oriented programming**

**[No. of Hours:09]**

OOPs, Classes and objects, Encapsulation, Inheritance, Polymorphism, Abstract class, Sealed class, Interface, Constructor and Destructors, Method Overloading, Method overriding, Operator Overloading, Modifiers, Indexers, Collections Namespaces, Delegates, Event handling, Exception Handling.

**UNIT III IO and Threads**

**[No. of Hours:06]**

Multithreading, Thread pooling, App domains, Concurrency and synchronization- Locks, Monitors, Mutexes, System.IO, Streams, TextWriter, TextReader, BinaryWriter, BinaryReader.

**UNIT IV ADO.Net, C# windows forms for data control**

**[No. of Hours:08]**

Grid, Datasource and databinding controls, Connected and disconnected scenarios, Dataset, connections, Adapters, commands, datareaders. Windows Forms and Controls in details: Windows form, Windows Forms Properties and Events, Windows Form Controls etc.

**UNIT V ASP.NET**

**[No. of Hours:08]**

Introduction to ASP.NET, Architecture, Working with Web and HTML Controls, Server Controls, Overview of ASP.NET Validation Controls, Data base connectivity using ASP.net. Introduction of XML, Using XML with ASP.net  
Master Pages, Displaying Data with the Grid View Control, State management.

**Text Books:**

- TB1. C#.Net Developers Guide- Greg Hack, Jason Werry, SaurabhNandu. (SyngRess)
- TB2. Wrox Press Professional C# 3rd Edition – Simon Robinson, Jay Glynn

**Reference Books:**

- RB1. Addison Wesley –C# Developers Guide to ASP.Net
- RB2. Wiley, ” Beginning Visual C# 2008”, Wrox
- RB3. Claudia M. Baca, Patti, PMP: Project Management Professional Workbook, Sybex, Workbook

**Course Outcomes (COs):**

**Upon successful completion of the course a student will be able to**

CO#	Detailed Statement of the CO
CO1	Knowledge and remember .NET Framework, its runtime environment and application development IDE of Visual Studio.
CO2	Understand the concept of object oriented for making programs.
CO3	Implement C# language constructs in the form of stand-alone console and window form applications.
CO4	Analyze and Understand database concepts in ADO.NET and apply the knowledge to implement distributed data-driven applications.
CO5	Design, document, debug ASP.NET web forms with server and validation controls and implement ASP.NET web services.
CO6	Create the programs based on console, windows and web application.

**Mapping of PO and CO:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	-	3	-	3	1	1	-	-	-	-	-	2			1
CO2	1	-	3	-	-	-	1	-	-	-	-	-	2			2
CO3	-	1	3	-	2	-	-	-	-	-	-	-	3	1		1
CO4	2	-	2	1	2	-	-	-	-	-	-	-	3		1	1
CO5	2	2	3	-	-	-	1	-	-	-	1	-	3	2	1	1
CO6	2	2	1	4				1	1	1	1		3	1	1	1
AVG	1.5	0.83	2.5	0.83	1.16	0.16	0.5	0.16	0.16	0.16	0.33	0	2.66	0.66	0.5	1.16

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

<b>Course code</b>	<b>: MCA303</b>			
<b>Course Name</b>	<b>: ALGORITHMS ANALYSIS &amp; DESIGN</b>			
<b>Semester /Year</b>	<b>: IIIrd Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives: The objectives of this course are**

1. Understand the important concepts of algorithms design and their analysis.
2. Analyze the efficiency of alternative algorithmic solutions to the problem.
3. Understand different algorithm paradigms like Divide and Conquer, Greedy, Dynamic, Backtracking and Branch and Bound.
4. Identify the appropriate data structures, algorithm design techniques and assess their impact on the performance of programs

**COUSE CONTENTS**

**UNIT-I**

**[No. of Hours:09]**

Algorithms, Analysis of Algorithms, Design of Algorithms, and Complexity of Algorithms  
Growth of Functions: Asymptotic notations, Mathematical Analysis of Non-Recursive and Recursive Algorithms. Recurrences and Solution of Recurrence Equations- The Substitution method, The Recurrence–Tree Method, The Master Method.

**UNIT-II**

**[No. of Hours:09]**

Sorting in polynomial Time: Insertion sort, Merge sort, Heap sort, and Quick sort, Sorting in Linear Time: Counting sort, Radix Sort, Bucket Sort. Red-Black Trees, Augmenting Data Structure.

**UNIT-III**

**[No. of Hours:09]**

Greedy Technique: Fractional Knapsack Problem, Activity Selection Problem, Dynamic Programming: 0/1 Knapsack Problem, Matrix-Chain Multiplication. Backtracking: Hamiltonian Circuit Problem; Branch-and-Bound: Assignment Problem, Traveling Salesperson Problem;

**UNIT-IV**

**[No. of Hours:09]**

Graph: Introduction, Representation of Graph, BFS, DFS, Minimum Spanning Tree: Prims Algorithm, Kruskal Algorithm, Single Source.  
Shortest Paths: Bellman-Ford Algorithm, Dijkstra Algorithm, All Pair Shortest Paths: Floyd-Warshall Algorithm,  
Flow Network: Maximum flow -min cut theorem.

**UNIT-V**

**[No. of Hours:06]**

NP-Completeness: P, NP, NP-Hard & NP-Complete Class, Reducibility & NP-Complete Problems. Approximation Algorithms: The Vertex Cover Problem, The Set Covering Problem



**Text Books:**

- TB1. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, “Introduction to Algorithms”, PHI, 2<sup>nd</sup> Edition, 2006  
 TB2. S. Dasgupta, C. Papadimitriou and U.Vazirani, “Algorithms”, McGraw Hill Higher Education, 1<sup>st</sup> Edition, 2017.  
 TB3. J. Kleinberg and E. Tardos, “Algorithm Design”, Pearson Education, 2<sup>nd</sup> Edition, 2009.

**Reference Books:**

- RB1. T. H Cormen, C E Leiserson, R L Rivest and C Stein: Introduction to Algorithms, 3<sup>rd</sup> Edition, Prentice-Hall of India,  
 RB2. Ellis Horowitz, Sartaj Sahni, S.Rajasekharan: Fundamentals of Computer Algorithms, 2nd Edition, Universities press,  
 RB3. Anany Levitin: Introduction to The Design & Analysis of Algorithms, 2nd Edition, Pearson Education.  
 RB4. Kenneth A. Berman, Jerome L. Paul: Algorithms, Cengage Learning.  
 RB5. Baase: Computer Algorithms: Introduction to Design and Analysis, 2nd ed., Addis

**Course Outcomes (COs):**

Upon successful completion of the course a student will be able to

CO #	Detailed Statement of the CO
CO1	Remember the basic concepts and complexities for various algorithms. Demonstrate P and NP complexity classes of the Problem.
CO2	Understand the concepts of asymptotic notations to Explain the complexities of various algorithms.
CO3	Apply and solve various sorting and tree-based algorithms.
CO4	Finding efficient solutions using various algorithms for given problems.
CO5	Evaluate and checking innovative solutions for real-world problems using different paradigms.
CO6	Construct the solution for real-world problems using various problem solving techniques

**CO-PO Mapping**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	-	-	-	-	-	-	-	-	-	3	1	1	1
CO2	2	3	3	2	-	-	-	-	-	-	-	-	1	2	1	1
CO3	3	2	3	2	1	-	-	-	-	-	-	-	2	2	2	1
CO4	2	2	2	3	2	1	-	-	-	2	-	-	3	2	1	1
CO5	2	3	2	2	3	2	1	-	2	1	2	2	1		1	1
CO6	2	2	2	1	-	-	1	1	1	1	-	-	2	1	1	1
AVG	2.33	2.33	2.16	1.66	0.83	0.5	0.33	0.16	0.5	0.66	0.33	0.33	2	1.33	1.16	1

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

<b>Course code</b>	<b>: MCA304</b>			
<b>Course Name</b>	<b>: NETWORK SECURITY &amp; CRYPTOGRAPHY</b>			
<b>Semester /Year</b>	<b>: IIIrd Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives: The objectives of this course are**

1. Understand the basic Knowledge of Network Security Concepts & the Challenges and Scope of Information Security
2. Understand the basic Concept of Block Cipher & the Importance of Cryptographic Algorithms and their Uses.
3. Learn and Understand Encryption Techniques & Access Control Mechanism Used for User Authentication and Authorization.
4. Understand the concept of authentication of message in network by using different techniques.
5. Aware and Learn the Usages of Sockets Layer (SSL), Secure Internet Protocol (IP) and HTTPS

**COURSE CONTENTS**

**UNIT I Introduction To security**

**[No. of Hours: 8]**

Basic aspects of Network security, Attacks active & passive attacks, Types of attack, VIRUS and its categories, Conventional Encryption, Conventional Encryption Model, Substitution & transposition techniques, Bit level encryption and operations.

**UNIT II Introduction Block Cipher Differential & Linear Cryptanalysis**

**[No. of Hours: 5]**

Block Cipher Design Principles, Block Cipher Modes of Operations, steganography, Differential & Linear Cryptanalysis

**UNIT III Conventional Encryption Algorithms**

**[No. of Hours: 9]**

DES, DES Algorithm, DES strength, 2DES, 3 DES, Man in Middle attack, DES standard, AES, Blowfish, International Data Encryption Algorithm IDEA, RC-5, CAST-128, RSA, Key Distribution, Diffie Hellman Key Exchange Algorithm, Random Number Generation.

**UNIT IV Message Authentication & Hash Functions**

**[No. of Hours: 10]**

Authentication Requirements, Authentication Functions, Message Authentication Codes MAC, HMAC, Hash Function, Birthday Attacks, Message Digest Algorithm: MD5 & SHA, Digital Signature, Digital Signature Standard (DDS), Proof of Digital Signature Algorithm, Digital certificate. X.509, X.25, Secure Electronic Transaction, , Authentication Protocol, Authentication Applications: Kerberos.

**UNIT V Email, Internet Security**

[No. of Hours: 7]

Secure Socket Layer, Directory Authentication Service, Electronic Mail Security, PEM, Pretty Good Privacy (PGP), IP security, S/MIME Security: Architecture, Authentication Header, Encapsulating Security Payloads, cyberlaws

**Text Books:**

TB1. Atul Kahate, "Cryptography and Network Security" TMH

**Reference Books:**

RB1. William Stallings, "Cryptography and Network Security: Principles and Practice", Prentice hall, New Jersey

RB2. Johannes A. Buchmann, "Introduction to Cryptography" Springer-Verlag

**Course Outcomes (CO):**

*After completion of the course, a student will be able to*

CO#	Detailed Statement of the CO
CO1	Able to understand & remember basics of cryptography & security like active and passive attacks and encryption and decryption techniques
CO2	Able to understand and apply the concept of linear and differential crypt analysis
CO3	Able to understand & remember basics of conventional encryption techniques like DES, Blowfish etc.
CO4	Able to understand basics of message authentication like digital signature, SET Authentication protocol like Kerberos etc.
CO5	Able to understand & remember the concept of SSL.
CO6	To design and compose Email security, Authentication Header, & Encapsulating Payload etc.

**CO-PO Mapping:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1			1	1							2	1		2
CO2	1	2	1	2	1								2			2
CO3	2	2		2	1	1		1					2			2
CO4	1	2	2	1		2	1						2	1		1
CO5		2	1	2	1	2		1					2	1		2
CO6	1	2	1	2	1								2			2
AVG	1.1	1.8	0.8	1.5	0.8	1	0.1	0.3	0	0	0	0	2	0.5	0	1.8

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

<b>Course code</b>	<b>: MCA305</b>			
<b>Course Name</b>	<b>: COMPUTER NETWORKS</b>			
<b>Semester</b>	<b>: IIIrd Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives:** The objectives of this course are

1. Build an understanding of the fundamental concepts of computer networking.
2. Familiarize the student with the basic taxonomy and terminology of the computer networking area.
3. Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.
4. Independently understand basic computer network technology.
5. Identify the different types of network topologies and protocols.
6. Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.

## COURSE CONTENTS

### Unit 1

[No. of Hours:

8]

**Introductory Concepts:** Goals and Applications of Networks, Need of Network, Elements of Network, Network structure and architecture, OSI & TCP/IP reference model, Transmission modes, networks topology, Guided and un Guided Media, High Speed networks: FDDI , Integrated services digital networks.

### Unit 2

[No. of Hours:

12]

**Data Link Layer:** Framing, error control (Single parity bit checking, 2D parity bit checking, checksum, CRC, Hamming Error Correction code), Elementary data link protocols:- sliding windows protocols (Stop & Wait ARQ , GO Back to N & Select repeat ARQ) , High Level Data Link Control

**Medium access sub layer:** Channel allocations (static and dynamic channel allocation), ALOHA Protocols- Pure ALOHA, slotted ALOHA, Carrier Sense Multiple Access Protocols, CSMA/CD, CSMA/CA.

### Unit 3

[No. of Hours:

10]

**Network Layer:** Point-to Point networks, routing algorithms, Adaptive and Non adaptive Routing algorithm, (Distance vector and Link state routing algorithm), congestion control strategies & algorithms (Token bucket and leaky bucket algorithm), internetworking, IPV4 & IP Datagram, IP addresses, Class of IP, Subnetting, masking, IPv6.

### Unit 4

[No. of Hours:

8]

**Transport Layer:** Design issues, connection management, Three way handshaking, TCP window Management, User Datagram Protocol, Transmission Control Protocol, Port number and socket address.

**Unit 5****[No. of Hours: 6]**

**Application Layer:** Network Security, symmetric and Asymmetric encryption algorithm, DES, RSA algorithms, Domain Name System, Simple Network Management Protocol, Electronic mail, SMTP, POP, File Transfer Protocol, Hyper Text Transfer Protocol.

**Text Books:**

- TB4. W. Stallings, “Data and Computer Communication”, Macmillan Press  
 TB5. Forouzan, “Data Communication and Networking”, TMH

**Reference Books:**

- RB1. Tanenbaum, “Data Communication & Computer Network”  
 RB2. Jefferey, Piyasat , “Networking Essentials” , PHI, 3rd Ed., 2007

**Course Outcomes (COs):**

**Upon successful completion of the course a student will be able to**

CO#	Detailed Statement of the CO
CO1	Outline the basic concept of networking, types, networking topologies and layered architecture. Master the data communications terminology.
CO2	Explain data link layer and MAC sub-layer.
CO3	Illustrate and identify the underlying concepts of IPv4& IPv6 protocols, Routing Algorithms, IP Addressing and Working of Networking Devices.
CO4	Discover the intricacies in the design of transport layer.
CO5	Relate application layer functionalities protocols along with concepts of security in networks.
CO6	Design and implement layer protocols within an environment.

**CO-PO Mapping**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2			2		1		1			3	1	1		2
CO2	2	1	1		2		1	1			1	2	2			1
CO3	2	1	1	1	1		2	2	2			2	2	1		1
CO4	1	1	2		3		2	1	2				2	1	1	1
CO5							1	1	2			1	1	2		2
CO6	1	1	2		3		2	1	2				2	1	1	1
AVG	1.8	1.2	1.5	1.0	2.2	0	1.5	1.2	1.8	0	1.0	2.0	1.7	1.2	1.0	1.3

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

<b>Course code</b>	<b>: MCA306</b>			
<b>Course Name</b>	<b>: RESEARCH METHODOLOGY</b>			
<b>Semester /Year</b>	<b>: IIIrd Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives: The objectives of this course are**

- understand some basic concepts of research and its methodologies
- identify appropriate research topics
- select and define appropriate research problem and parameters
- organize and conduct research (advanced project) in a more appropriate manner

**Course Contents**

**Unit I-Concept & Types of Research**

**[No. of Hours: 10]**

Meaning and importance of Research, Types of Research, Selection and formulation of Research Problem, Research Design, Classification of Research, Pure and Applied Research, Exploring or Formulative Research, Descriptive Research, Diagnostic Research/Study, Evaluation research/Studies, Action Research, Experimental Research, Historical Research.

**Unit II –Methods Research**

**[No. of Hours: 10]**

General Survey of various Methods including Survey Method, Interdisciplinary Method, Case Study Method, Sampling Method, Observation Method, Interview Method, Schedule Method, Questionnaire Method, Documentary Method, Library Method, Historical Method and Scientific Method. Characteristic Features of Scientific Method; Empirical Verifiable, Cumulative, Self - Correcting, Deterministic, Ethical & Ideological neutrality (Value Free).

**Unit III - Data Collection and Data Analysis**

**[No. of Hours:**

**10]**

Collection, Objectives and Classification of Data, Aims, Methods and Objects of Tabulation of Data, Forms and Processes of Interpretation and Presentation of Data, Primary, Secondary and Tertiary Data, Construction and adaptation of instruments, administration of questions and tests, Data organization in SPSS & Excel, Graphical representation of data, Testing of Hypothesis: Logical and Statistical Techniques.

**Unit IV: Report Writing**

**[No. of Hours:**

**10]**

Locating Information on a Topic of Interest, Acquiring Copies of Articles of Interest, The Nature of Scientific Variables, Conceptual Versus Operational Definitions of Variables, Levels of Measurement, Various Paradigms, The Basic Format for a Research Report, Identification of the Parts of a Research Report, Citation and Referencing Styles, Essentials of Report Writing, Aids for Writing Good Research Report.

**Text Books:**

- TB1. Bagchi, Kanak Kanti (2007) Research Methodology in Social Sciences: A Practical Guide, Delhi, Abijeet Publications.
- TB2. Kothari, C.R (2004) Research Methodology: An Introduction, Delhi, New Age.

**Reference Books:**

- RB1. Cooper, R. Donald and Pamela S. Schindler (2003) Business Research Methods, Delhi, Tata McGraw-Hill.
- RB2. Flyvbjerg, Bent (2001) Making Social Science Matter: Why Social Inquiry Fails and How it can Succeed Again, United Kingdom, Cambridge University Press.
- RB3. Goodde and Hatte (1952) Methods in Social Research, New York, McGraw – Hill.

**Course Outcome (COs):**

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Defining of the basic framework of research process
CO2	Describing of various research designs and techniques.
CO3	Illustrate the various sources of information for literature review and data collection.
CO4	Analyse the ethical dimensions of conducting applied research
CO5	Evaluate the components of scholarly writing and its quality
CO6	Design a well-structured research paper and scientific presentations

**CO-PO Mapping**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	1	3	1	1							2			1
CO2	2	2	2	2	1	1							1	1	1	1
CO3	2	3	2	3	2	2								1	1	2
CO4				2	2	2							2	1		
CO5	1	1	2	1	1				1					2	1	
CO6	1	1	2	1	1	2			1					2	1	
AVG	1.8	1.6	1.8	2.0	1.3	1.6			1.0				1.7	1.4	1.0	1.3

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

<b>Course code</b>	<b>: MCAP31.1</b>			
<b>Course Name</b>	<b>: ADVANCE JAVA LAB</b>			
<b>Semester /Year</b>	<b>: IIIrd Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives: The objectives of this course are**

1. Using Graphics, Animations and Multithreading for designing Simulation and Game based applications.
2. Design and develop GUI applications using Abstract Windowing Toolkit (AWT), Swing and Event Handling.
3. Design and develop Web applications
4. Designing Enterprise based applications by encapsulating an application's business logic.
5. Designing applications using pre-built frameworks.

**Course outcomes (COs):**

**Upon successful completion of the course a student will be able to**

<b>CO#</b>	<b>Detailed Statement of the CO</b>
<b>CO1</b>	Understand different layout managers and event handling
<b>CO2</b>	Understand different types of java beans
<b>CO3</b>	Design java JDBC with different databases
<b>CO4</b>	Understand java servlets and web applications
<b>CO5</b>	Design JSP web applications
<b>CO6</b>	Plan Java Servelets

**CO-PO Mapping**



	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	2	1	2	2		2				3	2	1	1
CO2	2	1	2	1	2								3	1		1
CO3	2	1	1	2	1		2						3		1	1
CO4	2		2	1	2								3	1	1	1
CO5		2		2		2							3	2	2	2
CO6	2	1	1					1	2				1	2	1	1
AVG	1.83	1.16	1.0	1.16	1.0	0.66	0.66	0.16	0.66				2.66	1.33	1	1.16

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

<b>Course code : MCAP31.2</b>				
<b>Course Name : PYTHON LAB</b>				
<b>Semester /Year : IIIrd Semester</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives: The objectives of this course are**

1. Basic programming constructs and functions in python.
2. Understand the applicability of data structures like lists, tuples, sets and dictionaries in python applications.
3. Use object-oriented programming features of python to develop applications.
4. Learn how to use exception handling in applications for error handling.
5. Database and file based programming

**COURSE CONTENTS**

- Working with Jupyter notebook.
- Programs based on loops and conditional statements.
- Programs based on string manipulations.
- Programs based on List.
- Programs based on tuples.
- Programs based on sets.
- Programs based on dictionary.
- Working with user defined functions.
- Working with lambda, map, filter and reduce functions.
- Programs based on recursion.
- Programs for file handling in Python.
- Programs for Sorting and searching.
- Database handling in Python using SQLite3.
- Working with in built and user defined modules,
- Working with Object Oriented Programming in Python.

**Course outcomes (COs):**

**Upon successful completion of the course a student will be able to**

CO #	Detailed Statement of the CO
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CO1	Describe the program creation in Python through usage of appropriate constructs
CO2	Demonstrate the working of basic programming constructors in Python.
CO3	Apply data structure primitives like strings, lists, tuples, sets and dictionaries on various types of data with or without using functions, object-oriented concepts to the programs in Python etc.
CO4	Analyze basic constructs of Python and how constructs can be used all together.
CO5	Evaluate the programs and its logic.
CO6	Develop programs using methods of constructs define in Python.

### CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	1	2								3		1	1
CO2	3	3	3	2	2	1	2				1		3	1		1
CO3	1	3	3	1	1								3			1
CO4	3	3	3	3	3	3	1				1		3	2	2	2
CO5	3	2	2	2	1								3		2	2
CO6	3	3	3	3	1	1	1	1	1	1	1	1	3	1	1	2
AVG	2.7	2.7	2.8	2.0	1.7	1.7	1.3	1.0	1.0	1.0	1.0	1.0	3.0	1.3	1.5	1.5

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

<b>Course code</b>	<b>: MCAP31.3</b>			
<b>Course Name</b>	<b>: PL/SQL LAB</b>			
<b>Semester /Year</b>	<b>: IIIrd Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

L - Lecture T – Tutorial P – Practical C – Credit

### **Course Objectives: The objectives of this course are**

9. To use expressions, operators, control structures, records and SQL within PL/SQL
10. To understand different built-in SQL Functions and how, where they can be used
11. To define different Cursor types and how they can be used in PL/SQL
12. To implement error handling in PL/SQL code
13. To create Procedures, Functions and Packages
14. To describe different types of database triggers and how they should be used

### **COURSE CONTENTS**

- Creating tables and query a database using SQL DDL/DML commands.
- Programs using cursors.
- Exceptional handling in PL/SQL.
- Programs using functions and procedures.
- Using triggers in PLSQL programs.

### **Course outcomes (COs):**

**Upon successful completion of the course a student will be able to**

<b>CO #</b>	<b>Detailed Statement of the CO</b>
CO1	Knowledge of Creating Databases, tables and query a database using SQL DML/DDDL commands.
CO2	Understand the programming constructs of PL/SQL.
CO3	Apply data structure primitives like cursors, triggers etc. on various types of data with or without using functions or procedures. Handling the errors to make the program robust.
CO4	Analyze the effect of applying cursors, triggers, and other primitives.
CO5	Evaluate the effect on the data base after applying SQL query and PL/SQL constructs.

CO6	Create PL/SQL programs using various programming constructs of Python.
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### CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
<b>CO1</b>	3				1	1	1		1		1		1			1
<b>CO2</b>	3	2	2		1		1						2			1
<b>CO3</b>	3	3	2	1	1	1	1						2			1
<b>CO4</b>	3	2	2	1									2			1
<b>CO5</b>	3	1	2	1									2			1
<b>CO6</b>	3	3	3	1	1	1	1				1		3	1	2	2
<b>AVG</b>	<b>3</b>	<b>2.2</b>	<b>2.2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>		<b>1</b>		<b>1</b>		<b>2</b>	<b>1</b>	<b>2</b>	<b>1.2</b>

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

<b>Course code</b>	: MCAP32.1			
<b>Course Name</b>	: PHP PROGRAMMING LAB			
<b>Semester /Year</b>	: III <sup>rd</sup> Semester			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

L - Lecture T – Tutorial P – Practical C – Credit

### Course Objectives:

1. To implement the advance concepts in the basic websites.
2. To create and implement the basic concepts and syntax of HTML and PHP programming together.
3. To be able to develop interactive programs using PHP.
4. To apply the various website governing tools such as session handling, exception handling, super globals etc.
5. To learn the skills that will help the students in creating websites with great look and feel using PHP programming constructs.

### Course Outcomes (COs):

*After completion of the course, a student will be able to*

CO#	Detailed Statement of the CO
CO1	Understand the basic concepts of PHP and write PHP programs.
CO2	Design and develop interactive websites.
CO3	Implement concepts like session handling, database operations etc.
CO4	Develop professional websites using various PHP tools such as PHP Super Globals, Exception handling and other PHP programming constructs.
CO5	Serve the society by creating and evaluating the websites with professional look and feel and use these skills to build successful career.
CO6	Create the connection between PHP with MySql Database

### CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	1	1		1		2				3			2

CO2	2	2	3	1			1		1				3	2	1	2
CO3	1	3	3										3	1	1	2
CO4	2	3	3			2				2			3	1	1	2
CO5	3	3	1								3	1	3	3	1	1
CO6	2	1	1										3	2	1	1
AVG	2.1	2.3	2.3	0.3	0.1	0.3	0.3	0	0.5	0.3	0.5	0.1	3	1.5	0.8	1.6

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

<b>Course code : MCAP32.2</b>				
<b>Course Name : C# DOT NET LAB</b>				
<b>Semester /Year : IIIrd Semester</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives: The objectives of this course are**

1. To learn and understand different types of statements in C#.
2. Use of data base for making dynamic websites using C# programming
3. Programming concepts in .Net Framework.
4. Data base connectivity using ADO.net
5. Understand and use of different graphical tools for the development of web page and website using C# programming.

**COURSE CONTENTS**

1. Write a C sharp program to generate prime numbers between 1 to200 and also print to the console. (ex. 1,2,3,5.....199).
2. Write a program to print ARMSTRONG number.
3. Write a C sharp program using loop that examines all the numbers between 2 and 1000, and displays only Perfect numbers.(A perfect number is the one whose sum of their divisors equals the number itself).For example given the number 6, the sum of its divisors is 6(1+2+3).Hence, 6 is a perfect number.
4. Write a C sharp program to accept an array of integers (10) and sort them in ascending order.
5. Write a program to implement the concept of abstract class.
6. Write a program to implement the concept of sealed class.
7. Write a C sharp program for jagged array and display its item through foreach loop.
8. Write a program in C Sharp using a class that gets the information about employee's such as Emp Id, First Name, Last Name, Basic Salary,Grade,Address, Pin Code and Contact Number. Write a method that calculates the Gross Salary (Basic +DA+HRA) and returns to the calling program and another method for the Net salary (Gross - (P.F + Income Tax)).Finally write a method that prints, a pay slip of an employee, containg all the above components in a proper format to the console.(Grade A = 20,000 , B=15,000 and C=10,000) DA=56% and HRA=20%., Pf=780, ITax.
9. Write a program to demonstrate boxing and unboxing.

10. Write a program to find number of digit, character, and punctuation in entered string.
11. Write a program using C# for exception handling.
12. Write a program to implement multiple inheritances using interface.
13. Write a program in C# using a delegate to perform basic arithmetic operations like addition, subtraction, division, and multiplication.
14. Write a program to get the user's name from the console and print it using different namespace.
15. Demonstrate the concept of Multithreading using locks in C Sharp
16. Write a program to implement Indexer.
17. Write a program to design two interfaces that are having same name methods how we can access these methods in another class.
18. Write a program to implement method overloading.
19. Write a program to implement method overriding
20. Write a program in C sharp to create a calculator in windows form.
21. Create a front end interface in windows that enables a user to accept the details of an employee like EmpId ,First Name, Last Name, Gender, Contact No, Designation, Address and Pin. Create a database that stores all these details in a table. Also, the front end must have a provision to Add, Update and Delete a record of an employee.
22. Create a database named MyDb (SQL or MS Access).Connect the database with your window application to display the data in List boxes using Data Reader.
23. Write a program using ADO.net to insert, update, delete data in back end
24. Display the data from the table in a DataGridView control using dataset.
25. Create a registration form in ASP.NET and use different types of validation controls.
26. Display the data from the table in a Repeater control using dataset in ASP.net.

**Course Outcomes (COs):**

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	Remember the basics of C# programming, different graphics tools and their use.
CO2	Understand of static and dynamic web pages using standard tools and learn various properties of the tools.
CO3	Develop interactive and user friendly websites using front end and back end programming.
CO4	To develop, implement and creating Applications with ADO.NET and SQL server
CO5	Create user interactive web pages using ASP.Net and xml.
CO6	Create console, windows and wed applications

**Mapping of PO and CO:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	1			3	1	2					2			1
CO2	3	1	2	3		3	2	3					2			2
CO3	3	2	3	3	1	2	2	3					3	1		1
CO4	2	1	3	3	2	3	2	3					3		1	1
CO5	3	1	3	1	2	3	2	3					3	2	1	1

CO6	2	3	2	2			1	1	2	1			3	1	1	1
AVG	2.7	1.5	2.3	2	0.8	2.3	1.7	2.5	0.3	0.2	0	0	2.7	0.7	0.5	1.2

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

<b>Course code : MCARBP</b>				
<b>Course Name : PROJECT / RESEARCH BASED PROJECT</b>				
<b>Semester /Year : IIIrd Semester</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives: The objectives of this course are**

In this course, the learners will be able to develop working expertise of solving complex computing problems through project based learning approach using real world case studies by implementing the concepts studied in the theory courses of this semester.

**Course outcomes (COs):**

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Identify the problem and describing it.
CO2	Understand the requirements of the chosen project.
CO3	Apply the collected requirements to define the describe the project in a systematic and comprehensive approach.
CO4	Analyze the technical aspects of the chosen project to find the possible solutions for development of the project.
CO5	Evaluate the effective reports and documentation for all project related activities and solutions.
CO6	Create plan for the project development.

**CO-PO Mapping**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1						1	2		2	1	2	1	1	2
CO2	1	3		2	1	2			1				3	2	2	1
CO3	1	1	3	2	1	1	1			2		1	3	2	2	2
CO4	1	1	1	1	1	1	2	1	1	2	2	3	2		3	
CO5	2			1	3	1	2	1	2	1	3	1	2	1	2	2
CO6	2	3	3	3	1	1	1	3	1	1	1	1	2	1	2	2
AVG	1.7	1.8	2.3	1.8	1.4	1.2	1.5	1.5	1.4	1.5	2.0	1.4	2.4	1.2	2	1.5



3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

### Fourth Semester

<b>Course code</b>	: MCA401.1			
<b>Course Name</b>	: ANDROID PROGRAMMING			
<b>Semester /Year</b>	: IVth Semester			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives: The objectives of this course are**

1. This course facilitates classroom and laboratory learning.
2. Letting students develop competence and confidence in android programming.
3. Understand the entire Android Apps Development Cycle.
4. Enable the students to independently create Android Applications.
5. Access and work with databases under the Android operating system.

**COUSE CONTENTS**

**UNIT I**

**[No. of Hours:10]**

History of Android, The Open Handset Alliance, Android Core building blocks, Android Architecture, Android SDK, Creation of New AVD, DVM, Creating run configuration, Building a sample Android application.

**UNIT II**

**[No. of Hours:10]**

Anatomy of Android Application, Android terminologies, Application Context, Activities, Activity lifecycle. Services, Intents and its Types, Android Manifest File and its common settings, Using Intent Filter, Android Fragments, Android Preferences.

**UNIT III**

**[No. of Hours:10]**

User Interface Design: Form widgets, Text Fields, Layouts, Button control, toggle buttons, Spinners (Combo boxes), Android Toast, Event handling, Images, Designing User Interfaces with Layouts.

**UNIT IV**

**[No. of Hours:10]**

Using Android Data and Storage APIs, Managing data using SQLite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Telephony APIs Text

**Text Books:**

- TB1. Sayed Y Hashimi and Satya Komatineni, “Pro Android”, Wiley India Pvt. Ltd.  
 TB2. Android application development for java programmers. By James C. Sheusi. Publisher: Cengage Learning, 2013.

**Reference Books:**

- RB1. Lauren Darcey and Shane Conder, “Android Wireless Application Development”, Pearson Education 2nd edition.  
 RB2. Reto Meier, “Professional Android 2 Application Development”, Wiley India Pvt Ltd.  
 RB3. Mark L Murphy, “Beginning Android”, Wiley India Pvt. Ltd.

**Course Outcomes (COs):**

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Knowledge and remember the basics of Java and Android
CO2	Describe the life cycles of Activities, Applications etc.
CO3	Apply the major components of Android API set to make apps. Use the development tools in the Android development environment.
CO4	Classifying and finding uses of UI –components and java Constructs.
CO5	Make UI-rich apps using all the major UI components.
CO6	Create Android apps using Java programming language.

**Mapping of PO and CO:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		1	3	2	3	2	1						3			1
CO2	1	2	3	2	2	1	2	1			1		3	2	2	2
CO3	2	1		1		2	1						2			2
CO4	1	1	3	2	3	1		1			1		3	1	1	1
CO5	1	1	3	2	2		1	2			1		3	1	2	2
CO6	1	1	2				1		1	1			2	1	1	1
AVG	1	1.16	2.33	1.5	1.66	1	1	0.66	0.16	0.16	0.5	0	2.66	0.83	1	1.5

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

<b>Course code</b>	<b>: MCA401.2</b>			
<b>Course Name</b>	<b>: DATA SCIENCE IN PYTHON</b>			
<b>Semester /Year</b>	<b>: IVth Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

L - Lecture T – Tutorial P – Practical C – Credit

### **Course Objectives: The objectives of this course are**

1. Understating the concept of Data Science
2. Using the data science using Python
3. Understanding the use of NumPy in data science and how it is different from Python List
4. To understand the dataframe, reading csv, tsv file and working on it.
5. Handling the missing value and data cleansing
6. Understanding the concept of visualize the numbers in graphs using the Python libraries Matplotlib and Seaborn

## **COURSE CONTENTS**

### **Unit I**

**[No. of Hours: 12]**

NumPy: Introduction, NumPy Array, NumPy Array Size, NumPy Array Shape, NumPy Mathematical Functions, NumPy Trigonometric Functions, NumPy Random, NumPy String Operations

### **Unit II**

**[No. of Hours: 12]**

Pandas: Pandas Series, Pandas DataFrame, Pandas Read\_csv, Pandas Write csv File, Data Cleansing, Pandas Handling Missing Values, Pandas concat(), Pandas join(), Pandas append(), Pandas GroupBy

### **Unit III**

**[No. of Hours: 10]**

Matplotlib: Matplotlib Line Plot, Matplotlib Histogram, Matplotlib Bar Chart, Matplotlib Pie Chart, Matplotlib Scatter Plot, Matplotlib Subplot, Matplotlib Save Figure, Matplotlib Image Show

### **Unit IV**

**[No. of Hours: 6]**

**Seaborn: Introduction**, Seaborn Line Plot, Seaborn Histogram, Seaborn Barplot

### **Text Books**

TB1. Pandas for everyone, Python Data Analysis by Daniel Y. Chen, Pearson publication

TB2. Laura Igual, Santi Seguí, “Introduction to Data Science - A Python Approach to Concepts,

**Reference book:**

- RB1. Techniques and Applications”, Springer
- RB2. Wes McKinney, “Python for Data Analysis”, O’Reilly
- RB3. Luca Massaron, John Paul Mueller, “Python for Data Science for Dummies”

**Course Outcomes (COs):**

Upon successful completion of the course a student will be able to

CO #	Detailed Statement of the CO
CO1	Defining the fundamental of data science and libraries used.
CO2	Understanding the scientific computing in Python, data analysis and plotting.
CO3	Applying data science functions on data
CO4	Analysing data through plots.
CO5	Evaluate the output produced by the different data science constructs.
CO6	Designing programs based on data science concepts.

**CO-PO Mapping:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3				2		1	1					2			1
CO2	1	3	2	1	2		1	1			1		3	2	1	2
CO3	1	3	2	1	2		1	1			1		3	2		2
CO4	1	3	2	1	2		1	1			1		3	2		2
CO5	1	3	3	2	1	1	1	1	1	1	2	1	3		2	2
CO6	3	3	3	2	2	1	1	1	1	1	2	1	3	2	2	2
AVG	1.7	3.0	2.4	1.4	1.8	1.0	1.0	1.0	1.0	1.0	1.4	1.0	2.8	2.0	1.7	1.8

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

<b>Course code</b> : MCA402.1				
<b>Course Name</b> : MOBILE COMPUTING				
<b>Semester /Year</b> : IVth Semester				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives: The objectives of this course are**

1. To make the student understand the concept of mobile computing paradigm, its novel applications and limitations.
3. To understand the typical mobile networking infrastructure through a popular GSM protocol
5. To understand the issues and solutions of various layers of mobile networks, namely MAC layer, Network Layer & Transport Layer
7. To understand the database issues in mobile environments & data delivery models.
8. To understand the ad hoc networks and related concepts.
9. To understand the platforms and protocols used in mobile environment

**COURSE CONTENTS**

**UNIT 1** **[No. of Hours: 10]**  
 Introduction to Mobile Computing, Issues in Mobile Computing, Wireless Telephony, Digital Cellular Standards, cellular system architecture, Multiple Access Protocols: TDMA, FDMA and CDMA, GSM, GPRS, handoffs Near-far problem, channel allocation in cellular systems.

**UNIT 2** **[No. of Hours: 10]**  
 Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, TCP over wireless- Indirect TCP, Snoop Protocol, Fast retransmit and Mobile TCP, Mobile IP, WAP: Architecture, applications.

**UNIT 3** **[No. of Hours: 6]**  
 Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system (CODA), Disconnected operations.

**UNIT 4** **[No. of Hours: 6]**  
 Mobile Agents computing, transaction processing in mobile computing environment, location management- static and dynamic, Ping pong effect, location based services.

**UNIT 5**

[No. of Hours: 8]

What is Ad-hoc Network?, Problems with Message Routing in Wireless Ad-hoc Mobile Networks, Dynamic State Routing (DSR), Route Maintenance and Routing error, Fisheye Routing (FSR), Ad-hoc on Demand Distance Vector (AODV)

**Text Books:**

- TB1.** Shambhu Upadhyaya, AbhijeetChaudhary, Kevin Kwiat, Mark Weises, “Mobile Computing”, Kluwer Academic Publishers
- TB2.** UWE Hansmann, LotharMerk, Martin-S-Nickious, Thomas Stohe, “Principles of Mobile Computing”, Springer International Edition
- TB3.** Jochen Schiller, “Mobile Communications,” 2nd Edition, Pearson Education Pvt. Ltd., 2018.
- TB4.** Raj Kamal, “Mobile Computing”, 2nd edition, Oxford University Press, 2014.
- TB5.** Koushik Sinha, Sasthi C. Ghosh, B.P. Sinha, “Wireless Networks and Mobile Computing”, CRC Press, 2016

**References Books:**

- RB1.** Sunilkumar S., Manvi M., S. Kakkasageri “Wireless and Mobile Networks, Concepts and Protocols”, 2nd edition, John Wiley & sons, 2016.
- RB2.** Amitabh Ghosh and RapeepatRatasuk, “Essentials of LTE and LTE-A,” Cambridge University Press, 2011.
- RB3.** Clint Smith and Daniel Collins, “3G Wireless Networks”, 2nd Edition, Tata McGraw Hill, 2007.
- RB4.** Jonathan Rodriguez, “Fundamentals of 5G Mobile Networks”, Wiley 2015.

**Course Outcomes (COs):**

Upon successful completion of the course a student will be able to

CO #	Detailed Statement of the CO
CO1	Defining the concept of mobile computing, architecture, multiple access protocols
CO2	Explain the concept of wireless LAN, Bluetooth, mobile IP
CO3	Utilize data management and data replication for mobiles computers
CO4	Compare the transaction processing models in mobile computer
CO5	Appraise the concept of ad-hoc network in wireless
CO6	Discuss and elaborate Various adhoc routing algorithms

**CO-PO Mapping:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3				1		1			1			2	1		1
CO2	3				1		1			1			1	1		1
CO3	3				1		1			1			1			1
CO4	3				1		1			1			1	1		1

<b>CO5</b>	<b>3</b>				<b>1</b>		<b>1</b>			<b>1</b>			<b>2</b>	<b>1</b>		<b>1</b>
<b>CO6</b>	<b>3</b>				<b>1</b>		<b>1</b>			<b>1</b>			<b>2</b>	<b>1</b>		<b>1</b>
<b>AVG</b>	<b>3</b>				<b>1</b>		<b>1</b>			<b>1</b>			<b>1.5</b>	<b>0.8</b>		<b>1</b>

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

<b>Course code</b>	<b>: MCA402.2</b>						
<b>Course Name</b>	<b>: BLOCKCHAIN TECHNOLOGY</b>						
<b>Semester /Year</b>	<b>: IVth Semester</b>						
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>			
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>			

**Course Objectives: The objectives of this course are**

In this course, the learners will be able to develop expertise related to the following:-

- To provide Knowledge and concept of cryptography and blockchain.
- To make familiar with Bitcoin and cryptocurrency with its various impact on blockchain.
- To know about the Ethereum technology with its multiple aspects.
- To provide an understanding about and Smart Contracts.
- To develop an understanding about the various applications of Blockchain.

**Course Content**

**Unit-I** **[No. of Hours**  
**10]**

Distributed systems, Blockchain, Generic elements of a blockchain, Benefits and limitations of blockchain, Tiers of blockchain technology, Features of a blockchain, Types of blockchain, Consensus,

**Unit-II** **[No. of Hours**  
**10]**

Decentralization: Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Blockchain and full ecosystem decentralization, Smart contracts, Decentralized Organizations,

**Unit-III** **[No. of Hours**  
**10]**

Cryptography: Symmetric Cryptography, Confidentiality, Integrity, Authentication, Non-repudiation, Public Key Cryptography: Asymmetric cryptography, Public and private keys, Hash functions

**Unit-IV**  
**10]****[No. of Hours**

Introduction to Bitcoin and Ethereum. Discussing few case studies of blockchain i.e., Block chain in Financial services and Government services.

**Text Books:**

TB1. Imran Bashir, Mastering Blockchain, Packt, 2018

**Reference Books**

RB1. Daniel Drescher, Block chain basics A non-technical introduction in 25 steps, Apress , 2017.

RB2. Paul Vigna and Michael J. Casey. The Age of Cryptocurrency, 2015.

**COURSE OUTCOMES (CO):**

*After completion of the course, a student will be able to*

CO#	Detailed Statement of the CO
CO1	Identify and define the basic concepts of blockchain technology.
CO2	Describe the basic concepts, technology used for blockchain and primitives of the distributed computing and cryptography related to blockchain.
CO3	Illustrate the security features in blockchain technologies and ways of achieving it.
CO4	Analyze the use of decentralization, consensus mechanism, smart contract etc. used in block chain technology.
CO5	Evaluate some technologies based upon block chain.
CO6	Discuss case studies based on the blockchain technology.

**CO-PO MAPPING:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3						2			1			1	1		2
CO2	3	2	1		1		1			1			2	2		2
CO3	2	1	1	1	2	1	1			1		1	2	2		2
CO4	2	2	1	1	2	2	1			1			2	2		2
CO5	1				2		1						2	1		2
CO6	1		1	2	1		1						2	2	2	2
AVG	2.0	1.7	1.0	1.3	1.6	1.5	1.2			1.0		1.0	1.8	1.7	2.0	2.0



<b>Course code</b>	<b>: MCA402.3</b>			
<b>Course Name</b>	<b>: CLOUD COMPUTING</b>			
<b>Semester /Year</b>	<b>: IVth Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives: The objectives of this course are**

1. To learn basic concepts, types and characteristics of cloud computing
2. To learn Cloud Computing Architecture and service models.
3. To learn Virtualization and its types in cloud computing.
4. To learn fundamental concepts and architecture of cloud computing security.
5. To learn basics of SO and cloud-based storages.

**COURSE CONTENTS**

**UNIT-I CLOUD COMPUTING FUNDAMENTALS**

**[No. of Hours: 5]**

Cloud Computing definition, benefits of cloud computing, characteristics of cloud, History of Cloud Computing, Cloud Architecture,

**UNIT II CLOUD COMPUTING MODELS AND SERVICES**

**[No. of Hours: 5]**

Cloud deployment Model: private, public, community and hybrid cloud public vs private clouds, Cloud service model: IaaS, PaaS, SaaS. Challenges of cloud computing.

**UNIT III CLOUD VIRTUALIZATION**

**[No. of Hours: 12]**

Virtualization, Characteristics, Virtualization in Cloud Computing, Pros and cons of Virtualization – Types of Virtualization –System Vm, Process VM, Virtual Machine monitor – Virtual machine properties. Hypervisors, Multitenancy, Types of Tenancy, Virtualization - Architecture Clustering, Grid Computing and Virtualization, Virtual Infrastructure, CPU Virtualization, Network and Storage Virtualization, Cloud Tools - VMware, Eucalyptus, Cloud Sim, Open nebula.

**UNIT IV SECURITY IN CLOUD COMPUTING****[No. of Hours: 9]**

**Security Issues in Cloud Computing:** Introduction, Security Challenges in Cloud Computing, Information Security, Privacy and Trusting Cloud Computing, Cloud Identity and Access Management (IAM), Authentication and Authorization with Cloud, Software as a security service

**UNIT V STORAGE ON CLOUD****[No. of Hours: 9]**

Service-Oriented Architecture, **Components of SOA**, Introduction to Storage Systems, Cloud Storage Concepts, Distributed File Systems: HDFS, Ceph FS, Cloud Databases: HBase, MongoDB, Cassandra, DynamoDB

**Text Books:**

- TB1. Gautam Shroff, “Enterprise Cloud Computing Technology Architecture Applications”, Cambridge University Press; 1 edition.  
TB2. Dimitris N. Chorafas, “Cloud Computing Strategies” CRC Press; 1 edition

**Reference Books:**

- RB1. Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing, A Practical Approach” McGraw-Hill Osborne Media; 1 edition

**Course Outcomes (COs):**

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Defining the basic concepts, principles and paradigm of Cloud Computing
CO2	Understanding of various Cloud computing models and services.
CO3	Analyzing the significance of implementing virtualization techniques.
CO4	Evaluate the need of security in Cloud computing.
CO5	Interpret the concept SOA and cloud-based storage in Cloud computing.
CO6	Create different cloud databases in Cloud Computing.

**CO-PO Mapping**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	2	1	1	1	2						2			1
CO2	2		1	2	2		1						2			2
CO3	3	1	2		2	1	2	1					2	1		2
CO4	2	1	1	1	1		1						2	1	1	2
CO5	2	2		2	1	1		1					2		1	2
CO6	2	1	1		2		2	2	1		1	1	2	1	1	
AVG	2.3	1	1.1	1.2	1.3	0.6	1.3	0.6	0.16	0	0.16	0.16	2	0.5	0.5	1.5

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

<b>Course code</b>	: MCA403			
<b>Course Name</b>	: RESEARCH & PUBLICATION ETHICS			
<b>Semester /Year</b>	: IVth Semester			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

L - Lecture T – Tutorial P – Practical C – Credit

### **Course Objectives: The objectives of this course are**

- To understand the philosophy of science and ethics, research integrity and publication ethics. To identify research misconduct and predatory publications.
- To understand indexing and citation databases, open access publications, research metrics (citations, h-index, impact Factor, etc.). To understand the usage of plagiarism tools.

### **Course Contents**

#### **Unit I-Philosophy and Ethics**

**[No. of Hours: 8]**

Introduction to philosophy: definition, nature and scope, concept, branches. Ethics: definition moral philosophy, nature of moral judgements and reactions.

#### **Unit II-Scientific Conduct**

**[No. of Hours: 8]**

Ethics with respect to science and research, Intellectual honesty and research integrity, Scientific misconducts: Falsification and Plagiarism (FFP), Redundant publication: duplicate and overlapping publication, salami slicing, Selective reporting and misrepresentation of data.

#### **Unit III-Publication Ethics**

**[No. of Hours: 8]**

Publication ethics: definition, introduction and importance, Best practices / standards setting initiatives and guidelines: COPE, WAME, etc. Conflicts of interest, Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types, violation of publication ethics, authorship and contributor ship, Identification of publication misconduct, complaints and appeals, Predatory publishers and journals Practice.

**Unit IV-Open Access Publishing**

**[No. of Hours: 8]**

Open access publications and initiatives, SHERPA / RoMEO online resource to check publisher copyright and self-archiving policies, Software tools to identify predatory publications developed by SPPU, Journal finder / journal suggestion tools viz. JANE, Elsevier journal Finder, Springer, Journal Suggester, etc.

**Unit V-Publication Misconduct**

**[No. of Hours: 8]**

Group Discussion, Subject specific ethical issues, FFP, authorship, Conflicts of interest, Complaints and appeals: examples and fraud from India and abroad. Software tools, Use of plagiarism software like Turnitin, Urkund and other open source software tools.

**Unit VI-Databases and Research Metrics**

**[No. of Hours: 8]**

Databases, Indexing databases, Citation databases: Web of Science, scopus, etc., Research Metrics, Impact factor of journal as per journal Citation report, SNP, SJR, IPP, Cite score, Metrics: h-index, g index, i10 index, altmetrics.

**Course Outcomes (COs):**

**Upon successful completion of the course a student will be able to**

CO#	Detailed Statement of the CO
CO1	Defining research ethics, publications misconduct and plagiarism.
CO2	Describing research ethics, publications misconduct and plagiarism.
CO3	Illustrate the intellectual honesty and research integrity.
CO4	Illustrate the various sources of information for data bases and research matrices.
CO5	Compare and understand the Open access publications and initiatives.
CO6	Appreciate the components of scholarly writing and evaluate its quality

**CO-PO Mapping**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2					2								2		1
CO2	2					2								2		1
CO3	3	1	2	2	2									2		
CO4	2	2	2	2	2	2	2							1	1	2
CO5	3	2	3	3	2	2										1
CO6	2	2	3											1		1
AVG	2.3	1.8	2.5	2.3	2.0	2.0	2.0							1.6	1.0	1.2

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

<b>Course code</b>	<b>: MCAP41.1</b>			
<b>Course Name</b>	<b>: ANDROID PROGRAMMING Lab</b>			
<b>Semester /Year</b>	<b>: IVth Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
			<b>2</b>	<b>1</b>

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives: The objectives of this course are**

1. Install and configure Android application development tools.
2. Design and develop user Interfaces for the Android platform.
3. Apply Java programming concepts to Android application development.
4. Apply essential Android Programming concepts.
5. Develop various Android applications related to layouts & rich uses interactive interfaces

**COURSE CONTENTS**

1. Android program to print hello world.
2. Android program to print addition of two numbers.
3. Android program to create a calculator.
4. Android program to create implicit intent.
5. Android program to create explicit intent.
6. Android program to create toggle button.
7. Android program to create spinner.
8. Android program to create EMI calculator.
9. Android program to use image view.
10. Android program to use different type of layouts.

**COURSE OUTCOMES (CO):**

*After completion of the course, a student will be able to*

<b>CO #</b>	<b>Detailed Statement of the CO</b>
<b>CO1</b>	Remember the basics of Java programming, different graphics tools and their use.
<b>CO2</b>	Development of static and dynamic web APPs using standard tools and learn various properties of the tools.
<b>CO3</b>	Develop interactive and user friendly APPs using front end and back end programming.
<b>CO4</b>	Develop simple applications using tools available in android studio.
<b>CO5</b>	Implement interactive graphics applications that use graphics tools, using android studio.
<b>CO6</b>	Create Android apps using Java programming language.

**CO-PO MAPPING:**

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>
<b>CO1</b>	3	1	1			3	1	2					3			1
<b>CO2</b>	3	1	2	3		3	2	3					3	2	2	2
<b>CO3</b>	3	2	3	3	1	2	2	3					2			2
<b>CO4</b>	2	1	3	3	2	3	2	3					3	1	1	1
<b>CO5</b>	3	1	3	1	2	3	2	3					3	1	2	2
<b>CO6</b>	3	2	2	2			1	1	2	1			2	1	1	1
<b>AVG</b>	<b>2.83</b>	<b>1.33</b>	<b>2.33</b>	<b>2</b>	<b>0.83</b>	<b>2.33</b>	<b>1.66</b>	<b>2.5</b>	<b>0.33</b>	<b>0.16</b>	<b>0</b>	<b>0</b>	<b>2.66</b>	<b>0.83</b>	<b>1</b>	<b>1.5</b>

<b>Course code</b>	<b>: MCAP41.2</b>			
<b>Course Name</b>	<b>: DATA SCIENCE IN PYTHON LAB</b>			
<b>Semester /Year</b>	<b>: IVth Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives: The objectives of this course are**

1. Using the data science using Python
2. Understanding the use of NumPy in data science
3. To understand the dataframe, reading csv, tsv file and working on it.
4. Handling the missing value and data cleansing
5. Understanding the concept of visualize the numbers in graphs using the Python libraries Matplotlib and Seaborn

**COURSE CONTENTS**

- Programs based using NumPy.
- Programs based on using series and dataframe using Pandas.
- Reading CSV files in Panadas
- Handling missing values in Panadas
- Using concat(), join(), append() and groupby in Panadas
- Plotting line plot, histogram, bar chart, pie chart, scatter plot, subplot etc. using Matplotlib and saving the figure.
- Plotting line plot, histogram, bar plot, scatter plot, heatmap, etc. using Seaborn

**Course Outcomes (COs):**

**Upon successful completion of the course a student will be able to**

CO #	Detailed Statement of the CO
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CO1	Design algorithms involving more complex data structures, and can implement it.
CO2	Understanding the performance of multiple methods and models, recognize the connections between how the data were collected and the scope of conclusions from the resulting analysis
CO3	Apply models and use different measures of model to assess outputs.
CO4	Analyse the data model applied using the data science tools.
CO5	Evaluate the data from disparate sources, cleaning the data and transform data from one format to another
CO6	Developing the program using various tools of data science.

### CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3				2		1	1					2			1
CO2	1	3	2	1	2		1	1			1		3	2	1	2
CO3	1	3	2	1	2		1	1			1		3	2		2
CO4	1	3	2	1	2		1	1			1		3	2		2
CO5	1	3	3	2	1	1	1	1	1	1	2	1	3		2	2
CO6	3	3	3	2	2	1	1	1	1	1	2	1	3	2	2	2
AVG	1.7	3.0	2.4	1.4	1.8	1.0	1.0	1.0	1.0	1.0	1.4	1.0	2.8	2.0	1.7	1.8

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated



<b>Course code</b>	<b>: MCASM42</b>			
<b>Course Name</b>	<b>: SEMINAR AND PRESENTATION</b>			
<b>Semester /Year</b>	<b>: IVth Semester</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives:** The objectives of this course are

1. Identify and compare technical and practical issues related to the area of course specialization.
2. Outline annotated bibliography of research demonstrating scholarly skills.
3. Prepare a well-organized report employing elements of technical writing and critical thinking.
4. Demonstrate the ability to describe, interpret and analyze technical issues and develop competence in presenting.

**Course outcomes (COs):**

**Upon successful completion of the course a student will be able to**

<b>CO #</b>	<b>Detailed Statement of the CO</b>
<b>CO1</b>	Defining the aim of the seminar topic.
<b>CO2</b>	Understanding the seminar topic and requirements of technical resources.
<b>CO3</b>	Apply the critical thinking on the topic of the seminar
<b>CO4</b>	Illustrate the work done in the topic with presentation.
<b>CO5</b>	Work is evaluated by a panel to boost the confidence to the student.
<b>CO6</b>	Create technical documents.

**CO-PO Mapping**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3			2			2					2	1	1	1	2
CO2			3	2							2		1		1	2
CO3					2				3				1		2	2
CO4									3				1		3	
CO5	2						2		2					1	2	2
CO6	2	2	1	2	2		2		2			1	1	1	2	2
AVG	2.3	2.0	2.0	2.0	2.0		2.0		2.5		2.0	1.5	1.0	1.0	1.8	2.0

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

<b>Course code</b>	: MCARP			
<b>Course Name</b>	: RESEARCH PROJECT			
<b>Semester /Year</b>	: IVth Semester			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>20</b>	<b>10</b>

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives: The objectives of this course are**

In this course, the learners will be able to develop working expertise of solving complex computing problems through project based learning approach using real world case studies by implementing the concepts studied in the theory courses of this semester.

**Course outcomes (COs):**

**Upon successful completion of the course a student will be able to**

CO#	Detailed Statement of the CO
CO1	Identify the problem and describing it.
CO2	Understand the requirements of the chosen project.
CO3	Apply the collected requirements to define the describe the project in a systematic and comprehensive approach.
CO4	Analyze the technical aspects of the chosen project to find the possible solutions for development of the project.
CO5	Evaluate the effective reports and documentation for all project related activities and solutions.
CO6	Create plan for the project development.

**CO-PO Mapping**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
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<b>CO1</b>	3	1						1	2		2	1	2	1	1	2
<b>CO2</b>	1	3		2	1	2			1				3	2	2	1
<b>CO3</b>	1	1	3	2	1	1	1			2		1	3	2	2	2
<b>CO4</b>	1	1	1	1	1	1	2	1	1	2	2	3	2		3	
<b>CO5</b>	2			1	3	1	2	1	2	1	3	1	2	1	2	2
<b>CO6</b>	2	3	3	3	1	1	1	3	1	1	1	1	2	1	2	2
<b>AVG</b>	<b>1.7</b>	<b>1.8</b>	<b>2.3</b>	<b>1.8</b>	<b>1.4</b>	<b>1.2</b>	<b>1.5</b>	<b>1.5</b>	<b>1.4</b>	<b>1.5</b>	<b>2.0</b>	<b>1.4</b>	<b>2.4</b>	<b>1.2</b>	<b>2</b>	<b>1.5</b>

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated