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]

SYLLABUS

FOR

Master of Computer Application (MCA)

Under CBCS PATTERN

School of Computer Application & Information Technology

(w.e.f. 2021-2022)

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)

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

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

First Semester

S. No.	Course Category	Couse Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	C	Sessional (Internal)	External (ESE)	
Theory										
1	Core	MCA-101	Problem Solving using 'C' Language	4	0	0	4	40	60	100
2	Core	MCA-102	Web Programming	4	0	0	4	40	60	100
3	Core	MCA-103	MFCS	4	0	0	4	40	60	100
4	Core	MCA-104	Computer Network	3	1	0	4	40	60	100
5	Core	MCA-105	Computer System Architecture	4	0	0	4	40	60	100
6	Core	MCA-106	Professional Communications & Seminar	3	1	0	4	40	60	100
Practical										
7	Core	MCA-P11	C Programming Lab	-	-	2	1	40	60	100
8	Core	MCA-P12	Web Programming Lab	-	-	2	1	40	60	100
			Total	**22**	**2**	**4**	**26**	**320**	**480**	**800**

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

Second Semester

S. No.	Course Category	Couse Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	C	Sessional (Internal)	External (ESE)	
Theory										
1	Core	MCA-201	Data Structure using 'C'	4	0	0	4	40	60	100
2	Core	MCA-202	Java Programming	4	0	0	4	40	60	100
3	Core	MCA-203	DBMS	4	0	0	4	40	60	100
4	Core	MCA-204	Graph Theory	3	1	0	4	40	60	100
5	Core	MCA-205	Computer Graphics	3	1	0	4	40	60	100
6	Core	MCA-206	Computer Based Numerical and Statistical Techniques	3	1	0	4	40	60	100
Practical										
7	Core	MCA-P21	Data Structure Lab	-	-	2	1	40	60	100
8	Core	MCA-P22	Java Programming Lab	-	-	2	1	40	60	100
9	Core	MCA-P23	SQL Lab	-	-	2	1	40	60	100
10	Core	MCA-SM24	Seminar and Presentation	-	-	2	1	100	-	100
			Total	**21**	**3**	**8**	**28**	**460**	**540**	**1000**

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

Third Semester

S. No.	Course Category	Couse Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	C	Sessional (Internal)	External (ESE)	
Theory										
1	Core	MCA-301	Operating System	4	0	0	4	40	60	100
2	Elective	MCA-302.1	Advance Java	4	0	0	4	40	60	100
		MCA-302.2	Python							
		MCA-302.3	PL/ SQL							
3	Core	MCA-303	Algorithm Analysis & Design	3	1	0	4	40	60	100
4	Core	MCA-304	Software Engineering	3	1	0	4	40	60	100
5	Core	MCA-305	Artificial Intelligence	3	1	0	4	40	60	100
6	Core	MCA-306	Software Testing	3	1	0	4	40	60	100
Practical										
7	Core	MCA-P31	Unix Lab	-	-	2	1	40	60	100
8	Elective	MCA-P32.1	Advance Java Lab	-	-	2	1	40	60	100
		MCA-P32.2	Python Lab							
		MCA-P32.3	PL/ SQL Lab							
9	Core	MCA-P33	Project	-	-	4	2	100	100	200
			Total	**20**	**4**	**8**	**28**	**420**	**580**	**1000**

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

Fourth Semester

S. No.	Course Category	Couse Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	C	Sessional (Internal)	External (ESE)	
Theory										
1	Core	MCA 401	Android Programming	4	0	0	4	40	60	100
2	Elective	MCA 402.1	PHP Programming	4	0	0	4	40	60	100
		MCA. 402.2	C# Dot Net							
		MCA 402.3	Data Science in Python							
3	Core	MCA 403	Network Security & Cryptography	3	1	0	4	40	60	100
4	Elective	MCA 404.1	Mobile Computing	3	1	0	4	40	60	100
		MCA 404.2	Big Data							
		MCA 404.3	Cloud Computing							
5	Elective	MCA 405.1	Supply Chain Management	4	0	0	4	40	60	100
		MCA 405.2	E-Commerce							
		MCA 405.3	Enterprise Resource Planning							
Practical										
6	Core	MCA P41	Android Lab	-	-	2	1	40	60	100
7	Elective	MCA P42.1	PHP Programming Lab	-	-	2	1	40	60	100
		MCA P42.2	C# Dot Net Lab							
		MCA P42.3	Data Science in Python Lab							
8	Core	MCA P43	Project	-	-	8	4	100	100	200
9	Core	MCA-SM44	Seminar and Presentation	-	-	4	2	100	-	100
			Total	**18**	**2**	**16**	**28**	**480**	**520**	**1000**

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

Examination Scheme:

Components	Internal	Assignment	Attendance	External (ESE)
Weightage (%)	20	15	5	60

FIRST SEMESTER

Course code : MCA-101				
Course Name : PROBLEM SOLVING USING 'C'				
Semester /Year : Ist Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

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-off 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:

	POI	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

Course code : MCA-102				
Course Name : WEB PROGRAMMING				
Semester /Year : Ist Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

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, reservewords, 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

Course code : MCA-103				
Course Name : MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE				
Semester /Year : Ist Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

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

Course Objectives: The objectives of this course are

1. Understand different Types of Discrete Structures
2. Analyse &understand the concepts of groups, and elementary properties of Rings and Fields.
3. Concept of basic principle of set theory, relations, function and its operations.
4. Learn the representation of lattices with POSET.
5. Learn the concepts of graphs, trees and its traversal, and recurrence relations.
6. Express a Logic Sentence in Terms of Predicates, Quantifiers, and Logical Connectives

COURSE CONTENTS

UNIT I. Proposition Logic

Proposition, logical connectives, truth tables, tautologies, contradiction, normal forms (conjunctive and disjunctive), validity of an argument, converse, inverse, contrapositive, Universal and existential quantifiers.

UNIT II. Matrix

Definition & types of matrix, Matrix addition and multiplication, Transpose and inverse of matrix, Rank of matrix, linear independence/dependence of vectors, Consistency of System of Linear Equations and its Solution, Eigen values and Eigenvectors, Cayley-Hamilton Theorem, Diagonalization.

UNIT III. Relations and functions

Cartesian product of sets, relation, types of relation, equivalence relation, equivalence classes, matrix and graph representation of a relation, closure of a relation, partial order relation, Hasse diagram. Binary operations, groups and properties, subgroups, cyclic groups and properties, group of permutations, orbit, cycles and alternating group, cosets, Lagrange's theorem.

UNIT -IV. Lattices & Posets

Posets, well ordered set, maximal and minimal element, greatest and least element, least upper bound, greatest lower bound, Lattices, properties of Lattices, Isomorphism, Some special lattices: Bounded lattice and complemented lattices, distributive lattice Modular lattice, Complete lattice.

UNIT –V. Recurrence relation

Homogenous and Non homogenous equation, Discrete numeric function, basis operations, convolution, recurrence relation, solution by iteration method, undetermined coefficient method, generating function method.

Text Books:

TB3. Kenneth H. Rosen, "Discrete Mathematics and its applications', TMH.
TB4. Liptschutz, Seymour, "Discrete Mathematics", TMH.".

Reference Books:

RB1. Doerr Alan and Levasseur Kenneth, "Applied Discrete Structure for Computer Science, Galgotia Pub.
RB2. Gersting "Mathematical Structure for Computer Science", WH freeman and Macmillan
RB3. Hopcroft J.E. Uliman J.D., "Introduction to Automata Theory, Language and Computation

Course Outcomes (CO):

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

CO#	Detailed Statement of the CO
CO1	Illustrate the basic principle of set theory, relations, function and its operations.
CO2	To understand the algebraic structure related to the groups, and elementary properties of Rings and Fields.
CO3	Solve an argument using logical notation like prepositional logic and determine if the argument is or is not valid.
CO4	Illustrate the basic operations on matrices and theorems Hamilton Theorem, Diagonalization.
CO5	Evaluate the problem using recurrence relations and Homogenous and Non homogenous equation, Discrete numeric function etc.
CO6	Design and Able to use posets and lattices to find the min and max elements etc.

CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1		1		2	1						1			1
CO2	2	1		2	1	1	2						1	1		1
CO3	1	2	2	2	2	1	2	1						1		1
CO4	2	1		2		2	2	1					2			1
CO5	1	2	2	2	2	2	1	2					3	2	2	2
CO6	2	3	3	1	2	2	2	1					3	3	1	1
AVG	**1.6**	**1.6**	**1.1**	**1.6**	**1.1**	**1.5**	**1.6**	**0.8**					**1.6**	**1.1**	**0.5**	**1.1**

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

Course code : MCA-104				
Course Name : COMPUTER NETWORKS				
Semester : 1st Semester				
	L	**T**	**P**	**C**
	3	**1**	**0**	**4**

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:

TB5. W. Stallings, "Data and Computer Communication", Macmillan Press
TB6. 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

Course code : MCA-105				
Course Name : COMPUTER ORGANIZATION & ARCHITECTURE				
Semester : Ist Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

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

Course Objectives: The objectives of this course are

1. To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
2. To expose students to the basic architecture of processing, memory and I/O organization in a computer system.
3. To explain the function of each element of a memory hierarchy,
4. To identify and compare different methods for computer I/O.

COURSE CONTENTS

Unit 1 **[No. of Hours: 10]**

Logic Gates and Boolean Algebra - Logic Gates: AND, OR, NOT, XOR, XNOR, NAND and NOR as Universal Gates. Boolean Algebra: Boolean postulates and laws, De Morgan's Theorem, Principle of Duality, Boolean expression, Boolean function, Minimization of Boolean expressions, Sum of Products (SOP), Product of Sums(POS), Minterm-Maxterm, Canonical forms , Karnaugh Map Simplification-Don't care conditions.

Unit 2 **[No. of Hours: 10]**

Combinational Circuits: Half Adder, Full Adder, Half Subtractor, Full Subtractor, Serial Adder/Subtractor, Parallel Adder/ Subtractor, Decoder, Encoders, Multiplexers, Demultiplexers. Sequential Circuits: Latch, Flip Flops- SR, JK, Data, Toggle,

Unit 3 **[No. of Hours: 8]**

Basic Organization: Micro-Operations, Register Transfer Micro-Operations, Arithmetic Micro-Operations, Logic Micro-Operations, Shift Micro-Operations, Bus and Memory Transfers, Programming Registers, CPU organization.

Unit 4 **[No. of Hours: 8]**

Memory Organization- Memory Hierarchy, Main Memory, Auxiliary Memory, Cache Memory, Virtual Memory. Address Space and Memory Space, Associative Memory, Page Table, Page Replacement.

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

Input-Output Organization- Modes of Transfer, Priority Interrupt, DMA, Input-Output Processor (IOP), CPU-IOP Communication.

Text Books:

TB1. M. M. Mano, Computer System Architecture Digital Design, 3rd ed., Pearson Education, Delhi, 2007.

TB2. T. Radhakrishnan and V. Rajaraman – Computer Organization & Architecture, PHI, 2004.

Reference Books:

RB1. D.P. Leach, A. P. Malvino, Goutam Guha, Digital Principles and Applications, Tata Mc-Graw Hill, New Delhi, 2011.

RB2. R.J. Tocci and N.S. Widner, Digital Systems - Principles & Applications, PHI, 10th Ed., 2007

Course outcomes (COs):

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

CO#	Detailed Statement of the CO
CO1	Identify the basic structure and functional units of a digital computer.
CO2	Illustrate the effect of addressing modes on the execution time of a program.
CO3	Compare different arithmetic and logic operations used in ALU design.
CO4	Examine the different types of control logic designs in processors.
CO5	Categorize the computer memory types based on performance and cost and interpret replacement algorithms.
CO6	Discuss the concepts of input/output organization, different communication schemes and data transfer modes.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	2		2						1	1		1
CO2	3	2	2	2	2		1						1	1	1	1
CO3	2	2	2	2	1		1						1	1	1	1
CO4	2	1	1	1	1		1						1			1
CO5	2	1	1	1	1		1						1			1
CO6	2	2	2	2	1		1						1	1	1	1
AVG	2.3	1.7	1.7	1.7	1.3	0	1.2	0	0	0	0	0	1.0	0.7	0.5	1.0

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

Course code	**: MCA-106**			
Course Name	**: PROFESSIONAL COMMUNICATION**			
Semester /Year	**: Ist sem**			
L	**T**	**P**	**C**	
3	**1**	**0**	**4**	

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 –GD strategies- activities to improve GD 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**, Publishe**r -Pearson Publication

TB3. Business Communication **Author** N Gupta, **Publisher** -Sathya Bhawna Publication

TB4. Comprehension and communication skills **Author**-Varinder kumsr. **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 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

Course code : MCA-P11				
Course Name : C PROGRAMMING LAB				
Semester /Year : Ist Semester				
	L	**T**	**P**	**C**
	0	**0**	**2**	**1**

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

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

CO-PO Mapping:

CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO2	PSO4
CO1	2	1	3	2	3	2	1						3	1	1	1
CO2	2	2	3	2	3	1	2	1					3	1	1	1
CO3	1	3	3	2	2	1	1	1			1		3	1	1	1
CO4	1	2	3	2	2	1	2	1			1		3	1	1	1
CO5	3	1	2	2	2	1	2	1					3	1	1	1
CO6	2	1	2	2	2	1	2	1					3	1	1	1
AVG	**1.8**	**1.6**	**2.6**	**2**	**2.3**	**1.1**	**1.5**	**0.8**	**0**	**0**	**0.4**	**0**	**3**	**1**	**1**	**1**

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

Course code : MCA-P12				
Course Name : WEB PROGRAMMING LAB				
Semester /Year : Ist Semester				
	L	**T**	**P**	**C**
	0	**0**	**2**	**1**

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

SECOND SEMESTER

Course code : MCA-201				
Course Name : DATA STRUCTURE USING C				
Semester /Year : IInd Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

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:

	POI	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

Course code	**: MCA-202**			
Course Name	**: JAVA PROGRAMMING**			
Semester /Year	**: IInd Semester**			
	L	**T**	**P**	**C**
	4	0	0	4

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, Introuduction 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	3	3	2	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

Course code : MCA-203				
Course Name : DBMS				
Semester /Year : IInd Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

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 (INF, 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, 7th Edition, 2016

TB2. Korth, Silberschatz, "Fundamentals of Database System Concepts", TMH, 6th 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, 2nd Edition, 1999.

RB2. C.J.Date, A. Kannan, S. Swamynathan "An Introduction to Database Systems",

RB3. Pearson Education, 8th 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

Course code : MCA-204				
Course Name : GRAPH THEORY				
Semester /Year : IInd Semester				
	L	**T**	**P**	**C**
	3	**1**	**0**	**4**

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

Course Objectives:

1. To know various terminology of graph and types of graphs
2. To understand various properties of different graphs
3. To know the application of graph theory to solve real life problem, engineering problems
4. To learn & understand various algorithms applied on graphs
5. To understand various theorems of graph theory.

COURSE CONTENTS:

UNIT 1: Introduction to Graphs [No. of Hours: 8]

Definition of a graph, applications of graph, finite and infinite graphs, degree of a vertex, types of graphs, isomorphism, sub-graphs, walk, path, circuit, connectedness, operations on graphs, Euler graph, Hamiltoniangraph, circuits and cut-sets. Planar graph, Euler's polyhedron formula, Kuratowski's graphs, detection of planarity, geometric dual, combinatorial dual, thickness and crossings.

UNIT 2: Trees and shortest path algorithms [No. of Hours: 8]

Tree Basics & Properties, pendent vertices, distance, center, diameters, radius, eccentricity, rooted and binary trees, On counting tress, Depth of Tree, spanning tree, Minimum Spanning Tree , fundamental circuits and cut-sets, finding all spanning trees of a graph.

Shortest distance Algorithms: Algorithms of Prims & Kruskal ,Dijkstra's Algorithm

UNIT3: Matrix representation of directed & undirected graphs [No. of Hours: 8]

Incidence matrix of graph, sub matrices of A(G), circuit matrix, fundamental circuit matrix and rank of B, cut set matrix, relationships among A(G) , adjacency matrices, path matrix, rank- nullity theorem. Directed graph, Types of directed graphs, Directed paths and connectedness, Euler digraph, Trees with directed edges, Fundamental circuit in digraph, Matrices A, B, C of digraph, adjacency matrix of digraph.

UNIT 4: Graph Coloring [No. of Hours: 8]

Partitioning of graph, Chromatic number, Wetch-Powell Algorithm, Chromatic partitioning, Chromatic polynomials, Decomposition theorem, Five Color theorem , Edge coloring, Chromatic Index, Region coloring, matching & covering, Four color problem.

UNIT 5: Network Flow & Enumeration of graph [No. of Hours: 8]

Network flows, max flow mincut algorithm, Enumeration and its types, Counting of labeled and unlabeled trees, Polya's counting theorem, Cayley's Theorem.

Text Book:

TB1. Narsingh Deo, "Graph Theory: With Application to Engineering and Computer Science", Prentice Hall of India, 2003.
TB2. Grimaldi R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", Addison Wesley, 1994.

Reference Books:

RB1. Clark J. and Holton D.A, "A First Look at Graph Theory", Allied Publishers, 1995.
RB2. Mott J.L., Kandel A. and Baker T.P. "Discrete Mathematics for Computer Scientists and Mathematicians" Prentice Hall of India, 1996.
RB3. 3.. Liu C.L., "Elements of Discrete Mathematics", Mc Graw Hill, 1985.
RB4. Rosen K.H., "Discrete Mathematics and Its Applications", Mc Graw Hill, 2007.

Course Outcomes (COs):

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

CO	Detailed Statement of the CO
CO1	To gain knowledge of graph theory to solve real life problems
CO2	Understand and interprets various graph theory concepts including theorems.
CO3	Apply theories and concepts to test and validate intuition and independent mathematical thinking in problem solving
CO4	Analyze new networks using the main concepts of graph theory.
CO5	Evaluate Algorithms with given problem of graph theory.
CO6	Create and design own methods to Graph theory solve real life problems with help of graph theory.

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
CO2		3	1				1						2	2		2
CO3	1		2			1		2	2				3	2	1	2
CO4			3							3		1	2	2		1
CO5	1										2		3	2	1	1
CO6	1											1				
AVG	**1**	**0.6**	**1.2**	**0.4**	**0**	**0.2**	**0.2**	**0.4**	**0.4**	**0.6**	**0.4**	**1**	**2.6**	**1.8**	**0.6**	**1.4**

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

Course code	**: MCA-205**			
Course Name	**: COMPUTER GRAPHICS**			
Semester /Year	**: IInd Semester**			
	L	**T**	**P**	**C**
	3	**1**	**0**	**4**

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

Course Objectives: The objectives of this course are

1. To introduce the use of the components of a graphics system and become familiar with building approach of graphics system components and algorithm.
2. To understand basic principle of 2-dimensional graphics such as transformation, translation etc.
3. To discuss various line clipping algorithms.
4. To discuss Bezier curve and surfaces

COURSE CONTENT

Unit I – Computer Graphics and output primitives [No. of Hours: 8]

Concepts and applications, Random and Raster scan devices, CRT, LCD, TFT, plasma panels, DLP, Printers, Keyboards, Mouse, Scanners, Graphics Software, output primitives, Pixel ,frame buffer, function for segment, segmenting display file ,posting and un-posting & appending segment, Free storage allocation ,display file structure.

Unit II Line and circle drawing algorithm [No. of Hours: 8]

DDA, Bresenham's. Line and Circle generating algorithm, Midpoint circle drawing algorithms: Attributes of output primitive, Antialising, Area filling: Filled area primitive: Scan-line Polygon fill Algorithm, boundary fill algorithm, flood fill algorithm.

Unit III – 2-D-Transformation, Viewing, Clipping [No. of Hours: 8]

Two-dimensional Transformations: Translation, scaling, rotation, reflection, shear, matrix representation of all homogeneous coordinates composite transformation. 2D-projections– parallel and perspective projection, 2D dimensional viewing, Viewing pipeline, Window-to-view port transformation. Clipping operations, Line Clipping: Cohen Sutherland, Liang-barsky, concave & convex polygon ,Polygon Clipping, Sutherland Hodgeman polygon.

Unit IV – 3-D Transformation and Visible surface detection [No. of Hours: 8]

3D object representations: Polygon Surface, Tables, Plane Equation. Curved lines and Surfaces: Spline representation, Interpolating and approximation curves, continuity conditions Cubic Splines, Bezier curves, B-Spline curves: characteristics and generation, Visible Surface detection Algorithm: Object based and image-based methods, depth comparison, A-Buffer, Back face removal, Scan-line method, Area subdivision method.

Unit V – Overview of Multimedia **[No. of Hours: 8]**

Overview of multimedia, Classification, basic concept of sound/audio MIDI: devices, messages, software. Speech, Video and Animation: Basic concept, computer-based animation, methods of controlling animation, display of animation, and transmission of animation.

Text Books:

TB1. Computer Graphics by Donand Hearn & M. Pauline Baker PHI.
TB2. Introduction to Computer Graphics Anirban Mukhopadhyay & Arup Chattopadhyay.
TB3. Schaum's outlines – Computer Graphics Mc Graw Hill International Edition.5

References Books:

RB1. Multimedia Computing Communication & Applications " By Ralf Steimnety & Kerla Neshtudt." Prince Hall.
RB2. Principles of Interactive Compo Graphics; W.M.Newman & Robert F Sproull.
RB3. Computer Graphics by Rogers TMH.
RB4. Principles of Multimedia by Ranjan Parekh TMH.
RB5. "Multimedia Systems Design", P.K.Andleigh & K. Thakrar, Prentice Hall Pvt. Ltd.

Course outcomes (COs):

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

CO#	Detailed Statement of the CO
CO1	Describe the working of Cathode – ray tube
CO2	Describe the representation of point, line and circle
CO3	Construct 2D and 3D Transformation
CO4	Identify parallel and perspective projection
CO5	Understand the concept of Animation
CO6	Plan Line Drawing Programs

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
CO2	3	2	2	2									2	1		2
CO3	2	2		2	2	2							2	1		2
CO4	2				2								2			1
CO5	2		2										2	2	1	2
CO6	2	2	2	1	1	1	1						2	1	1	1
AVG	**2.33**	**1.3**	**1**	**0.83**	**0.83**	**0.5**	**0.16**	**0**	**0**	**0**	**0**	**0**	**1.83**	**1**	**0.33**	**1.5**

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

Course code	**: MCA-206**			
Course Name	**: COMPUTER BASED NUMERICAL AND STATISTICAL TECHNIQUES**			
Semester /Year	**: IInd Semester**			
	L	**T**	**P**	**C**
	3	**1**	**0**	**4**

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

Course Objectives: The objectives of this course are

1. Overview of some of the issues and problems that arise in scientific computation, such as (non-)linear systems, numerical and symbolic integration, differential equation and simulation.
2. Suitable and effective methods called Numerical Methods, for obtaining approximate representative numerical results of the problems.
3. Problems in the field of Applied Mathematics, Theoretical Physics and Engineering which requires computing of numerical results using certain raw data.
4. To solve complex mathematical problems using only simple arithmetic operations. The approach involves formulation of mathematical models of physical situations that can be solved with arithmetic operations.
5. To deal with various topics like finding roots of equations, solving systems of linear algebraic equations, interpolation and regression analysis, numerical integration & differentiation, solution of differential equation, boundary value problems, solution of matrix problems.
6. To understand the basic concepts of statistics

COURSE CONTENT

UNIT I Fixed &Floating point Arithmetic [No. of Hours: 2]

Representation of floating point numbers, Representation of Integers, Operations, Normalization, Errors in numerical computation.

UNIT II Interpolation and approximation [No. of Hours: 10]

Difference tables, Polynomial Interpolation: Newton's forward and backward formula Central Difference Formulae: Sterling's, Bessel's formula, Gauss forward and backward formula. Interpolation with unequal intervals: Lagrange's, hermit Interpolation, Newton Divided difference formula.

UNIT III Numerical Differentiation and Integration and Differential equation

[No. of Hours: 8]

Introduction, Numerical Differentiation, Numerical Integration, Trapezoidal rule, Simpson's rules. Solution of differential equations: Picard's Method, Euler's Method, Taylor's Method, Runge Kutta methods

UNIT IV: Solution of Linear and Nonlinear equations [No. of Hours: 8]
Gauss Elimination, Gauss Seidal iterative method, Solution of Nonlinear equation using Bisection Method, Iteration Method, Regula-Falsi method, Newton Raphson method, Secant method, zeros of polynomials.

UNIT V: Basic Statistics [No. of Hours: 12]
Measure of central tendency: Mean, Median, Mode, Curve Fitting, Method of least squares, fitting of straight lines, polynomials, exponential curves, Correlation and Regression analysis: Introduction, Scatter Diagram, Types of Correlation, Karl Pearson's Method, Linear regression.

Text Books:

TB1. Rajaraman V., :Computer Oriented Numerical Methods". PHI
TB2. Grewal B.S., "Numerical methods in Engineering and Science. Khanna Publishers, Delhi.
TB3. SP Gupta , Statistical Methods, Sultan &Chand sons

References Books:

RB1. Gerald and Wheatley, "Applied Numerical Analyses", AW
RB2. Jain, Iyengar and Jain, "Numerical Methods for Scientific and Engineering Computations:, New Ager Int.
RB3. T.Veerarajan, T Ramchandran, "Theory and Problems of Numerical Methods", TMH

Course outcomes (COs):

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

CO#	Detailed Statement of the CO
CO1	Illustrate the basic understanding of common numerical methods used to obtainapproximate solutions to otherwise intractable mathematical problems.
CO2	Understand and apply Numerical analysis which has enormous applications in the field of Science and some fields of Engineering.
CO3	Apply numerical methods for various mathematical operations and tasks.
CO4	Analyse and evaluate the accuracy of common numerical methods.
CO5	Evaluate and analyzes the statistical techniques used for straight lines, polynomials, exponential curves
CO6	Design and solve various problems using Numerical Differentiation and Integration and Differential equation

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2											2			1
CO2	1	3	2	1	1								3	2	1	2
CO3	1	3		1									3	1	1	1
CO4		3	2	1	1					1			2	3		1
CO5	3	2	1	2	1		1		1				2			1
CO6	2	1	2	1	3		1	1	1	1			1	2	2	3
AVG	**1.6**	**2.3**	**1.1**	**1**	**1**	**0**	**0.3**	**0.1**	**0.3**	**0.3**	**0**	**0**	**2.1**	**1.3**	**0.6**	**1.5**

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

Course code	**:**	**MCA-P21**			
Course Name	**:**	**DATA STRUCTURE Lab**			
Semester /Year	**:**	**IInd Semester**			
		L	**T**	**P**	**C**
		0	**0**	**2**	**1**

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
CO1	Analyze & understand the difference between linear and non linear DS & implement array & link list and its types
CO2	Understand and implement stack and queues using array and link list
CO3	Understand and implement BST, addition and deletion of nodes, Huffman algorithm etc.
CO4	To implement different sorting techniques like selection Bubble, insertion, merge quick sort etc.
CO5	To understand and implement linear and binary search

CO6	To create and implement of graphs like directed and undirected graphs etc

CO-PO Mapping:

	POI	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**	**0**	**0**	**0**	**0**	**0**	**2**	**1**	**0.3**	**1**

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

Course code : MCA-P22				
Course Name : JAVA PROGRAMMING LAB				
Semester /Year : IInd Semester				
	L	**T**	**P**	**C**
	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

Course code : MCA-P23				
Course Name : SQL LAB				
Semester /Year : IInd Semester				
	L	**T**	**P**	**C**
	0	**0**	**2**	**1**

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/DDL 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
CO1	1	1	3	2	3	2	1						3			1
CO2	2	1	2	1	2	1		1					3	1		1
CO3	3	1		1	1	1	2						3	1	2	2
CO4	1	1	3	2	1		3	1			2	1	3	2	2	1
CO5	1	1	2			1	2	2			3		1	1	3	1
CO6		3	3	1	1	1	1						3	2	2	2
AVG	**1.6**	**1.3**	**2.6**	**1.4**	**1.6**	**1.2**	**1.8**	**1.3**			**2.5**	**1.0**	**2.7**	**1.4**	**2.3**	**1.3**

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

Course code : MCA-SM24				
Course Name : SEMINAR AND PRESENTATION				
Semester /Year : IInd Semester				
	L	**T**	**P**	**C**
	0	**0**	**2**	**1**

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

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

THIRD SEMESTER

Course code : MCA-301				
Course Name : OPERATING SYSTEM				
Semester /Year : IIIrd Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

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:

	POI	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**

Course code : MCA-302.1				
Course Name : ADVANCE JAVA				
Semester /Year : IIIrd Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

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, JPassword Field, Jbutton, Jcheckbox, Jradio button, Jlist, Jscrollpane, Jcombobox, Jmenu, Jmenubar, JMenultem, 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 Echel, "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 : MCA-302.2				
Course Name : PYTHON				
Semester /Year : IIIrd Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

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, 1st Edition, 2011.
TB2. Mark Lutz, "Learning Python", O'Reilly, 4th Edition, 2013.
TB3. Y. Daniel Liang, "Introduction to Programming Using Python", Pearson, 1st Edition,2013.

Reference Books:

RB1. Kenneth A. Lambert, "The Fundamentals of Python: First Programs", Cengage Learning, 1st Edition, 2011.
RB2. Allen Downey, "Think Python: How to Think Like a Computer Scientist", O'Reilly, 2ndEdition, 2015.
RB3. Reema Thareja, "Python Programming using Problem Solving Approach", Oxford University Press, 1st Edition, 2017.
RB4. Joel Grus, "Data Science from Scratch", O'Reilly, 2nd Edition, 2019.
RB5. Tony Gaddis, "Starting out with Python", Pearson, 3rd 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 : MCA-302.3				
Course Name : PL/SQL				
Semester /Year : IIIrd Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

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

Course code : MCA-303				
Course Name : ALGORITHMS ANALYSIS & DESIGN				
Semester /Year : III				
	L	**T**	**P**	**C**
	3	**1**	**0**	**4**

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, 2nd Edition, 2006

TB2. S. Dasgupta, C. Papadimitriou and U.Vazirani, "Algorithms", McGraw Hill Higher Education, 1st Edition, 2017.

TB3. J. Kleinberg and E. Tardos, "Algorithm Design", Pearson Education, 2nd Edition, 2009.

Reference Books:

RB1. T. H Cormen, C E Leiserson, R L Rivest and C Stein: Introduction to Algorithms, 3rd Edition, Prentice-Hall of India,

RB2. Ellis Horowitz, Sartaj Sahni, S.Rajasekharan: Fundamentals of ComputerAlgorithms, 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

Course code	**:**	**MCA-304**			
Course Name	**:**	**SOFTWARE ENGINEERING**			
Semester /Year	**:**	**IIIrd Semester**			
		L	**T**	**P**	**C**
		3	**1**	**0**	**4**

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

Course code : MCA-305				
Course Name : ARTIFICIAL INTELLIGENCE				
Semester /Year : IIIrd Semester				
	L	**T**	**P**	**C**
	3	**1**	**0**	**4**

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; Skolemnisation; 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 Word; 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**	**0**	**0**	**0**	**0**	**0**	**0**	**2.16**	**1.0**	**1.16**	**1.5**

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

Course code : MCA306				
Course Name : SOFTWARE TESTING				
Semester /Year : IIIrd Semester				
	L	**T**	**P**	**C**
	3	**1**	**0**	**4**

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

Course Objectives: The objectives of this course are

1. To gain knowledge of the concept of Software Testing.
2. Core Software Testing Concepts
3. Testing at the unit, module, subsystem and system levels
4. The testing processes.
5. Testing Best Practices

COURSE CONTENTS

Unit I: Introduction to Testing **[No. of Hours: 10]**

Strategic Approach to Software Testing, Test Strategies for Conventional Software, Validation Testing, System Testing, Basic Terminologies, V Shaped Software Lifecycle Model

Unit II: Functional Testing **[No. of Hours: 10]**

Black-box Testing, Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing

Unit II: Structural Testing **[No. of Hours: 10]**

White-box Testing, Basis Path Testing: Program Graph, DD Path graph, Cyclomatic Complexity, Graph Matrices, Control Flow Testing: Statement Coverage, Branch Coverage, Condition Coverage, Path Coverage

Text Books:

TB1. Roger S. Pressman, Software Engineering: A Practitioner's Approach, Seventh Edition, McGraw Hill Education.2009.

Reference Books:

RB1. Yogesh Singh, Software Testing, Cambridge University Press, 2011

Course Outcomes (COs):

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

CO#	Detailed Statement of the CO
CO1	Define Testing and fundamentals of software testing.
CO2	Relate and extend knowledge of testing for given set of test cases during development and regression testing
CO3	Identify tests according to their purpose and the test activities they support.
CO4	Distinguish between black box and white box testing
CO5	Determine cyclomatic Complexity
CO6	Design test cases and discuss debugging tools

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3		3									2			1
CO2	2	3	3	2	3								2		1	1
CO3	2	3	3	2	2		2						2	2		1
CO4	2	2	3	2	2								2	2		1
CO5	2	2	2	2	3		2						1		1	1
CO6	2	2	2	3	1	2	2						2		1	1
AVG	**2**	**2.5**	**2.1**	**2.3**	**2**	**0.3**	**1**						**1.8**	**0.6**	**0.5**	**1**

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

Course code : MCA-P31				
Course Name : UNIX LAB				
Semester /Year : IIIrd Semester				
	L	**T**	**P**	**C**
	0	**0**	**2**	**1**

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

Course Objectives:

The objectives of this course are

1. To learn basic knowledge about architecture of Unix and different basic Commands of Unix
2. To learn how to use process management.
3. To learn basic structure and various commands of UNIX 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 UNIX system

COURSE CONTENTS:

- How to apply basic commands of UNIX
- How to apply filter commands.
- How to apply UNIX 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

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

CO-PO Mapping:

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

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

Course code : MCA-P32.1				
Course Name : ADVANCE JAVA LAB				
Semester /Year : IIIrd Semester				
	L	**T**	**P**	**C**
	0	**0**	**2**	**1**

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

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 and web applications
CO5	Design JSP web applications
CO6	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**	**0**	**0**	**0**	**2.66**	**1.33**	**1**	**1.16**

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

Course code : MCA-P32.2				
Course Name : PYTHON LAB				
Semester /Year : IIIrd Semester				
	L	**T**	**P**	**C**
	0	**0**	**2**	**1**

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 inpython 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
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

Course code : MCA-P32.3				
Course Name : PL/SQL LAB				
Semester /Year : IIIrd Semester				
	L	**T**	**P**	**C**
	0	**0**	**2**	**1**

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

CO #	Detailed Statement of the CO
CO1	Knowledge of Creating Databases, tables and query a database using SQL DML/DDL 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.

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		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

Course code : MCA-P33				
Course Name : PROJECT				
Semester /Year : IIIrd Semester				
	L	**T**	**P**	**C**
	0	**0**	**4**	**2**

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

Course code : MCA-401				
Course Name : ANDROID PROGRAMMING				
Semester /Year : IV				
	L	**T**	**P**	**C**
	3	**1**	**2**	**4**

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 Education2nd 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

Course code : MCA-402.1				
Course Name : PHP PROGRAMMING				
Semester /Year : IVth Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

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

Course code : MCA-402.2				
Course Name : C# DOT NET				
Semester /Year : IV				
	L	**T**	**P**	**C**
	3	**1**	**2**	**4**

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, BinaryWirter, 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

Course code : MCA-402.3				
Course Name : DATA SCIENCE IN PYTHON				
Semester /Year : IVth Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

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 Metplotlib 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]**

Metplotlib: 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

Course code : MCA 403				
Course Name : NETWORK SECURITY & CRYPTOGRAPHY				
Semester /Year : IVth Semester				
	L	**T**	**P**	**C**
	3	**1**	**0**	**4**

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, Men in Middle attack, DES standard, AES, Blowfish, International Data Encryption Algorithm IDEA, RC-5, CAST-128, RSA, Key Distribution, Deffie Hellmen 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:

	POI	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

Course code : MCA-404.1				
Course Name : MOBILE COMPUTING				
Semester /Year : IVth Semester				
	L	**T**	**P**	**C**
	3	**1**	**0**	**4**

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
2. novel applications and limitations.
3. To understand the typical mobile networking infrastructure through a popular GSM
4. protocol
5. To understand the issues and solutions of various layers of mobile networks,
6. 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
CO5	3				1		1			1			2	1		1
CO6	3				1		1			1			2	1		1
AVG	**3**				**1**		**1**			**1**			**1.5**	**0.8**		**1**

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

Course code : MCA-404.2				
Course Name : BIG DATA				
Semester /Year : IVth Semester				
	L	**T**	**P**	**C**
	3	**1**	**0**	**4**

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

Course Objectives: The objectives of this course are

1. To understand the concept of Big data
2. To understand HADOOP
3. To understand the Big Data concerns: Storage and Analysis

COURSE CONTENTS

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

Introduction to Big Data Platform, Structuring Big data, Elements of Big Data, Big data stack, Big data Analytics, Introducing Technologies for handling Big Data: Distributed and Parallel Computing for Big Data, Cloud Computing and Big Data

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

Big Data Storage Concepts, Clusters, File Systems and Distributed File Systems, NoSQL, Sharding, Replication, CAP Theorem, ACID, BASE, Big Data Processing Concepts, Parallel Data Processing, Distributed Data Processing, Hadoop, Processing in Batch Mode, Processing in Real time Mode

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

Introduction to Hadoop Ecosystem, Hadoop Distributed File System, HDFS Architecture, Features of HDFS, Map Reduce, Features of Map Reduce, Hadoop Yarn, HBase, Hive, Sqoop, ZooKeeper, Flume, Oozie.

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

Understanding Map Reduce Fundamentals, Map Reduce Framework, Exploring Features of Map Reduce, Working of Map Reduce, Exploring Map and Reduce Functions, Techniques to optimize Map Reduce, Hardware/ Network Topology, Synchronization, File System, Uses of Map Reduce

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

Big Data Storage Technology, **On-Disk Storage Devices:** Distributed File Systems, RDBMS Databases, NoSQL Databases, **In-Memory Storage Devices:** In-Memory Data Grids, In-Memory Databases.

Text Books:

TB1. VK Jain, “Big Data & Hadoop”, Khanna Book Publishing Co. [P] Ltd.
TB2. Tom White “ Hadoop: The Definitive Guide” Third Edit on, O’reily Media, 2012.
TB3. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.

References Books:

RB1. Robert D. Schneider , “Hadoop for Dummies”, Wiley publication
RB2. Bernard Marr, “Big Data In Practice”, Wiley publication
RB3. Michael Berthold, David J. Hand, "Intelligent Data Analysis”, Springer, 2007.
RB4. Jay Liebowitz, “Big Data and Business Analytics” Auerbach Publications, CRC press (2013)
RB5. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.
RB6. Glen J. Myat, “Making Sense of Data”, John Wiley & Sons, 2007
RB7. Pete Warden, “Big Data Glossary”, O’Reily, 2011.
RB8. Michael Mineli, Michele Chambers, Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley Publications, 2013.

Course Outcomes (COs):

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

CO #	Detailed Statement of the CO
CO1	Defining Big Data Fundamentals
CO2	Understanding Hadoop applications for Big Data.
CO3	Illustrate the concepts of MapReduce framework
CO4	Compare Big Data Storage Technologies.
CO5	Evaluate the results using HDFS
CO6	Create plan for the implementation of Big Data

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2												2			2
CO2	1	2											2			2
CO3			2										2			2
CO4					2					2			2	2		2
CO5		3											2	1		2
CO6	3	3	3	2	2		1					2	2	2		2
AVG	**2**	**2.7**	**2.5**	**2.0**	**2.0**		**1.0**			**2.0**		**2.0**	**2.0**	**1.7**		**2.0**

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

Course code : MCA-404.3				
Course Name : CLOUD COMPUTING				
Semester /Year : IVth Semester				
	L	**T**	**P**	**C**
	3	**1**	**0**	**4**

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

Course code : MCA-405.1				
Course Name : SUPPLY CHAIN MANAGEMENT				
Semester /Year : IVth Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

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

Course Objectives: The objectives of this course are

1. To develop an understanding of basic concepts and role of Logistics and supply chain management in business.
2. To understand how supply chain drivers play an important role in redefining value chain excellence of Firms.
3. To develop analytical and critical understanding & skills for planning, designing and operations of supply chain.
4. To understand, appraise and integrate various supply chain strategies.

COURSE CONTENTS

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

Introduction, Concept, Scope and advantages, Customer Relationship management (CRM) – Introduction, Concept, Scope and advantages, eCRM and its applications.

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

Forecasting - Demand forecasting, planning for Supply Chain Management, Information technology in Supply Chain, Eight supply chain processes- Planning, Information, Source, Suppliers, Inventory, Production, Location, Transportation and Return of goods.

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

Typical IT solutions- Electronic Data Interchange, Intranet and extranet, Supply chain performance measurement.

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

Data Warehousing, E- commerce, E – procurement, Bar coding technology, GPS, RFID, Information Systems in Supply Chain

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

Case Study – Case Studies for SCM & CRM such as SCM Mumbai Tiffinwala, Live case study from IT perspective.

Text Books:

TB1. Supply Chain management- Strategy, Planning & Operation-6th edition; Chopra, Meindl & Kalra(2016) Pearson Education

Reference Books:

RB1. Supply Chain Management: Text and cases Shah, J. (2009) Pearson, New Delhi.
RB2. Logistics Management- The Supply Chain Imperative Sople V. Vinod , Pearson Education
RB3. Business Logistics/Supply Chain Management Ballou Srivastava, Pearson Education
RB4. Logistics and Supply Chain Management Christopher, M (1992) Pitman Publishing, London.
RB5. Logistics and Supply Chain Management Cases and Concepts Raghuram, Rangaraj MccMillan
RB6. Supply Chain Management N. Chandrasekaran Oxford
RB7. Supply Chain Management Pankaj Madan Neeraj Anand Global Academic Publishers & Distributors
RB8. Supply Chain Logistics Management-2nd Edition Bowersox, Closs, Cooper McGraw Hill

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 Supply Chain Management (SCM) and Customer Relationship Management (CRM)
CO2	Understanding the demand forecasting and supply chain process
CO3	Apply IT solutions for supply chain management
CO4	Analyse the technologies with supply chain management
CO5	Evaluate the different scenarios of supply chain management.
CO6	Contrast some case studies of supply chain management

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			2
CO2	3												2			2
CO3	1	3	3	2			1	1			1	1	2	1	2	2
CO4					3								2		1	2
CO5	2	1	2		1	1	1	1					2	1	1	2
CO6	1	3	1	1		1	1		1			1	2		2	2
AVG	**2**	**2.3**	**2**	**1.5**	**2**	**1**	**1**	**1**	**1**		**1**	**1**	**2**	**1**	**1.5**	**2**

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

Course code : MCA-405.2				
Course Name : E-COMMERCE				
Semester /Year : IVth Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

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

Course Objectives:

1. To learn the concepts and skills for the strategic use of e-commerce.
2. To learn related information technology from three perspectives: business to consumers, business-to-business, and intra-organizational.
3. To be able to examine the role of e-commerce in altering the structure of entire industries.
4. Get involve in business processes including electronic transactions, supply chains, decision making and organizational performance.
5. Overall improve the business profits and thereby improve the profit of the organization.

COURSE CONTENTS

Unit-I **[No. of Hours: 7]**

Basic of e-commerce- introduction, electronic commerce framework, anatomy of e-commerce applications, e-commerce consumer applications. mercantile process models, mercantile models from the consumer's perspective, mercantile from the merchant's perspective.

Unit-II **[No. of Hours: 12]**

E-commerce types and terms- types of electronic payment systems, digital token-based electronic payment systems, smart cards & electronic payment systems, credit card- based electronic payment systems, risk & electronic payment systems, designing electronic payment systems.

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

Behavioral knowledge for e-commerce- intra organizational e-commerce, customization and internal commerce, supply chain management (scm) and e-commerce.

Unit-IV **[No. of Hours: 12]**

New era of e-commerce- digital document and its types, corporate data warehouse, the new age of information based marketing, online marketing process, advertising on the internet

Unit-V **[No. of Hours: 14]**

Information technology for e-commerce- consumer search and resource discovery, information search and retrieval-e-commerce catalogs and directories, information filtering for e-business, multimedia concepts, digital video and electronic commerce

Course Outcomes (COs):

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

CO#	Detailed Statement of the CO
CO1	Defining the basic concepts e-commerce.
CO2	understanding the business using new e-commerce strategies.
CO3	Apply various new business mantras to make successful business using new concepts viz. SCM, Digital Document, Corporate data warehouse etc.
CO4	Analyse the functions of new era of e-commerce in the existing system.
CO5	Evaluate the smart e-commerce processes and conversion from the existing paper-based commerce.
CO6	Discuss the case studies on e-commerce platforms

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	3		3	3		2		2		2	2			2
CO2	2	2	3		2	3		2		2		2	2	1	1	2
CO3	3	3	1								3	1	2	1	3	2
CO4	2	1	3		3	3	2	2		2		2	2		1	2
CO5	2	1	3		3	3	1	2	1	2		2	2	2	2	2
CO6	2	2	2		2	2	1	1	1	1		2	2	2	2	2
AVG	**2.3**	**1.7**	**2.5**		**2.6**	**2.8**	**1.3**	**1.8**	**1.0**	**1.8**	**3.0**	**1.8**	**2.0**	**1.5**	**1.8**	**2.0**

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

Course code : MCA-405.3				
Course Name : ENTERPRISE RESOURCE PLANNING				
Semester /Year : IVth Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

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

Course Objectives: The objectives of this course are

1. To learn the need and evolution of ERP Systems and related technologies.
2. To learn ERP benefits and classification and implementation of ERP Life Cycle
3. To learn Analytical Hierarchy Process & its applications and ERP implementation approaches and its strategies.
4. To learn factors affecting ERP success and effectiveness.
5. To learn extend ERP and its learning and emerging issues.

COURSE CONTENTS

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

Enterprise wide information system, Custom built and packaged approaches, Needs and Evolution of ERP Systems, Common myths and evolving realities, ERP and Related Technologies, Business Process Reengineering and Information Technology, Supply Chain Management, Relevance to Data Warehousing, Data Mining and OLAP, ERP Drivers, Decision support system

Unit-II **[No. of Hours: 6]**

ERP Domain, ERP Benefits classification, Present global and Indian market scenario, milestones and pitfalls, Forecast, Market players and profiles, Evaluation criterion for ERP product.

Unit-III **[No. of Hours: 6]**

ERP Life Cycle: Adoption Decision, Acquisition, Implementation, Use & Maintenance, Evolution and Retirement phases, ERP Modules

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

Framework for evaluating ERP acquisition, Analytical Hierarchy Processes (AHP), Applications of AHP in Evaluating ERP, Selection of Weights, Role of consultants, vendors and users in ERP implementation; Implementation vendor's evaluation criterion, ERP Implementation approaches and methodology, ERP Implementation strategies, ERP Customization,

Unit- V **[No. of Hours: 8]**

Critical success and failure factors for implementation, Model for improving ERP effectiveness, ROI of ERP Implementation, Hidden costs, ERP success inhibitors and accelerators, Management concern for ERP success, Strategic Grid: Useful guidelines for ERP Implementations.

Text Books:

TB1. Enterprise Resource Planning, Alexis Leon
TB2. ERP Concepts &Planning ,V.K. Garg&N.K. Venkita Krishnan

Reference Books:

RB2. ERP Ware: ERP Implementation Framework ,V.K. Garg&N.K. Venkita Krishnan

Course Outcomes (COs):

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

CO #	Detailed Statement of the CO
CO1	Defining basic use of enterprise software and its role in integrating business functions, reengineered business processes, phases of ERP implementation life cycle, domains of ERPs, implementation cost,
CO2	Understanding the work done during the ERP implementation life cycle.
CO3	Illustrate the Analytical Hierarchy Processes (AHP) for the selection of ERP system. Apply the customization to ERP system as per user's requirement.
CO4	Analyse the role of consultant, vendors and users in ERP implementation.
CO5	Evaluate critical success and failure factors for implementation, Hidden cost during ERP implementation.
CO6	Formulate methodology for the implementation of ERP system.

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	2				1		2	1	1	2
CO2		1	1				2						1			1
CO3	3	1	1				1						2	1		1
CO4		1	3	1	2	2	1	1			1		2	2	2	2
CO5	1		2	2	3	1					1		2		2	2
CO6	2	3	3	2	2	1	1	1			1		2	2	2	2
AVG	**2.3**	**1.4**	**2.0**	**1.5**	**2.3**	**1.3**	**1.4**	**1.0**			**1.0**		**1.8**	**1.5**	**1.8**	**1.7**

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

Course code : MCA-P41				
Course Name : ANDROID PROGRAMMING Lab				
Semester /Year : IV				
	L	**T**	**P**	**C**
			2	**1**

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

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

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	2					3			1
CO2	3	1	2	3		3	2	3					3	2	2	2
CO3	3	2	3	3	1	2	2	3					2			2
CO4	2	1	3	3	2	3	2	3					3	1	1	1
CO5	3	1	3	1	2	3	2	3					3	1	2	2
CO6	3	2	2	2			1	1	2	1			2	1	1	1
AVG	**2.83**	**1.33**	**2.33**	**2**	**0.83**	**2.33**	**1.66**	**2.5**	**0.33**	**0.16**	**0**	**0**	**2.66**	**0.83**	**1**	**1.5**

Course code : MCA-P42.1				
Course Name : PHP PROGRAMMING LAB				
Semester /Year : IVth Semester				
	L	**T**	**P**	**C**
	0	**0**	**2**	**1**

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

Course code : MCA-42.2				
Course Name : C# DOT NET LAB				
Semester /Year : IV				
	L	**T**	**P**	**C**
	0	**0**	**2**	**2**

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.

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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

Course code : MCA-P42.3				
Course Name : DATA SCIENCE IN PYTHON LAB				
Semester /Year : IVth Semester				
	L	**T**	**P**	**C**
	0	**0**	**2**	**1**

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 Metplotlib 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
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

Course code : MCA-P43				
Course Name : PROJECT				
Semester /Year : IVth Semester				
	L	**T**	**P**	**C**
	0	**0**	**8**	**4**

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

Course code : MCA-SM44				
Course Name : SEMINAR AND PRESENTATION				
Semester /Year : IVth Semester				
	L	**T**	**P**	**C**
	0	**0**	**4**	**2**

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

Course Objectives: The objectives of this course are

5. Identify and compare technical and practical issues related to the area of course specialization.
6. Outline annotated bibliography of research demonstrating scholarly skills.
7. Prepare a well-organized report employing elements of technical writing and critical thinking.
8. 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

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