Go, Change the world®

RV Educational Institutions ®
RV College of Engineering ®

Autonomous Institution Affiliated to Visvesvaraya Technological University, Belagavi

Approved by AICTE, New Delhi

Scheme & Syllabus of
I & II Semester

2022 SCHEME

MASTER OF COMPUTER APPLICATIONS
2-Year Program

VISION

Leadership in Quality Technical Education, Interdisciplinary Research & Innovation, with a Focus on Sustainable and Inclusive Technology

MISSION

1. To deliver outcome based Quality education, emphasizing on experiential learning with the state of the art infrastructure.
2. To create a conducive environment for interdisciplinary research and innovation.
3. To develop professionals through holistic education focusing on individual growth, discipline, integrity, ethics and social sensitivity.
4. To nurture industry-institution collaboration leading to competency enhancement and entrepreneurship.
5. To focus on technologies that are sustainable and inclusive, benefiting all sections of the society.

QUALITY POLICY

Achieving Excellence in Technical Education, Research and Consulting through an Outcome Based Curriculum focusing on Continuous Improvement and Innovation by Benchmarking against the Global Best Practices.

CORE VALUES

Professionalism, Commitment, Integrity, Team Work, Innovation

RV COLLEGE OF ENGINEERING®

(Autonomous Institution Affiliated to VTU, Belagavi)
R.V. Vidyaniketan Post, Mysore Road
Bengaluru – 560 059

Scheme & Syllabus of
I & II Semester

2022 SCHEME

MASTER OF COMPUTER APPLICATIONS

MASTER OF COMPUTER APPLICATIONS

DEPARTMENT VISION

Pioneering in ICT Enabled Quality Education and Research with a focus on Sustainable and Inclusive Applications

DEPARTMENT MISSION

1. To adapt novel methodologies for quality education through experiential learning.
2. To empower students with continuous, holistic education, emphasizing on discipline, ethics and social commitment.
3. To become a vibrant knowledge center for research and software development.
4. To continuously build capacity steering towards industry- institute collaborative research and entrepreneurial competencies.
5. To utilize and develop free and open source software tools for sustainable and inclusive growth.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1 Practice software engineering principles and standards to develop software to meet customer requirements across verticals

PEO2 Contribute to build sustainable and inclusive applications using mathematical, simulation and meta heuristic models

PEO3 Demonstrate entrepreneurial qualities through individual competence and team work

PEO4 Achieve successful professional career with integrity and societal commitments leading to lifelong learning

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1 Solve real world computing system problems of various industries by understanding and applying the principles of mathematics, computing techniques and business concepts

PSO2 Design, test, develop and maintain desktop, web, mobile and cross platform software applications using modern tools and technologies

GLOSSARY OF ABBREVIATIONS

1.	AS	Aerospace Engineering
2.	BS	Basic Sciences
3.	BT	Biotechnology
4.	CH	Chemical Engineering
5.	CHY	Chemistry
6.	CIE	Continuous Internal Evaluation
7.	CS	Computer Science & Engineering
8.	CV	Civil Engineering
9.	EC	Electronics & Communication Engineering
10.	EE	Electrical & Electronics Engineering
11.	EI	Electronics & Instrumentation Engineering
12.	ET	Electronics & Telecommunication Engineering
13.	GE	Global Elective
14.	HSS	Humanities and Social Sciences
15.	IM	Industrial Engineering & Management
16.	IS	Information Science & Engineering
17.	L	Laboratory
18.	MA	Mathematics
19.	MBT	M. Tech in Biotechnology
20.	MCE	M. Tech. in Computer Science & Engineering
21.	MCN	M. Tech. in Computer Network Engineering
22.	MCS	M. Tech. in Communication Systems
23.	MDC	M. Tech. in Digital Communication
24.	ME	Mechanical Engineering
25.	MHT	M. Tech. in Highway Technology
26.	MIT	M. Tech. in Information Technology
27.	MMD	M. Tech. in Machine Design
28.	MPD	M. Tech in Product Design & Manufacturing
29.	MPE	M. Tech. in Power Electronics
30.	MSE	M. Tech. in Software Engineering
31.	MST	M. Tech. in Structural Engineering
32.	MVE	M. Tech. in VLSI Design & Embedded Systems
33.	N	Internship
34.	P	Projects (Minor / Major)
35.	PHY	Physics
36.	SDA	Skill Development Activity
37.	SEE	Semester End Examination
38.	T	Theory
39.	TL	Theory Integrated with Laboratory
40.	VTU	Visvesvaraya Technological University

POST GRADUATE PROGRAMS

Sl. No	Core Department	Program	Code
1.	BT	M. Tech in Biotechnology	MBT
2.	CS	M. Tech in Computer Science & Engineering	MCE
3.	CS	M. Tech in Computer Network Engineering	MCN
4.	CV	M. Tech in Structural Engineering	MST
5.	CV	M. Tech in Highway Technology	MHT
6.	EC	M. Tech in VLSI Design & Embedded Systems	MVE
7.	EC	M. Tech in Communication Systems	MCS
8.	EE	M. Tech in Power Electronics	MPE
9.	ET	M. Tech in Digital Communication	MDC
10.	IS	M. Tech in Software Engineering	MSE
11.	IS	M. Tech in Information Technology	MIT
12.	ME	M. Tech in Product Design & Manufacturing	MPD
13.	ME	M. Tech in Machine Design	MMD
14.	MCA	Master of Computer Applications	MCA

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MASTER OF COMPUTER APPLICATIONS

I SEMESTER MCA												
			Credit Allocation									
SL No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Total Credits**	**BoS**	**Category**	**CIE Duration (H)**	**Max Marks CIE**	**SEE Duration (H)**	**Max Marks SEE**
1.	22MAT11T	Mathematical Foundation for Computer Science	4	1	0	**5**	MAT	Theory	1.5	100	3	100
2.	22MCA12T	Linux Shell Scripting	3	1	0	**4**	MCA	Theory	1.5	100	3	100
3.	22MCA13TL	Computer Networks	4	0	1	**5**	MCA	Theory + Lab	1.5 + 3	150	3 + 3	150
4.	22MCA14TL	Object Oriented Programming	4	0	1	**5**	MCA	Theory + Lab	1.5 + 3	150	3 + 3	150
5.	22MCA15TL	Web Application Programming	4	0	1	**5**	MCA	Theory + Lab	1.5 + 3	150	3 + 3	150
6.	22HSS16L	Ability Enhancement Course-I*	0	0	2	**2**	HSS	Lab	1.5	50	2	50
7.	22MCA17T	Basics of Programming**	2	0	0	**0**	MCA	Theory	1.5	50	-	-
						26						

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*Identified External Agency will conduct the classes and evaluate both CIE and SEE

Note: *Students are mandatorily required to get Two MOOC certification courses as recommended by HSS BoS, within I-IV Semester MCA and this is considered for the evaluation in course code 22HSS43. This is included in the HSS board.*

****Bridge Course:*** The Basics of Programming with course code 22MCA17T is a non-credit course offered to Non-Computer Science background students only.

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MASTER OF COMPUTER APPLICATIONS

II SEMESTER MCA												
			Credit Allocation									
SL No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Total Credits**	**BoS**	**Category**	**CIE Duration (H)**	**Max Marks CIE**	**SEE Duration (H)**	**Max Marks SEE**
1.	22MCA21T	Research Methodology and IPR	2	0	0	**2**	MCA	Theory	1.5	50	2	50
2.	22MCA22T	Design and Analysis of Algorithms	3	1	0	**4**	MCA	Theory	1.5	100	3	100
3.	22MCA23TL	Data Modeling	4	0	1	**5**	MCA	Theory + Lab	1.5 + 3	150	3 + 3	150
4.	22MCA24TL	Cloud Native Fullstack Application Development-I	3	0	1	**4**	MCA	Theory + Lab	1.5 + 3	150	3 + 3	150
5.	22MCA25XTL	Integrated Professional Elective- I	4	0	1	**5**	MCA	Theory + Lab	1.5 + 3	150	3 + 3	150
6.	22MCA26XT	Professional Elective-II	3	1	0	**4**	MCA	Theory	1.5	100	3	100
7.	22MCA27L	Design Thinking*	0	0	2	**2**	MCA	Lab	1.5	50	2	50
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* Societal Project - Design thinking course will be based on Sustainable Development Goals (SDGs)

List of Electives: II Semester

SL No	Course Code	Elective- I	SL No	Course Code	Elective-II
1.	22MCA251TL	Internet of Things	1.	22MCA261T	DevOps
2.	22MCA252TL	Data Science-I	2.	22MCA262T	Advanced Computer Networks
3.	22MCA253TL	Software Testing and Practices	3.	22MCA263T	Cryptography and Network Security
4.	22MCA254TL	2D and 3D Modeling	4.	22MCA264T	Digital Marketing

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MASTER OF COMPUTER APPLICATIONS

III SEMESTER MCA												
			Credit Allocation									
SL No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Total Credits**	**BoS**	**Category**	**CIE Duration (H)**	**Max Marks CIE**	**SEE Duration (H)**	**Max Marks SEE**
1.	22MCA31T	Software Engineering	3	0	0	**3**	MCA	Theory	1.5	100	3	100
2.	22MCA32TL	Modern Application Development	4	0	1	**5**	MCA	Theory + Lab	1.5 + 3	150	3 + 3	150
3.	22MCA33TL	Cloud Native Fullstack Application Development-II	3	0	1	**4**	MCA	Theory + Lab	1.5 + 3	150	3 + 3	150
4.	22MCA34XT	Professional Elective-III	3	1	0	**4**	MCA	Theory	1.5	100	3	100
5.	22MCA35XT	Open Elective - I	3	0	0	**3**	MCA	Theory	1.5	100	3	100
6.	22MCA36L	Minor Project	0	0	4	**4**	MCA	Lab	3	100	3	100
7.	22MCA37L	Internship*	0	0	6	**6**	MCA	Lab	3	100	3	100
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Six Weeks Internship to be completed during the intervening Vacation of II and III semesters

List of Electives: III Semester

SL No	Course Code	Elective- III	SL No	Course Code	Open Elective
1.	22MCA341T	Data Science-II	1.	22MCA351T	Sustainability and Society
2.	22MCA342T	Augmented Reality and Virtual Reality	2.	22MCA352T	Anthropology and Digital World
3.	22MCA343T	UI/UX	3.	22MCA353T	Media and Communication
4.	22MCA344T	Blockchain and Cyber Security	4.	22MCA354T	Philosophy and AI

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IV SEMESTER MCA												
			Credit Allocation									
SL No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Total Credits**	**BoS**	**Category**	**CIE Duration (H)**	**Max Marks CIE**	**SEE Duration (H)**	**Max Marks SEE**
1.	22MCA41L	Project Work	0	0	15	**15**	MCA	Lab	1.5	100	3	100
2.	22MCA42L	Technical Seminar	0	0	2	**2**	MCA	Lab	1.5	50	2	50
3.	22HSS43L	Ability Enhancement Course-II	0	0	2	**2**	MCA	Lab		50	ONLINE	50
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MASTER OF COMPUTER APPLICATIONS

Credit Distribution for MCA 2022 Scheme

		SEM-I	SEM-II	SEM-III	SEM-IV	TOTAL CREDITS
SL No	**Course Type**	**Credits**				**Credits**
1.	Basic Science Course (BSC)	05	--	--	--	05
2.	Professional Core Course (PCC)	04	02	03	--	09
3.	Integrated Professional Core Course (IPCC)	15	14	09	--	38
4.	Professional Elective Course (PCE)	--	08	04	--	12
5.	Open Elective Course (OEC)	--	--	03	--	03
6.	Audit Course/ Ability Enhancement Course (AUD/AEC)	02	--	--	02	04
7.	Project / Internship	--	02	10	15	27
8.	Seminar	--	--	--	02	02
	Total	**26**	**26**	**29**	**19**	**100**

SEMESTER: I					
MATHEMATICAL FOUNDATION FOR COMPUTER SCIENCE(Theory)					
Course Code	**:**	**22MAT11T**	**CIE**	**:**	**100 Marks**
Credits: L:T:P	**:**	**4:1:0**	**SEE**	**:**	**100 Marks**
Total Hours	**:**	**52L+26T**	**SEE Duration**	**:**	**3.00 Hours**

UNIT-I	**10 Hrs**
Sets, Relations and Functions: Basics of set theory, Cartesian product of sets. Relations, Properties of relations, Zero-one matrices and directed graphs, Hasse diagram, Equivalence relations and partitions. Functions- types of functions, ceil function and the floor function, Function composition and Inverse function.	
UNIT-II	**10 Hrs**
Logic: Basic connectivity and Truth table, Logical equivalence, logical implications, Quantifiers – Predicates: Predicative logic, Free and Bound variables, Rules of inference, Consistency. Proofs of theorems-direct, indirect, and proof by contradiction.	
UNIT-III	**11 Hrs**
Engineering Optimization: Introduction to Operations Research, Linear Programming Problem-Formation, Classical optimization techniques-Simplex method. Transportation Model-North-west corner rule, Vogel's approximation method, Optimum solution using modified distribution method. Assignment Model-Hungarian method**.**	
UNIT-IV	**11 Hrs**
Statistics and Probability: Curve fitting by method of least squares, fitting of curves – polynomial, exponential, power function. Correlation and linear regression analysis. Basic concepts of probability, conditional probability, Bayes' theorem**.**	
UNIT-V	**10Hrs**
Probability Distributions: Random variables- discrete and continuous, probability mass function, probability density function, and cumulative density function. Binomial distribution, Poisson distribution, Exponential distribution, and Normal distribution.	

Course Outcomes: After going through this course, the student will be able to	
CO1	Understand fundamental concepts of sets, relations, functions, logic, statistics and probability theory.
CO2	Apply fundamental concepts of functions, reasoning, statistics and probability theory for different domains in data science and machine learning
CO3	Analyze mathematical concepts like relational algebra, statistics, and probability theory to optimize the solutions of engineering problem.
CO4	Implement overall mathematical knowledge gained to demonstrate and analyze the problems arising in practical situations.

Reference Books	
1.	Ralph P Grimaldi, B.V.Ramana, Discrete and Combinatorial Mathematics, An applied Introduction, Pearson Education, 5th Edition, 2019, ISBN: 9789353433055, 9353433053.
2.	Kenneth H Rosen, Discrete Mathematics & its applications, McGraw-Hill, 8th Edition, 2021, ISBN: 9390727359 · 9789390727353.
3.	Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying E. Ye, "Probability and Statistics for Engineers and Scientists", Pearson, 9th Edition, 2021, ISBN-13: 9780136860969.
4.	Wayne L Winston, Operations Research: Applications and Algorithms, Thomson Learning, 4th Edition, 2004, ISBN 0-534-38058-1

Scheme of Continuous Internal Evaluation (CIE): 20 + 50 + 30 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. Final test marks will be reduced to 50 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (30 marks), Video based seminar/presentation/demonstration (30 marks) adding up to 60 marks. Final EL marks will be reduced to 30 Marks.

Scheme of Semester End Examination (SEE) for 100 marks:

The question paper will have FIVE full questions with internal choice from each unit. Each question will carry 20 marks. Student will have to answer one full question from each unit.

Rubric for CIE & SEE Theory courses					
RUBRIC for CIE			***RUBRIC for SEE***		
SL.NO	**Contents**	**Marks**	**Q.NO**	**Contents**	**Marks**
1	QUIZZES – Q1 & Q2	20	Every unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit [unit 1 to 5]		
2	TESTS – T1 & T2	50	1 & 2	Unit 1: Question 1 or 2	20
3	Experiential Learning – EL1 & EL2	30	3 & 4	Unit 2: Question 3 or 4	20
	Total Marks	**100**	5 & 6	Unit 3: Question 5 or 6	20
			7 & 8	Unit 4: Question 7 or 8	20
			9 & 10	Unit 5: Question 9 or 10	20
				Total Marks	**100**

SEMESTER: I					
LINUX SHELL SCRIPTING (Theory)					
Course Code	**:**	**22MCA12T**	**CIE**	**:**	**100 Marks**
Credits: L:T:P	**:**	**3:1:0**	**SEE**	**:**	**100 Marks**
Total Hours	**:**	**39L+26T**	**SEE Duration**	**:**	**3.00 Hours**

UNIT–I	07 Hrs
The Unix/Unix Like Operating System architecture and commands: Unix Architecture, Features of UNIX, General purpose utility commands, Basic and advanced file attributes, File system. **Introduction to version control system:** git and its usage for managing code repositories. **Introduction to Shell Script:** Shell scripts, read, command line arguments, exit, variables, wildcards, escape characters logical operators and conditional operators	
UNIT–II	**08 Hrs**
Programming through Shell Script: if conditional, case conditional, expr computations and string handling, while looping, for looping, set and shift, trap interrupting a program, debugging shell scripts with set command, validation and data entry scripts, function: introduction, scope of variable, return codes. **Scripting Standards:** Scripts and naming convention, Script File Permission, Shell Script Format, Sequence of Script execution.	
UNIT–III	**08 Hrs**
Introduction to filters: pr: paginating files**,** head: Displaying the beginning of a file, tail: displaying the end of the file, cut: slitting a file vertically, paste: pasting files, sort: ordering a file, uniq, tr: translating characters. **Filters and regular expression: grep:** Searching for a pattern, Basic Regular Expression, Extended Regular Expression and egrep, types of grep. **sed**: stream editor, Line addressing, Context addressing, Text editing, Substitution. **awk**: Simple awk filtering, splitting a line into fields, printf, redirecting and expression, comparison, begin and end, built-in variables and arrays.	
UNIT–IV	**08 Hrs**
User Management: Adding a group, adding a user, user profiles, modifying and removing users **Process Management:** Process status, system processes, mechanism of process creation, Internal and External commands, process states and Zombies, killing processes with signals **Job scheduling:** Scheduling jobs with at and crontab. **Log Management**: Running script in background for tracking various log messages, tail with egrep and echo, Central logging (rsyslog)	
UNIT–V	**08 Hrs**
Database Administration and Backup: Backing up each database to a separate file, Backing up a single database, Backup all databases to a single file, schedule a backup to automatically back up a web portal or website data. **Real Time Practice:** Shell scripting to execute different commands on different remote servers, Automatic email alert generation about hardware resources, Automate installation of required git version using shell script, Shell script to backup file system **Introduction to Docker and Curl:** Brief introduction about docker and its usage while automating infrastructure management. **Introduction to Curl:** Automating user communication to and from servers using Curl	

Course Outcomes: After going through this course, the student will be able to	
CO1	Understand how to write shell scripts from basic to advanced level
CO2	Analyze and Identify high-level steps such as verifying user input to automate repetitive tasks
CO3	Apply shell scripting techniques and standards using filters for pattern matching on plain text data and variety of system log files
CO4	Develop effective and interactive scripts using functional blocks, operating system and networking utilities to manage complex and repetitive tasks in real time scenarios

Reference Books	
1.	Sumitabha Das, Unix Concepts and Applications, McGraw Hill, 4th Edition, 2012, ISBN:978-0-07-063546-3
2.	Ganesh Naik, Learning Linux Shell Scripting, Packt Publishing, 2nd Edition, May 2018, ISBN:978-1788993197
3.	Narendra Kumar Reddy, Complete Bash Shell Scripting, Polu Packt Publishing , April 2020, ISBN: 9781800209695 https://www.packtpub.com/in/cloud-networking/complete-bash-shell-scripting-video
4.	Mokhtar Ebrahim, Andrew Mallett, Mastering Linux shell scripting, Packt Publishing, 2nd Edition, 2018, ISBN 9781788990554
5.	Imran Afzal, A Complete Course on Linux bash shell scripting with real life examples, Packt Publishing, July 2019, ISBN:9781838984083

Scheme of Continuous Internal Evaluation (CIE): 20 + 50 + 30 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding up to 100 Marks. Final test marks will be reduced to 50 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (30), Video based seminar/presentation/demonstration (30) adding up to 60 marks. Final EL marks will be reduced to 30 Marks.

Scheme of Semester End Examination (SEE) for 100 marks:

The question paper will have FIVE full questions with internal choice from each unit. Each question will carry 20 marks. Student will have to answer one full question from each unit...

Rubric for CIE & SEE Theory courses					
RUBRIC for CIE			***RUBRIC for SEE***		
SL.NO	**Contents**	**Marks**	**Q.NO**	**Contents**	**Marks**
1	QUIZZES – Q1 & Q2	20	Every unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit [unit 1 to 5]		
2	TESTS – T1 & T2	50	1 & 2	Unit 1:Question 1 or 2	20
3	Experiential Learning – EL1 & EL2	30	3 & 4	Unit 2:Question 3 or 4	20
	Total Marks	**100**	5 & 6	Unit 3:Question 5 or 6	20
			7 & 8	Unit 4:Question 7 or 8	20
			9 & 10	Unit 5:Question 9 or 10	20
				Total Marks	**100**

SEMESTER: I					
COMPUTER NETWORKS (Theory & Practice)					
Course Code	**:**	**22MCA13TL**	**CIE**	**:**	**100+50 Marks**
Credits: L:T:P	**:**	**4:0:1**	**SEE**	**:**	**100+50 Marks**
Total Hours	**:**	**52L+26P**	**SEE Duration**	**:**	**3.00 Hours**

UNIT-I	**10 Hrs**
Introduction: Introduction, Uses of Computer Networks, Network Hardware, Network Software: Protocol Hierarchies, Design Issues for the Layers, Reference Models: The OSI Reference Model, The TCP/IP Reference Model, A Comparison of the OSI and TCP/IP Reference Models Physical Layer-Guided Transmission Media, Digital Modulation and Multiplexing	
UNIT-II	**10 Hrs**
Data Link Layer: Data link Layer Design issues, Error Detection codes, Sliding Window Protocols (Stop and Wait, Go-Back-N (GBN) and Selective Repetitive (SR)) **Medium Access Control:** The Channel Allocation Problem, Multiple Access Protocols, Ethernet	
UNIT–III	**12 Hrs**
The Network Layer: Network Layer Design issues, Routing algorithms- The Optimality Principal, Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, Hierarchical routing, Congestion Control Algorithms, Quality of Service, Internetworking	
UNIT–IV	**10 Hrs**
The Network Layer in the Internet: The Network Layer in the internet- IP version 4 Protocol, IP version 6 protocol: The Main IPv6 Header, Extension Headers, Internet Control Protocols: ICMP, ARP, DHCP	
UNIT–V	**10 Hrs**
The Transport Layer: The Transport Service: Services Provided to the Upper Layers, Berkeley Sockets, Elements of Transport Protocols, Internet transport protocols- TCP: Introduction to TCP, The Service Model, Protocol, Segment Header, UDP **The Application Layer**: The Domain Name System, Electronic Mail, The World-Wide-Web, Streaming Audio and Video	

LABORATORY	
1.	Create a LAN with three or more nodes implementing star topology and demonstrate classful addressing
2.	Create a LAN using physical networks/virtual machine and install FTP server to demonstrate file transfer
3.	Demonstrate secured file transfer and computing over wired network and wireless network with SCP and SSH key based computing
4.	Demonstrate to calculate IP addresses using ipcalc
5.	Build DHCP server using dns-masq with and without MAC binding with IPV4 and IPV6
6.	Build DNS server for resolving the names and IP addresses
7.	Build a Firewall to Restrict Network Access using Firewall
8.	Demonstrate basic trouble shooting using ping, traceroute, ifconfig, nslookup, netstat and route
9.	Demonstrate multiple client server communication on different ports using netcat
10.	Demonstrate Proxy - Server setup for a web server and SSH port forwarding

Course Outcomes: After going through this course, the student will be able to	
CO1	Understand the fundamentals of computer networking and the concept of layered approach
CO2	Identify the design issues, services, interfaces and protocols for data flow in computer networks
CO3	Demonstrate the protocols and services designed for the layered approach
CO4	Analyze and evaluate the principles and protocols of computer networks

Reference Books	
1.	Andrew S. Tanenbaum, David J Wetherall, "Computer Networks", Pearson Education, Pearson Publication, 5th Edition, 2012, ISBN-1978-81-317-8757-1
2.	Behrouz A Forouzan, Firouz Mosharraf, "Computer Networks A Top-Down Approach", Tata McGraw-Hill Education Pvt. Ltd, 2011, ISBN 13: 9781259001567
3.	Peterson, Larry L., and Bruce S. Davie. Computer networks: a systems approach. Elsevier, 2012, 5th Edition, ISBN-13: 978-0-12-385059-1
4.	Stallings, William. Data and computer communications. Pearson Education India, 2007, 8th Edition, ISBN: 0-13-243310-9.

Scheme of Continuous Internal Evaluation (CIE) Theory: 20 + 50 + 30 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analysing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding up to 100 Marks. Final test marks will be reduced to 50 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (30), Video based seminar/presentation/demonstration (30) adding upto 60 marks. Final EL marks will be reduced to 30 Marks.

Laboratory (CIE): 40 + 10 = 50

Conduction of laboratory exercises, Lab report & observation & analysis (50 Marks), Lab Test (50 Marks), adding upto 100 marks. Final marks will be reduced to 40 & Innovative Experiment/Concept Design & Implementation (10 Marks) adding up to 50 Marks.

Scheme of Semester End Examination (SEE) Theory for 100 marks:

The question paper will have FIVE full questions with internal choice from each unit. Each question will carry 20 marks. Student will have to answer one full question from each unit**.**

Scheme of Semester End Examination (SEE) Laboratory for 50 marks :

SEE for practical will be jointly conducted and evaluated by two examiners. The duration of practical examination is 3 hours and is evaluated for 50 marks. The break up for conduction of practical examination is (i) Procedure and Write up : 20% of max marks, (ii) Conducting the practical: 60% of max marks, (iii) Viva Voce: 20% of max marks

Rubric for CIE & SEE for Integrated Theory courses with Laboratory					
RUBRIC for CIE			***RUBRIC for SEE***		
SL.NO	**Contents**	**Marks**	**Q.NO**	**Contents**	**Marks**
1	QUIZZES – Q1 & Q2	20	Every unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit [unit 1 to 5]		
2	TESTS – T1 & T2	50	1 & 2	Unit 1:Question 1 or 2	20
3	Experiential Learning – EL1 & EL2	30	3 & 4	Unit 2:Question 3 or 4	20
4	Laboratory	50	5 & 6	Unit 3:Question 5 or 6	20
	Total Marks	**150**	7 & 8	Unit 4:Question 7 or 8	20
			9 & 10	Unit 5:Question 9 or 10	20
				Theory Exam Marks	**100**
				Laboratory Exam Marks	**50**
				Total Marks	**150**

SEMESTER: I					
OBJECT ORIENTED PROGRAMMING (Theory & Practice)					
Course Code	**:**	**22MCA14TL**	**CIE**	**:**	**100 + 50 Marks**
Credits: L:T:P	**:**	**4:0:1**	**SEE**	**:**	**100 + 50 Marks**
Total Hours	**:**	**52L+26P**	**SEE Duration**	**:**	**3.00 Hours**

UNIT–I	**11 Hrs**
Object Oriented Programming: Introductions, OOP, classes, class attributes, instances, instance attributes, Constructor and Destructor, Encapsulation **Introduction to Python Programming Language:** Introduction to python, program output, input, comments, operators, variables and assignment, numbers, if statement, while loop, for loop, and the range ( )	
UNIT–II	**11 Hrs**
Data Types: Operations and methods on strings, tuples, lists, sets and dictionaries **Functions:** Built-in Functions: Lambda, MAP, Filters and User defined Functions **Magic Methods:** Magic method syntax, available methods	
UNIT–III	**10 Hrs**
Basics of Polymorphism and Inheritance: Operator and function overloading, Introduction to Inheritance, types of Inheritance, sub classing and scope, overriding methods **Modules and Packages:** What are modules, modules and packages, creation of packages, importing modules, importing packages **Introduction to Numpy module:** numpy basics, numpy data types, creation of ndarray, nested sequences, numpy array iteration, concatenation	
UNIT–IV	**10 Hrs**
Reading and Writing Files: Introduction to File operation, opening a File, Techniques for Reading Files, Writing Files. **Context Managers:** Context manager syntax, when you should write context managers **Error and Exceptions:** Introduction to exceptions in python, detecting and handling exceptions, exceptions as strings, raising exceptions, assertions, standard exceptions	
UNIT–V	**10 Hrs**
Decorators: Understanding Decorators, Decorator Syntax, Decorators Functions, Decorator classes. **Generators:** Understanding Generators, Generator syntax, Generator Examples **OOP for Database Programming:** Introduction, Architecture, Steps for Connecting Database, Basic Operations with Examples	

LABORATORY **Student should implement using Python Language. Apply Unit testing and integration testing (As per problem definition). Develop various test cases, execute them and analyze the test results**	
1.	Implement 10 operations on string and Tuple
2.	Implement 10 operations on sets and lists
3.	Demonstrate dictionary concepts for a given scenario
4.	Implement importing of user defined modules using Magic Methods
5.	Implement any two types of Inheritance
6.	Implement overloading concept
7.	Implement overriding concept
8.	Demonstrate any five-exception handling mechanism using files
9.	Write a python program to Insert, Search, and Retrieve data into Employee Database
10.	Write a program to create Fibonacci series using generators and stack the same with a decorator to find the time taken by the generator

Course Outcomes: After going through this course, the student will be able to	
CO1	Understand the basic concepts of object oriented programming
CO2	Identify and apply relevant object-oriented concepts in any real world scenario.
CO3	Utilize object-oriented concepts to solve any real world problem
CO4	Analyze solutions using OOPs concepts for real world applications

Reference Books	
1.	Hetland, Magnus Lie, Beginning Python: from novice to Professional, Apress, 3rd Edition, 2017, ISBN 978-1-4842-0029-2.
2.	Sneeringer, Luke, Professional Python, John Wiley & Sons, 2016, ISBN -978-1-119-07085-6
3.	Paul Gries, Jennifer Campbell, Jason Montojo, Practical Programming, SHROFF Publishers and Distributors Pvt, 3rd Edition, 2018, ISBN: 13:978935213681-0.
4.	Wesley J Chun, Core Python Programming, Pearson Education, 3rd Edition, 2012, ISBN 13: 978-0-13-267820-9.

Scheme of Continuous Internal Evaluation (CIE) Theory: 20 + 50 + 30 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analysing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding up to 100 Marks. Final test marks will be reduced to 50 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (30), Video based seminar/presentation/demonstration (30) adding up to 60 marks. Final EL marks will be reduced to 30 Marks.

Laboratory (CIE): 40 + 10 = 50

Conduction of laboratory exercises, Lab report & observation & analysis (50 Marks), Lab Test (50 Marks), adding up to 100 marks. Final marks will be reduced to 40 & Innovative Experiment/Concept Design & Implementation (10 Marks) adding up to 50 Marks.

Scheme of Semester End Examination (SEE) Theory for 100 marks:
The question paper will have FIVE full questions with internal choice from each unit. Each question will carry 20 marks. Student will have to answer one full question from each unit**.**
Scheme of Semester End Examination (SEE) Laboratory for 50 marks :
SEE for practical will be jointly conducted and evaluated by two examiners. The duration of practical examination is 3 hours and is evaluated for 50 marks. The break up for conduction of practical examination is (i) Procedure and Write up : 20% of max marks, (ii) Conducting the practical: 60% of max marks, (iii) Viva Voce: 20% of max marks

Rubric for CIE & SEE for Integrated Theory courses with Laboratory					
RUBRIC for CIE			***RUBRIC for SEE***		
SL.NO	**Contents**	**Marks**	**Q.NO**	**Contents**	**Marks**
1	QUIZZES – Q1 & Q2	20	Every unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit [unit 1 to 5]		
2	TESTS – T1 & T2	50	1 & 2	Unit 1:Question 1 or 2	20
3	Experiential Learning – EL1 & EL2	30	3 & 4	Unit 2:Question 3 or 4	20
4	Laboratory	50	5 & 6	Unit 3:Question 5 or 6	20
	Total Marks	**150**	7 & 8	Unit 4:Question 7 or 8	20
			9 & 10	Unit 5:Question 9 or 10	20
				Theory Exam Marks	**100**
				Laboratory Exam Marks	**50**
				Total Marks	**150**

SEMESTER: I					
WEB APPLICATION PROGRAMMING (Theory & Practice)					
Course Code	**:**	**22MCA15TL**	**CIE**	**:**	**100 + 50 Marks**
Credits: L:T:P	**:**	**4:0:1**	**SEE**	**:**	**100 + 50 Marks**
Total Hours	**:**	**52L+26P**	**SEE Duration**	**:**	**3.00 Hours**

UNIT–I	**10 Hrs**
Introduction to Web Technologies: Internet, WWW, Web Browsers, Web Servers, URLs, MIME, HTTP, Security, the Web Programmers Toolbox. WAMP, LAMP, ZAMP, Client-Side Scripting versus Server-Side Scripting **Mark-up Language:** HTML5 tags- Formatting, Commenting, Code, Anchors, Backgrounds, Images, Hyper-links, Lists, Tables, Semantic Elements in HTML, Multimedia, Forms	
UNIT–II	**12 Hrs**
Front End Design: Cascading Style Sheet (CSS): Introduction to CSS – Basic syntax and structure, In-line Styles, Embedding Style Sheets, Linking External Style Sheets, Backgrounds, manipulating text, Margins and Padding, Positioning using CSS **Bootstrap:** Getting Started with Bootstrap- Mobile-irst design, Why Bootstrap, Including Bootstrap in your HTML file, The Bootstrap CDN, Overriding with custom CSS, Using the Bootstrap customizer, Deep customization of Bootstrap **Using the Base CSS:** Implementing the Bootstrap Base CSS, Headings, Body copy, Typographic elements, Emphasis inline elements, Alignment classes, Emphasis classes, Addresses, Blockquotes, Abbreviations, Lists, Tables, Basic styling, Buttons, Forms, Inline forms, Horizontal forms, Code, Images, Font families **Doing More with Components:** Jumbotron, Badges, Progress bar, Button groups	
UNIT–III	**08 Hrs**
Basics of JavaScript: Overview of JavaScript, Object orientation and JavaScript, Syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions	
UNIT–IV	**11 Hrs**
XML: Introduction, syntax, Document structure, Document Type Definitions, Namespaces, XML schema, displaying raw XML documents **JSON:** Introduction-JSON Is a Data Interchange Format, JSON Is Programming Language Independent, JSON Syntax -JSON Is Based on JavaScript Object Literals ,Name-Value Pairs, Proper JSON Syntax, Syntax Validation, JSON as a Document, The JSON Media Type, JSON Data Types -Quick Look at Data Types, The JSON Data Types, The JSON Object Data Type, JSON Schema -Contracts with Validation Magic, Introduction to JSON Schema	
UNIT–V	**11 Hrs**
Document Object Model: The JavaScript Execution Environment, The Document Object Model, Elements Access in Java Script, Events and Event Handling, The DOM2 Event Model, DOM Tree Traversal and Modification **Data Visualization**: Getting Started with D3.JS, Using SVG to Create Images Using Code, Base tag, Basic elements, Positioning an element , Styling an element, Important SVG elements	

LABORATORY	
1.	Design a static web portal using HTML5 semantic elements, style using CSS
2.	Design a web page to demonstrate, customization of Bootstrap classes using CSS
3.	Develop an event countdown timer using HTML5, CSS/Bootstrap and JavaScript
4.	Design a JS program to show the stack implementation using Arrays
5.	Write a JS program to demonstrate any 4 methods of a. String object b. Date object c. Number Object
6.	Write a JS program to illustrate the following concepts considering appropriate scenario a. Different ways of creating objects and nested objects b. Different kinds of DOM events
7.	Design a form and validate the fields. Use regular expression to condition the fields
8.	Compose an XML file to store name, address, Email Id and phone number of three person and access the data using JavaScript, display the result by applying styles
9.	Design JSON document to store information about faculty in MCA Department, college affiliated to VTU. Make up sample data for 5 students. Access the values through JavaScript and store them in the table format
10.	Design a page to display complex shapes using D3.JS

Course Outcomes: After going through this course, the student will be able to	
CO1	Describe the basic constructs of the web concepts
CO2	Determining and comparing the relevant components that can be applied to a given problem
CO3	Apply the concepts to design and implement the web solutions for the given scenario
CO4	Analyze the web components in building an application

Reference Books	
1.	Robert W. Sebesta, Programming the World Wide Web, Pearson Education, 10th Edition, 2018, ISBN: 9780133775983.
2.	Lindsay Basset, Introduction to JavaScript Object Notation, O'Reilley Media, Inc., August 2015, 9781491929483.
3.	Aravind Shenoy, Ulrich Sossou, Learning Bootstra, O'Reilly Media, 2020, ISBN 978-1-78216-184-4.
4.	Matthew Huntington, D3.js Quick Start Guide, Packt Publishing, 2018, ISBN-13: 978-1789342383

Scheme of Continuous Internal Evaluation (CIE) Theory: 20 + 50 + 30 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analysing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding up to 100 Marks. Final test marks will be reduced to 50 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (30), Video based seminar/presentation/demonstration (30) adding up to 60 marks. Final EL marks will be reduced to 30 Marks.

Laboratory (CIE): 40 + 10 = 50

Conduction of laboratory exercises, Lab report & observation & analysis (50 Marks), Lab Test (50 Marks), adding up to 100 marks. Final marks will be reduced to 40 & Innovative Experiment/Concept Design & Implementation (10 Marks) adding up to 50 Marks.

Scheme of Semester End Examination (SEE) Theory for 100 marks:

The question paper will have FIVE full questions with internal choice from each unit. Each question will carry 20 marks. Student will have to answer one full question from each unit**.**

Scheme of Semester End Examination (SEE) Laboratory for 50 marks :

SEE for practical will be jointly conducted and evaluated by two examiners. The duration of practical examination is 3 hours and is evaluated for 50 marks. The break up for conduction of practical examination is (i) Procedure and Write up : 20% of max marks, (ii) Conducting the practical: 60% of max marks, (iii) Viva Voce: 20% of max marks

Rubric for CIE & SEE for Integrated Theory courses with Laboratory					
RUBRIC for CIE			***RUBRIC for SEE***		
SL.NO	**Contents**	**Marks**	**Q.NO**	**Contents**	**Marks**
1	QUIZZES – Q1 & Q2	20	Every unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit [unit 1 to 5]		
2	TESTS – T1 & T2	50	1 & 2	Unit 1:Question 1 or 2	20
3	Experiential Learning – EL1 & EL2	30	3 & 4	Unit 2:Question 3 or 4	20
4	Laboratory	50	5 & 6	Unit 3:Question 5 or 6	20
	Total Marks	**150**	7 & 8	Unit 4:Question 7 or 8	20
			9 & 10	Unit 5:Question 9 or 10	20
				Theory Exam Marks	**100**
				Laboratory Exam Marks	**50**
				Total Marks	**150**

SEMESTER: I					
ABILITY ENHANCEMENT COURSE-I (Practice)					
Course Code	**:**	**22HSS16L**	**CIE**	**:**	**50 Marks**
Credits: L:T:P	**:**	**0:0:2**	**SEE**	**:**	**50 Marks**
Total Hours	**:**	**26 hrs / Semester**	**SEE Duration**	**:**	**2.00 Hours**

UNIT-I	**05 Hrs**
Communication Skills: Basics, Method, Means, Process and Purpose, Basics of Business Communication, Written & Oral Communication, Listening **Communication with Confidence & Clarity**: Interaction with people, the need, the uses and the methods, Getting phonetically correct, using politically correct language, Debate & Extempore. **Assertive Communication**: Concept of Assertive communication, Importance and applicability of Assertive communication, Assertive Words, being assertive	
UNIT-II	**06 Hrs**
Aptitude Test Preparation: Importance of Aptitude tests, Key Components, Quantitative **Aptitude** – Problem Solving, Data Sufficiency, Data Analysis - Number Systems, Math Vocabulary, fraction decimals, digit places, profit and loss, time and work, time, speed and distance, calendar, clock, permutations and combinations, probability etc. **Mental ability:** coding-decoding, blood relations, puzzle test, logical sequence of words	
UNIT-III	**05 Hrs**
Reasoning and Logical Reasoning: logic, statement- arguments, assumptions, courses of actions, conclusions, deriving conclusions from passages, logical puzzles, Analytical Reasoning, Critical Reasoning **Presentation Skills:** Discussing the basic concepts of presentation skills, Articulation Skills, IQ & GK, How to make effective presentations, body language, Rapport Building	
UNIT-IV	**05 Hrs**
Interview Skills: Questions asked and how to handle them, Behavioral, technical and HR Interviews, etiquette **Motivation and Stress Management:** Self-motivation, group motivation, leadership abilities, Stress clauses and stress busters to handle stress and de-stress; Understanding stress - Concept of sound body and mind, Dealing with anxiety, tension, and relaxation techniques. Individual Counseling & Guidance, Career Orientation. Balancing Personal & Professional Life	
UNIT –V	**05 Hrs**
Professional Practice: Professional Dress Code, Time Sense, Respecting People & their Space, Relevant Behavior at different Hierarchical Levels. Positive Attitude, Self-Analysis and Self-Management **Professional Ethics:** values to be practiced, standards and codes to be adopted as professional engineers in the society for various projects**.** Balancing Personal & Professional Life	

Course Outcomes: After going through this course, the student will be able to	
CO1	Understand and solve problems covering Quantitative, verbal Ability and Logical Reasoning
CO2	Apply and enhance communication, leadership and interpersonal working skills with professional ethics
CO3	Inculcate problem solving, decision making, stress management skills for lifelong learning
CO4	Develop their potential and become confident to acquire a high degree of self

Reference Books	
1.	Arun Sharma, How to prepare for Quantitative Aptitude for CAT, McGraw Hill, 8th Edition, 2022, ISBN:978-93-53160-18-0
2.	R S Agarwal, Dr. R.S. Aggarwal, S Chand Publishing, 2022, ISBN: 978-9355012326
3.	R S Agarwal, A Modern Approach to Verbal and Non-verbal Reasoning, S Chand Publishing, 2018, ISBN:978-9352832163
4.	Kerry Patterson, Joseph Grenny, Ron McMillan, Crucial Conversation: Tools for Talking When Stakes are High, McGraw-Hill Publication, 3rd Edition, 2021, ISBN: 9780071772204
5.	Aptimithra: Best Aptitude Book, Ethnus, Tata McGraw Hill, 2014 ISBN: 9781259058738

Scheme of Continuous Internal Evaluation Laboratory (CIE): 40 + 10 = 50
Conduction of aptitude, Reasoning, communication skills, analysis and presentation (50 Marks), Test (50 Marks), adding upto 100 marks. Final marks will be reduced to 40 & Experiential Learning (10 Marks) adding up to 50 Marks
Semester End Evaluation (SEE); Theory (50 Marks) - SEE for 50 marks are executed by means of an examination. The duration of the SEE will be for 2 hours.

Lab Only Course with 50 Marks					
RUBRIC for CIE			***RUBRIC for SEE***		
SL.NO	**Contents**	**Marks**	**Q.NO**	**Contents**	**Marks**
1	Continuous evaluation by the course co-ordinators	50	The evaluation is individual for the student		
2	Test	50	1.	Aptitude and Reasoning (Problem Solving):	20
	Marks (Sl No 1+2)	**100**	2.	Communication Skills (Verbal, Non-Verbal presentation skill analysis)	20
	Reduced to	40		Viva voce	10
3	Experiential Learning	10			
	Total Marks	**50**		**Total Marks**	**50**

SEMESTER: I					
BASICS OF PROGRAMMING (Theory)					
Course Code	**:**	**22MCA17T**	**CIE**	**:**	**50 Marks**
L:T:P	**:**	**2*:0:0**	**SEE**	**:**	**---**
Total Hours	**:**	**26L**	**SEE Duration**	**:**	**---**

UNIT–I	**05 Hrs**
C Programming: Decision making, control structures and arrays: C Structure, Data Types, Input-Output Statements, Decision making with if statement, simple if statement, the if-else statement, nesting of if-else statements, the else-if ladder, the switch statement, the ?: operator, the goto statement, the break statement, programming examples The while statement, the do...while statement, the for statement, nested loops, jumps in loops, the continue statement, programming examples. One dimensional and two dimensional arrays, declaration and initialization of arrays, reading, writing and manipulation of above types of arrays	
UNIT–II	**05 Hrs**
Structures: Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, Operations on individual members, array of structures, structures within structures, structures and functions, Unions, size of structures	
UNIT–III	**06 Hrs**
Pointers: Pointers in C, Declaring and accessing pointers in C, Pointer arithmetic, Functions , Call by value, Call by reference, Pointer as function arguments, recursion, Passing arrays to functions, passing strings to functions, Functions returning pointers, Pointers to functions, Programming Examples	
UNIT–IV	**05 Hrs**
Digital Logic: Binary Systems and Combinational Logic Digital Computers and Digital Systems, Binary Numbers, Number Base Conversion, Octal and Hexadecimal Numbers, subtraction using r's and r-1 complements, Binary Code, Binary Logic, Digital Logic Gates **Computer Organization:** Basic Operational Concepts, Software, Performance, Multiprocessing and Multi computers, Machine Instruction: Memory Locations and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Interrupts	
UNIT–V	**05 Hrs**
Operating System: Operating-System Structure, Operating-System Operations, Overview of - Process Management, Memory Management, Storage Management, Protection and Security, Distributed Systems **CPU Scheduling:** Basic Concepts of CPU scheduling, Scheduling Algorithms-FCFS, SJF, Round Robin, Priority Scheduling	

*The Basics of Programming (**22MCA17T**) is a mandatory audit course **(non-credit course)** is offered to Non-Computer Science background students only.

Course Outcomes: After going through this course, the student will be able to	
CO1	Understand the basic concepts of programming, digital logic, organization, and operating system
CO2	Demonstrate the principles of logical programming and operating system management
CO3	Apply and analyse the programming and logical skills to real world problems
CO4	Evaluate and compare the methods, solutions and algorithms of basics of programming

Reference Books	
1.	Herbert Schild, C:The Complete Reference, McGraw Hill Education, 4th Edition, July 2017, ISBN-13: 978-0070411838
2.	Yashwant Kanetkar, Let us C, ,BPB Publications ,18th Edition, 2021, ISBN-13: 978-9391392994
3.	M.Morris Mano, Digital Logic and Computer Design" Pearson, 2016, ISBN-13: 978-9332542525
4.	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Concepts, Wiley India Pvt. Limited , 9th Edition, ISBN-BRV: !978-1-118-12938-8

Scheme of Continuous Internal Evaluation (CIE) Theory: 10 + 30 + 10 = 50

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks adding upto 20 marks. Final Quiz mark will be reduced to 10 marks

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. Final test marks will be reduced to 30 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (10), Video based seminar/presentation/demonstration (10) adding upto 20 marks. Final EL marks will be reduced to 10 Marks

Rubric for CIE & SEE Theory courses of 50 Marks			
RUBRIC for CIE			***RUBRIC for SEE***
SL.NO	**Contents**	**Marks**	**No SEE Examination for this bridge course**
1	QUIZZES – Q1 & Q2	10	
2	TESTS – T1 & T2	30	
3	Experiential Learning – EL1 & EL2	10	
	Total Marks	**50**	

SEMESTER: II					
RESEARCH METHODOLOGY AND IPR (Theory)					
Course Code	**:**	**22MCA21T**	**CIE**	**:**	**50 Marks**
L:T:P	**:**	**2:0:0**	**SEE**	**:**	**50 Marks**
Total Hours	**:**	**26L**	**SEE Duration**	**:**	**2.00 Hours**

UNIT–I	**06 Hrs**
Research Methodology: Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing how Research is Done, Research Process, Criteria of Good Research, Research Problem, Selecting the Problem, Technique Involved in Defining a Problem, Reviewing the literature, bringing clarity and focus to the research problem, improving research methodology, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed	
UNIT–II	**05 Hrs**
Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs. Design of Sample Surveys: Introduction, Sample Design, Sampling and Non-sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs	
UNIT–III	**05 Hrs**
Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout. Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports	
UNIT–IV	**05 Hrs**
Intellectual Property: IP law basics, types of Intellectual Property, Agencies responsible for Intellectual property Registrations, foundations of trademark law, International trademark law, subject matter of copyright, International copy right Law, foundations of Patent law- patentability, design patents. International Patent law	
UNIT–V	**05 Hrs**
Protecting Software and Computer: Related Innovations: An overview, Case studies ,Software Patent vs Copyright, Guideline for computer – related invention in Europe and Japan, Case studies	

Course Outcomes: After going through this course, the student will be able to	
CO1	Identify the suitable research methods and articulate the research steps in a proper sequence for the given problem
CO2	Conduct literature survey, define the problem statement, and suggest suitable solution for the given problem and present in the format of the research paper like IEEE/ACM/Elsevier or a proof of concept
CO3	Analyze the problem and formulate the problem to develop methodology to conduct research
CO4	Apply Copy Right Act /Patent Act /Cyber Law/ Trademark / Plagiarism check to the given case and prepare the technical paper

Reference Books	
1.	C.R. Kothari, Gaurav Garg, "Research Methodology: Methods and Techniques", New Age International 4th Edition, 2018. ISBN-13: 978-9386649225
2.	Ranjit Kumar, "Research Methodology- A step-by- step guide for beginners". SAGE Pub 3rd Edition, 2011, ISBN: 9781849203005, 9781849203012
3.	Debirag E. Bouchoux, "Intellectual Property", Cengage learning, 4th Edition, ISBN-13: 978-1-111- 64857-2
4.	Prabuddha Ganguli, "Intellectual Property Rights", Tata McGraw-Hill Publishing Company Limited,ISBN-13:978-0-07-007717-1

Scheme of Continuous Internal Evaluation (CIE) Theory: 10+ 20 + 20 = 50

QUIZ: Quiz will be conducted in online/offline mode. Two quiz will be conducted. Each quiz will be evaluated for 10 Marks, adding up to 20 Marks. Final quiz marks will be reduced to 10 Marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analysing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding up to 100 Marks. Final test marks will be reduced to 20 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and plan to carry out research study after literature review. Publication of paper, Video based seminar / presentation / (10) adding upto 20 marks. Final EL marks will be reduced to 20 Marks.

Scheme of Semester End Examination (SEE) Theory for 50 marks: The question paper will have FIVE full questions with internal choice from each unit. Each question will carry 10 marks. Student will have to answer one full question from each unit**.**

Rubric for CIE & SEE for Integrated Theory Course with Theory					
RUBRIC for CIE			***RUBRIC for SEE***		
SL.NO	**Contents**	**Marks**	**Q.NO**	**Contents**	**Marks**
1	QUIZZES– Q1 & Q2	10	Every unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit [unit 1 to 5]		
2	TESTS – T1 & T2	20	1 & 2	Unit 1: Question 1 or 2	10
3	Experiential Learning – EL1 & EL2	20	3 & 4	Unit 2: Question 3 or 4	10
			5 & 6	Unit 3: Question 5 or 6	10
			7 & 8	Unit 4: Question 7 or 8	10
	Total Marks	**50**	9 & 10	Unit 5: Question 9 or 10	10
				Total Marks	**50**

SEMESTER: II					
DESIGN AND ANALYSIS OF ALGORITHMS (Theory)					
Course Code	**:**	**22MCA22T**	**CIE**	**:**	**100 Marks**
L:T:P	**:**	**3:1:0**	**SEE**	**:**	**100 Marks**
Total Hours	**:**	**39L+26T**	**SEE Duration**	**:**	**3.00 Hours**

UNIT–I	**08 Hrs**
Fundamentals of Algorithms and Divide and Conquer technique: Notion of Algorithm, Review of Asymptotic Notations, Recursive functions using stack, Mathematical Analysis of Non-Recursive and Recursive Algorithms **Divide and Conquer**: Binary Search, Merge Sort, Quick Sort and its performance.	
UNIT–II	**08 Hrs**
Decrease-and-Conquer & Greedy Method **Decrease and Conquer** : Insertion Sort, Topological Sorting, Depth First Search using stack, Breadth First Search using Queue **Greedy Method :** Representation of Graphs, Knapsack Problem, Minimum-Cost Spanning Trees: Prim's Algorithm, Kruskal's Algorithm; Single Source Shortest Paths	
UNIT–III	**08 Hrs**
Space and Time Trade Offs and Limitations of Algorithmic Power **Space-Time Tradeoffs:** Introduction, sorting by Counting, Input Enhancement in String Matching. **Limitation of Algorithmic Power:** Lower-Bound Arguments, Decision Trees, P, NP, and NP-Complete Problems, Challenges of Numerical Algorithms.	
UNIT–IV	**07 Hrs**
Dynamic Programming: Warshall's Algorithm, Floyd's Algorithm for the All-Pairs Shortest Paths Problem, 0/1 Knapsack, The Traveling Salesperson problem.	
UNIT–V	**08 Hrs**
Backtracking and Branch - Bound Technique Introduction to trees, tree traversal techniques **Backtracking:** n – Queens problem, Hamiltonian Circuit Problem, Subset – Sum Problem **Branch and Bound**-Assignment Problem, Travelling Salesman Problem	

Course Outcomes: After going through this course, the student will be able to	
CO1	Identify the data structures, paradigms and approaches used in algorithms and its impact in practice
CO2	Classify different computational models (e.g., divide-and-conquer), order notation and various complexity measures (e.g., running time, disk space) for real world applications
CO3	Apply relevant data structures and algorithm techniques to design efficient solutions for different applications
CO4	Analyze and evaluate the algorithms based on the data structures used, order of notation and performance metrics

Reference Books	
1.	Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Person Education, 3rd Edition, 2016, ISBN-13: 9780321358288
2.	Ellis Horowitz,Sanguthevar Rajasekaran,Sartaj Sahni, "Fundamentals Of Computer Algorithms", Galgotia Publications, 2nd Edition, 2004, ISBN 13: 9788175152571
3.	Rod Stephens, "Essential Algorithms A Practical Approach to Computer Algorithms", Wiley, 2013, ISBN: 978-1-118-61210-1
4.	Rajesh K. Shukla, "Analysis and Design of Algorithms A Beginner's Approach", Wiley Edition: 2015, ISBN 13: 9788126554775

Scheme of Continuous Internal Evaluation (CIE): 20 + 50 + 30 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. Final test marks will be reduced to 50 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (30), Video based seminar/presentation/demonstration (30) adding up to 60 marks. Final EL marks will be reduced to 30 Marks.

Scheme of Semester End Examination (SEE) for 100 marks:

The question paper will have FIVE full questions with internal choice from each unit. Each question will carry 20 marks. Student will have to answer one full question from each unit...

Rubric for CIE & SEE Theory courses

RUBRIC for CIE			***RUBRIC for SEE***		
SL.NO	**Contents**	**Marks**	**Q.NO**	**Contents**	**Marks**
1	QUIZZES – Q1 & Q2	20	Every unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit [unit 1 to 5]		
2	TESTS – T1 & T2	50	1 & 2	Unit 1:Question 1 or 2	20
3	Experiential Learning – EL1 & EL2	30	3 & 4	Unit 2:Question 3 or 4	20
	Total Marks	**100**	5 & 6	Unit 3:Question 5 or 6	20
			7 & 8	Unit 4:Question 7 or 8	20
			9 & 10	Unit 5:Question 9 or 10	20
				Total Marks	**100**

SEMESTER: II					
DATA MODELING (Theory & Practice)					
Course Code	**:**	**22MCA23TL**	**CIE**	**:**	**100+50 Marks**
L:T:P	**:**	**4:0:1**	**SEE**	**:**	**100+50 Marks**
Total Hours	**:**	**52L+26P**	**SEE Duration**	**:**	**3.00 Hours**

UNIT–I	10 Hrs
Introduction to Databases **Database Languages and Architecture** :Introduction to data, information, databases, database management system; Characteristics of database approach, Data models, Schema and instances, Three schema architecture and Data Independence, Database Languages and Interfaces, Database System Environment, Centralized and Client/ Server Architectures of DBMSs **Conceptual Data Modeling:** A Sample Database Application, Entity Types, Entity Sets, Attributes, Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types, Refining the ER Design for the Company Database, ER Diagrams, Naming Conventions, and Design Issues	
UNIT–II	**11 Hrs**
Relational Model: Relational Model Concepts, Relational Model Constraints and Relational Database Schemas and Keys, Update Operations, Transactions, and Dealing with Constraint Violations, Relational Database Design Using ER-to-Relational Mapping **Structured Query Language:** Data Definition and Data Types, Specifying Constraints in SQL, Basic Retrieval Queries in SQL, INSERT, DELETE, and UPDATE Statements in SQL, More Complex SQL Retrieval Queries-Nested Queries, Tuples, and Set/ Multi set Comparisons, exists and unique, join tables and outer joins, aggregate functions, Schema Change Statements in SQL **Normalization:** Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Cod Normal form	
UNIT–III	**10 Hrs**
Transaction Concepts: Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions **Semantic Data Modeling: Introduction –** Mind the Semantic Gap **Semantic Modeling Elements-** General Elements, Common and Standardized Elements **Semantic Model Development:** Development Activities, vocabularies, Patterns, and Exemplary Models	

UNIT–IV	11 Hrs
MongoDB: SQL and NoSQL evolution, MongoDB key characteristics and use cases, MongoDB configuration and best practices, Reference documentation **Scheme Design and Data Modeling : Data modeling,** MongoDB scheme design, Modeling data for atomic operations Modeling relationships, Connecting to MongoDB using Python **MongoDB CRUD operations : CRUD using the shell-** Administration, MapReduce in the mongo shell, Aggregation framework, Securing the Shell	
UNIT–V	**10 Hrs**
Advanced Querying: MongoDB CRUD operations: CRUD in Mongoid, CRUD using the Python driver, Comparison operators, Update operators, Smart querying **Aggregation:** Why Aggregation**,** Aggregation operators, Expression operators, Limitations **Indexing:** Index types- single field indexes , compound indexes	

LABORATORY	
Exercise 1	Design, Create and Implement the relational databases for any one of the Domains like Tourism, Human Resource Management, Debris Management and Others **Note :** Minimum Six (6) Queries to be executed including nested queries
Exercise 2	Design, Create and Implement the relational databases for any one of the Domains like Health Care, Energy, Agriculture, Telecom and others **Note :** Minimum Six (6) Queries to be executed including joins
Exercise 3	Create and implement CRUD operations using MongoDB for any one of the domains. Telecom, Tourism, Human Resource Management and Others **Note** : Minimum Six (6) Queries to be executed
Exercise 4	Create and implement CRUD operations using MongoDB for any one of the domains. Health Care, Energy, Agriculture **Note** : Minimum Six (6) Queries to be executed
Exercise 5	Implement an interface to perform CRUD operations in MongoDB using Python Driver for any one of the Domain listed in the exercises

Reference Books	
1.	RamezElmasri, Shamkant B. Navathe, Fundamentals of Database Systems, Pearson Addison Wesley, 6th Edition, 2011, ISBN 13: 978-0-136-08620-8
2.	Raghu Ramakrishnan, Johannes Gehrke, Database Management System, Mc Graw-Hill, 3rd Edition, 2014, ISBN-13:978-8131769591
3.	Alex Giamas, Mastering MongoDB 3.x,Packt Publishing,Kindle Edition, 2017 ISBN 978-1-78398-260-8
4.	Panos Alexopoulos, Semantic Modeling for Data,O'Reilly Media, Inc.First Edition, 2020, ISBN 9781492054276

Course Outcomes: After going through this course, the student will be able to	
CO1	Understand the fundamental concepts of structured, unstructured and semantic data models
CO2	Apply suitable data model concept to solve the given problem
CO3	Analyse relational and non-relational data model to check the performance of the data models with respect to design and manipulations
CO4	Design and implement suitable data model for any given real time scenarios

Scheme of Continuous Internal Evaluation (CIE) Theory: 20 + 50 + 30 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analysing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding up to 100 Marks. Final test marks will be reduced to 50 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (30), Video based seminar/presentation/demonstration (30) adding up to 60 marks. Final EL marks will be reduced to 30 Marks.

Laboratory (CIE): 40 + 10 = 50

Conduction of laboratory exercises, Lab report & observation & analysis (50 Marks), Lab Test (50 Marks), adding up to 100 marks. Final marks will be reduced to 40 & Innovative Experiment/Concept Design & Implementation (10 Marks) adding up to 50 Marks.

Scheme of Semester End Examination (SEE) Theory for 100 marks:

The question paper will have FIVE full questions with internal choice from each unit. Each question will carry 20 marks. Student will have to answer one full question from each unit**.**

Scheme of Semester End Examination (SEE) Laboratory for 50 marks :

SEE for practical will be jointly conducted and evaluated by two examiners. The duration of practical examination is 3 hours and is evaluated for 50 marks. The break up for conduction of practical examination is (i) Procedure and Write up : 20% of max marks, (ii) Conducting the practical: 60% of max marks, (iii) Viva Voce: 20% of max marks

Rubric for CIE & SEE for Integrated Theory courses with Laboratory					
RUBRIC for CIE			***RUBRIC for SEE***		
SL.NO	**Contents**	**Marks**	**Q.NO**	**Contents**	**Marks**
1	QUIZZES – Q1 & Q2	20	Every unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit [unit 1 to 5]		
2	TESTS – T1 & T2	50	1 & 2	Unit 1:Question 1 or 2	20
3	Experiential Learning – EL1 & EL2	30	3 & 4	Unit 2:Question 3 or 4	20
4	Laboratory	50	5 & 6	Unit 3:Question 5 or 6	20
	Total Marks	**150**	7 & 8	Unit 4:Question 7 or 8	20
			9 & 10	Unit 5:Question 9 or 10	20
				Theory Exam Marks	**100**
				Laboratory Exam Marks	**50**
				Total Marks	**150**

SEMESTER: II					
CLOUD NATIVE FULLSTACK APPLICATION DEVELOPMENT-I (Theory & Practice)					
Course Code	**:**	**22MCA24TL**	**CIE**	**:**	**100 + 50 Marks**
Credits: L:T:P	**:**	**3:0:1**	**SEE**	**:**	**100 + 50 Marks**
Total Hours	**:**	**39L+26P**	**SEE Duration**	**:**	**3.00 Hours**

UNIT–I	**08 Hrs**
Object Oriented Design: Introduction to Object-Oriented Concepts, How to Think in Terms of Objects, The Anatomy of a Class, Class Design Guidelines, Designing with Objects **Inheritance:** Mastering Inheritance and Composition, Designing with Interfaces and Abstract Classes, Building Objects and Object-Oriented Design, Design Patterns, The SOLID Principles of Object-Oriented Design	
UNIT–II	**08 Hrs**
Java Fundamental: Applications of Java Programming, Conditional and Control Statements, Arrays, String Handling, Classes, Objects and Methods, Inheritance, super keyword. Interface, Exception Handling **Threads:** The Thread Class and Runnable Interface, Creating Thread, Creating Multiple Threads, Thread Priorities, Synchronization, using Synchronization Methods, Thread Communication using notify(), wait() and notify All(), suspending, Resuming and stopping Threads	
UNIT–III	**08 Hrs**
Java Advanced Programming: Java Concurrency package, Java Generics: Generics Fundamentals Bounded Types, Generic Methods, Generic Constructors, Some Generic, Restrictions. Collections: Collections Overview, The Collection Interfaces, The collection Classes. The Arrays Class. Lambda Expressions, Java Memory Management **Java Design Patterns**: Creational, Behavioral and Structural patterns	
UNIT–IV	**07 Hrs**
RESTful API: Java APIs For JSON Processing, Introduction To the Basics of RESTful Architecture Design Strategy, Guidelines, Best Practices, Essential RESTful API Patterns	
UNIT–V	**08 Hrs**
Advanced RESTful API: Patterns, Microservice API Gateways, RESTful Services API Testing and Security, RESTful Service Composition for Smart Applications RESTful API Design Tips	

LABORATORY	
1.	Write a Java program to demonstrate the concepts Encapsulation, Inheritance & Multiple Inheritance
2.	Complete the following: 1. Create a package named shape. 2. Create some classes in the package representing some common shapes like Square, Triangle, and Circle. 3. Import and compile these classes in other program.
3.	Write a Java program to demonstrate the concepts i)Abstraction, Run Time Polymorphism
4.	Write a Java programs to demonstrate the concepts of design patterns.
5.	Write a Java program that demonstrated the Thread Life Cycle
6.	Write a Java code to demonstrate producer & consumer problems using thread wait & notify methods.
7.	Write a Singleton class which is thread safe and immutable.
8.	Using Java Generics demonstrates below concepts using Java program i) Type wildcards with Java Generics
9.	Build portal RESTful web API to demonstrate to create a web resource which can be accessed using REST URI's and demonstrate the concept of GET, POST, PUT & DELETE
10.	Build portal RESTful web API to demonstrate below concepts i) Write a Web API to demonstrate the concepts of security using basic Oauth2

Course Outcomes: After going through this course, the student will be able to	
CO1	Understand Object Oriented Design concepts
CO2	Identify the Objects, patterns and services in/ for real-time applications
CO3	Apply the concept of Objects, patterns and services for real-time applications
CO4	Analyze solutions using OOPs concepts for real world applications

Reference Books	
1.	Matt Weisfeld, Object-Oriented Thought Process, Addison-Wesley Professional, 5th Edition, 2019, ISBN: 9780135182130
2.	Jeff Friesen, Java Threads and the Concurrency Utilities, Apress , ISBN: 9781484217009
3.	Ian F. Darwin, Java Cookbook, O'Reilly Media, Inc., 4th Edition, ISBN: 9781492072584
4.	Bogu, Mohanram Balachandar, RESTful Java Web Services, Packt Publishing, 3rd Edition, 2017, ISBN: 9781788294041

Scheme of Continuous Internal Evaluation (CIE) Theory: 20 + 50 + 30 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. Final test marks will be reduced to 50 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (30), Video based seminar/presentation/demonstration (30) adding upto 60 marks. Final EL marks will be reduced to 30 Marks.

Laboratory (CIE): 40 + 10 = 50

Conduction of laboratory exercises, Lab report & observation & analysis (50 Marks), Lab Test (50 Marks), adding up to 100 marks. Final marks will be reduced to 40 & Innovative Experiment/Concept Design & Implementation (10 Marks) adding up to 50 Marks.

Scheme of Semester End Examination (SEE) Theory for 100 marks:

The question paper will have FIVE full questions with internal choice from each unit. Each question will carry 20 marks. Student will have to answer one full question from each unit**.**

Scheme of Semester End Examination (SEE) Laboratory for 50 marks :

SEE for practical will be jointly conducted and evaluated by two examiners. The duration of practical examination is 3 hours and is evaluated for 50 marks. The break up for conduction of practical examination is (i) Procedure and Write up : 20% of max marks, (ii) Conducting the practical: 60% of max marks, (iii) Viva Voce: 20% of max marks

Rubric for CIE & SEE for Integrated Theory courses with Laboratory					
RUBRIC for CIE			***RUBRIC for SEE***		
SL.NO	**Contents**	**Marks**	**Q.NO**	**Contents**	**Marks**
1	QUIZZES – Q1 & Q2	20	Every unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit [unit 1 to 5]		
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3	Experiential Learning – EL1 & EL2	30	3 & 4	Unit 2:Question 3 or 4	20
4	Laboratory	50	5 & 6	Unit 3:Question 5 or 6	20
	Total Marks	**150**	7 & 8	Unit 4:Question 7 or 8	20
			9 & 10	Unit 5:Question 9 or 10	20
				Theory Exam Marks	**100**
				Laboratory Exam Marks	**50**
				Total Marks	**150**

SEMESTER: II					
INTERNET OF THINGS (Theory & Practice)					
Course Code	**:**	**22MCA251TL**	**CIE**	**:**	**100 + 50 Marks**
Credits: L:T:P	**:**	**4:0:1**	**SEE**	**:**	**100 + 50 Marks**
Total Hours	**:**	**52L+26P**	**SEE Duration**	**:**	**3.00 Hours**

UNIT–I	10 Hrs
Introduction to Internet of Things: Fundamentals of Electronics and devices for Internet of Things: Rectification process, Diode characteristics, Digital electronics, Transistor behaviour and Oscillators Physical and Logical design of IoT Technologies that enable Internet of Things Applications and Use cases, IoT Deployment Levels. Network and Communication, Standards related to Internet of Things, Protocols in Internet of things	
UNIT–II	**10 Hrs**
Programming with Arduino: Understanding the eco system of Arduino, Pinout configuration, Digital input and output, Analog input and output, working with sensors and actuators. Arduino serial communication. Communication interfaces (SPI and I2C) wired and wireless communication with Arduino using bluetooth modules	
UNIT–III	**10 Hrs**
Programming with Raspberry Pi: Understanding the eco system of Raspberry Pi3/Pi4, Pinout configuration, python modules like Rpi.GPIO and gpiozero. Digital input and output, working with sensors and actuators. Raspberry Pi serial communication. Communication interfaces (SPI and I2C).wired and wireless communication with raspberry Pi. Serial communication from raspberry Pi3 to Arduino and vice versa. Monitoring and Controlling between raspberry pi.	
UNIT–IV	**10 Hrs**
Programming with esp32: Understanding the eco system of esp8266/esp32, pinout configuration, Digital, Analog input and output, working with sensors and actuators. communication from raspberry Pi to nodeMCU/esp32, Network and web stack configuration with esp32, wireless communication using esp32 about the sensor status and controlling actuators remotely.	
UNIT–V	**12 Hrs**
IoT Application Development: Integrating sensors with IoT Dashboards and micro services IoT Platforms design methodology: Introduction to ten steps design methodology Introduction to Flow based IoT Dashboard: Fundamentals of NodeRED, creating basic dashboard Introduction to MQTT based IoT Dashboard: setup and configuration of dashboard like Things board Introduction to hosted IoT dashboard services like Adafruit io or thing board hosted service. IoT alert integration: alert integration in the form of email, tweets or any social media post.	

LABORATORY	
Practice Lab : Fundamentals of Electronics using SEELab3 kit and Introduction to variety of devices and development boards used to develop IoT Applications Full wave rectifier using PN junction : Refer Section 3.3 in the SEElab3 kit manual Diode V-I functional analysis Refer Section 3.13 in the SEElab3 kit manual Logic gates : Refer Section 3.11 in the SEElab3 kit manual PNP & NPN transistor nature : Refer Section 3.13 and 3.15 in the SEElab3 kit manual IC555 oscillator :Refer Section 3.6 in the SEElab3 kit manual Identifying the IoT Kit elements : sensors , actuators and development boards and other accessories Study about the principle of operations, operating conditions, cost, tolerance and durability study	
1.	Write a program with Arduino UNO board to calculate the distance of a obstacle based on the Ultrasonic sensor inputs. If the distance calculated is less than a certain value turn on a buzzer with an LED in ON state and display the distance in serial monitor
2.	Write a program with Arduino UNO to indicate the level of temperature using the LEDs indicating the low, medium and high values of temperature (Red, Blue and Green) OR Write a program with Arduino UNO to implement the interactive traffic signal.
3.	Write a program with Arduino UNO board to control servo motor based on potentiometer inputs **OR** to control a mini water pump based on water levels in a container **OR** Demonstrate HC-05 module for controlling Arduino with Bluetooth using Serial Communication integrating any mobile app.
4.	Write an interactive python script on Raspberry Pi3 to implement the serial communication from Raspberry Pi to Arduino or vice versa with any one sensor and actuator from the following components a) LED b) Buzzer c) Temperature and humidity sensor d) LDR sensor
5.	Write a python script on Raspberry pi to control servo motor or DC Motor based on the Potentiometer inputs or button switch inputs. OR change the color of RGB LED / Bulb based on the potentiometer inputs
6.	Develop python script to read water temperature, and water calculate water level in a container using Ultrasonic sensor and control the mini water pump. OR Develop a python script to calculate water consumption bill based on the water flow sensor inputs
7.	Write a micropython or arduino program with esp32 based NodeMCU board to calculate the distance of an obstacle based on the Ultrasonic sensor inputs. If the distance calculated is less than a certain value turn on LED
8.	Write an arduino script with esp32 based nodemcu board to operate a 4 channel relay and control evices connected to relay, demonstrating minimal home automation
9.	Develop a digital scale based on esp32 with Load Cell and HX711 Amplifier
10.	IoT dashboard setup and configuration Integrate Things Board / node-red IoT dashboard with any two sensor / actuator on PC or Rpi4 **OR** Integrate Adafruit or similar hosted IoT Dashboard with arduino, RaspberryPi and any sensor / actuator. **OR** Demonstrate publish subscribe communication model using esp32 or RaspberryPi and sensors/actuators **OR** Demonstrate alert service integration to any IoT application based on esp32 or RaspberryPi

Course Outcomes: After going through this course, the student will be able to	
CO1	Understand the fundamentals of electronics and hardware devices required for IoT including deployment levels, Network protocols and standards
CO2	Comprehend various development boards, sensors, actuators, architecture of Arduino, Raspberry Pi, esp32 with Arduino IDE or other IDE
CO3	Interact with Arduino, Raspberry Pi, esp32 using python, JavaScript and c/c++ to program the devices (sensors and actuators) to develop an integrated system
CO4	Design, Setup, Configure and Develop IoT Applications (Dashboards) and integrate several essential micro service like social media notification, email, push notifications including visualization of IoT Data

Reference Books	
1.	ArshdeepBahga, Vijay Madisetti, Internet of Things: A Hands-on Approach, Orient Blackswan Private Ltd, July 1st 2015, ISBN : 8173719543
2.	Wizardry, Exploring Arduino: Tools and Techniques for Engineering, WILEY, 1st Edition, ISBN-10: 1118549368, ISBN-13: 978-1118549360
3.	Elector, The Official ESP32 Book, ISBN : 978-1-907920-63-9
4.	The Official Raspberry Pi Handbook by The Magpi Magazine, 2023
5.	Maneesh Rao, Internet of Things with Raspberry Pi 3, Pack Publihing, April 2018 ISBN: 9781788627405
6.	Simon Monk, Programming the Raspberry Pi, McGraw Hill TAB, 3rd Edition, July 2021, ISBN-13: 978-1264257355

Scheme of Continuous Internal Evaluation (CIE) Theory: 20 + 50 + 30 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

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EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (30), Video based seminar/presentation/demonstration (30) adding up to 60 marks. Final EL marks will be reduced to 30 Marks.

Laboratory (CIE): 40 + 10 = 50

Conduction of laboratory exercises, Lab report & observation & analysis (50 Marks), Lab Test (50 Marks), adding up to 100 marks. Final marks will be reduced to 40 & Innovative Experiment/Concept Design & Implementation (10 Marks) adding up to 50 Marks.

Scheme of Semester End Examination (SEE) Theory for 100 marks:
The question paper will have FIVE full questions with internal choice from each unit. Each question will carry 20 marks. Student will have to answer one full question from each unit**.**
Scheme of Semester End Examination (SEE) Laboratory for 50 marks :
SEE for practical will be jointly conducted and evaluated by two examiners. The duration of practical examination is 3 hours and is evaluated for 50 marks. The break up for conduction of practical examination is (i) Procedure and Write up : 20% of max marks, (ii) Conducting the practical: 60% of max marks, (iii) Viva Voce: 20% of max marks

Rubric for CIE & SEE for Integrated Theory courses with Laboratory					
RUBRIC for CIE			***RUBRIC for SEE***		
SL.NO	**Contents**	**Marks**	**Q.NO**	**Contents**	**Marks**
1	QUIZZES – Q1 & Q2	20	Every unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit [unit 1 to 5]		
2	TESTS – T1 & T2	50	1 & 2	Unit 1:Question 1 or 2	20
3	Experiential Learning – EL1 & EL2	30	3 & 4	Unit 2:Question 3 or 4	20
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	Total Marks	**150**	7 & 8	Unit 4:Question 7 or 8	20
			9 & 10	Unit 5:Question 9 or 10	20
				Theory Exam Marks	**100**
				Laboratory Exam Marks	**50**
				Total Marks	**150**

SEMESTER: II					
DATA SCIENCE – I (Theory & Practice)					
Course Code	**:**	**22MCA252TL**	**CIE**	**:**	**100+50**
Credits: L:T:P	**:**	**4:0:1**	**SEE**	**:**	**100+50**
Total Hours	**:**	**52L+26P**	**SEE Duration**	**:**	**3.00 Hours**

UNIT-I	10 Hrs
Introduction to Data Science and Exploratory Data Analysis: Data Science, Brief History of Data Science, Increasing attention to data science, Fundamental fields of study to data science, Data science and Related Terminologies, Types of Analytics, Application of Data Science, Data Science Process Model **Introduction to Exploratory Data Analysis**: Steps in data preprocessing, Understanding the data - Steps involved in EDA using Python Programming, looking at the data, visualizing the data, Treatment of Outliers, Data visualization using Python-Matplotlib Library, Seaborn Library, Dimensionality Reduction, Independent and Dependent Variables	
UNIT-II	**11 Hrs**
Machine Learning and Supervised Learning Models: Types of Machine learning algorithms, Supervised and Unsupervised Learning Algorithms, Supervised Learning algorithm, Unsupervised learning algorithm, Overfitting and under fitting, correctness, The bias-variance tradeoff, Feature Extraction, and selection **Supervised Learning Algorithms**: K-Nearest Neighbors, Similarity Based on Distance Function, KNN Model Building , Model performance measures Linear Regression, Building linear regression, Interpretation of Linear Regression coefficients, Validation of Linear regression ,Decision Tree, Tree Structure, Criteria for splitting decision node	
UNIT-III	**11 Hrs**
Ensemble Methods and Unsupervised Learning: Ensemble methods, Bias Variance Trade off, Random Forest as ensemble technique, Control Parameters, out of bag error rate, Tuning the Random Forest, Variable Importance Plot, Model Performance Measures **Unsupervised Learning:** Introduction, Association Rule Mining, Clustering, K Means clustering	
UNIT-IV	**10 Hrs**
Text Analytics and Artificial Intelligence **Text Analytics:** Introduction, Unstructured data, word cloud, sentiment analysis , web and social media analytics **Artificial Intelligence and Deep Learning :** Introduction, Application of Artificial Intelligence, Classification of Artificial Intelligence, Difference between AI and Deep Learning	
UNIT –V	**10 Hrs**
Deep Learning: Neural Networks- Perceptron, Feed Forward Neural networks, Back Propagation, Tensor, Layer Abstraction, Linear Layer, NN as sequence of layers, Loss and optimization, Other activation functions, SoftMax and Cross entropy, Dropout , Working of Deep Learning, Convolutional Neural Networks **Artificial Neural Networks**: Application of ANN, ANN model building, Steps in ANN model building, Model Performance Measures, Types of ANN	

LABORATORY	
1.	Consider the automobile dataset and perform exploratory data analysis. a. Identify the dimension, structure, and summary of the data set b. Preprocess the dataset and treat them (like missing values, 'na', ?). Justify the treatment c. Plot the histogram for continuous variables (at least two) to analyze the data. d. Draw a violin plot do describe the distribution of a numerical variable to analyze the data. e. Recognize the outliers using box plot (Display the box plot before and after outlier treatment) f. Display a heat map to display the relationship among the attributes g. Standardize the continuous variable (if any)
2.	For the data set in Q1, a. Show the distribution of continuous variables using histogram Identify the relationship between two continuous variables using scatter plot c. Find and display the frequency of the categorical values using count plot d. Apply point plots to display one continuous and one categorical variable e. #Question 1b has to be performed before 2a
3.	Consider the health care dataset that consists of several imaging details from patients that had a biopsy to test for breast cancer. The variable diagnosis classifies the biopsied tissue as M = malignant or B = benign. Describe and pre-process the dataset. Use KNN supervised learning model to predict Diagnosis using texture_mean and radius_mean . Analyze the model using different k values and display the performance of the model
4.	Consider the student_performance dataset. Predict the student performance as "Pass" or "Fail" by implementing a decision tree. Perform data preprocessing and visualize the data. Identify the important feature affecting the student performance and analyze the efficiency of the decision tree using different metrics. Plot the decision tree. .
5.	For the dataset in Q4, apply random forest algorithm to predict the student performance. a. Plot the important variables using seaborn b. Tune the random forest for training and test data based on best parameters and implement it c. Analyze the model performance and display the output
6.	For the market basket dataset, apply apriori algorithm and identify the best rules based on support and confidence values.
7.	For the Mall-Customers dataset Implement k-means clustering algorithm and visualize the clusters.
8.	Consider the given text dataset. Implement different text processing techniques and identify the most important keywords from the text. Display a word cloud from the same.
9.	Consider the iris dataset and apply the Multilayer perceptron to classify the type of the flower. Analyze the performance of the perceptron and display the output. .
10.	Consider the MNIST data set and implement CNN architecture to identify the handwritten images. Optimize the model and display the output.

Note : Students will be given with different case studies and scenario's during examination

Course Outcomes: After going through this course, the student will be able to	
CO1	Understand the need and fundamental concepts of data science in real world applications
CO2	Identify and apply the relevant data science concept for given scenario
CO3	Demonstrate the different data science concepts for various domains like education, business, healthcare etc.
CO4	Evaluate and analyze the performance of the models for real world applications

Reference Books	
1.	B Uma Maheswari, R Sujatha, Introduction to Data Science Practical Approach with R and Python , Wiley Publications, ISBN-: 9789354640506 , ISBN-13: 9789354640513 (EBook)
2.	Joel Grus, Data Science from Scratch, First principles with Python , O'Reilly, 2nd Edition, ISBN : 9789352138326
3.	Laura Igual , Santi Seguí, Springer Publications, Introduction to Data Science- A Python Approach to Concepts, Techniques and Applications, ISSN: 1863-7310 ISSN 2197-1781 (electronic)
4.	Sayan Mukhopadhyay, Advanced Data Analytics Using Python, Apress, ISBN-13 (pbk): 978-1-4842-3449-5 ISBN-13 (electronic): 978-1-4842-3450-1

Scheme of Continuous Internal Evaluation (CIE) Theory: 20 + 50 + 30 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. Final test marks will be reduced to 50 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (30), Video based seminar/presentation/demonstration (30) adding upto 60 marks. Final EL marks will be reduced to 30 Marks.

Laboratory (CIE): 40 + 10 = 50

Conduction of laboratory exercises, Lab report & observation & analysis (50 Marks), Lab Test (50 Marks), adding up to 100 marks. Final marks will be reduced to 40 & Innovative Experiment/Concept Design & Implementation (10 Marks) adding up to 50 Marks.

Scheme of Semester End Examination (SEE) Theory for 100 marks:

The question paper will have FIVE full questions with internal choice from each unit. Each question will carry 20 marks. Student will have to answer one full question from each unit**.**

Scheme of Semester End Examination (SEE) Laboratory for 50 marks :

SEE for practical will be jointly conducted and evaluated by two examiners. The duration of practical examination is 3 hours and is evaluated for 50 marks. The break up for conduction of practical examination is (i) Procedure and Write up : 20% of max marks, (ii) Conducting the practical: 60% of max marks, (iii) Viva Voce: 20% of max marks

Rubric for CIE & SEE for Integrated Theory courses with Laboratory					
RUBRIC for CIE			***RUBRIC for SEE***		
SL.NO	**Contents**	**Marks**	**Q.NO**	**Contents**	**Marks**
1	QUIZZES – Q1 & Q2	20	Every unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit [unit 1 to 5]		
2	TESTS – T1 & T2	50	1 & 2	Unit 1:Question 1 or 2	20
3	Experiential Learning – EL1 & EL2	30	3 & 4	Unit 2: Question 3 or 4	20
4	Laboratory	50	5 & 6	Unit 3:Question 5 or 6	20
	Total Marks	**150**	7 & 8	Unit 4:Question 7 or 8	20
			9 & 10	Unit 5:Question 9 or 10	20
				Theory Exam Marks	**100**
				Laboratory Exam Marks	**50**
				Total Marks	**150**

SEMESTER: II					
SOFTWARE TESTING AND PRACTICES (Theory and Practice)					
Course Code	**:**	**22MCA253TL**	**CIE**	**:**	**100 + 50 Marks**
L:T:P	**:**	**4:0:1**	**SEE**	**:**	**100 + 50 Marks**
Total Hours	**:**	**52L+26P**	**SEE Duration**	**:**	**3.00 Hours**

UNIT–I	**10 Hrs**
Introduction to software testing -Definitions, Test Cases, Test case design techniques, Preparing a Test Plan, Levels of Testing, Software testing life cycle, Software testing methodologies: Waterfall testing, Agile Testing, Iterative testing , QA, QC & Testing Case study- Develop test cases for any real world application using test case description template	
UNIT–II	**10 Hrs**
Test Automation- Need of Automation Testing, Refactoring, Continuous Improvement, Difference between Manual and Automation testing, Choosing right tools, Test Automation Architecture(SUT), Automation Frameworks	
UNIT –III	**12 Hrs**
Introduction to JMeter- Why JMeter, Configuring JMeter Components of JMeter - Test Plan, Thread Groups, Controllers, Samplers(FTP,HTTP/HTTPS,JDBC), Listeners, Timers, Assertions, Configuration Elements, Pre-Processors and Post-Processors, Collectors	
UNIT –IV	**10Hrs**
Submitting Forms and Managing Sessions- Capturing simple forms(Check boxes, Radio buttons, File uploads/File Downloads, Posting and Reading JSON data, Managing sessions with cookies and URL rewriting	
UNIT –V	**10Hrs**
Types of Testing using JMeter- Performance Testing(Load/Stress testing), Distributed Testing, Database Testing, API Testing, Security Testing, Test Execution and Reporting	

LABORATORY	
Note: Students are required to create a Test plan, Configure test scenarios, Run the test, Analyze the results and Generate reports for the following Lab programs. Based on the result analysis Iterate and optimize the testing process.	
1.	Demonstrate the concept of Single and Multiple threads simulating concurrent user actions such as logging in, browsing pages and submitting forms. Analyze response times, throughput and error rates under different load levels
2.	Demonstrate Assertions by sending parameter values to the database and assert the response code for both successful and failure cases
3.	Demonstrate pre-processor and post processor concept in the following Scenario a. Add data to Sampler using Pre-processor for an HTTP request b. Validate all the status codes generated from Sampler page using RegEx (Regular Expression Extractor) of Post-processor
4.	Demonstrate the use of Simple and Modular Controllers and Listeners for the following scenario a. A sampler to store the sampler request whose data can be extended outside to other samplers b. A container that provides values to all the sampler within the thread group
5.	Perform database load testing to measure the performance under database load. Configure JMeter to send SQL queries to the database server and monitor the response times. Analyze the query execution times, throughput, and resource utilization to identify any performance issues in the database layer.
6.	Consider a web application and perform load testing under the following conditions - Normal and peak load conditions.
7.	Set up a distributed testing environment using JMeter to distribute the load across multiple machines. Configure a master-slave setup where the master controls and coordinates the load testing activities across multiple slave instances.
8.	Demonstrate response codes validations(Eg:200, 300, 400, 500) for different API calls
9.	Demonstrate the concept of collection by implementing the CRUD operations on a website in which all the API calls are the input to the other call.(Eg: GET method's response value should be input for the POST method).
10.	Demonstrate multipart request with file upload feature for various file type extensions(.pdf,.xlsx,.csv,.json)

Course Outcomes: After going through this course, the student will be able to	
CO1	Understand the basic concepts of Automation testing
CO2	Identify and apply relevant automation testing techniques suitable for a real world scenario
CO3	Demonstrate various types of testing using JMeter
CO4	Analyze the test result and automation process for real world applications

Reference Books	
1	Paul C. Jorgensen, "Software Testing, A Craftsman's Approach", Auerbach Publications, 4th Edition, First Indian Reprint, 2014, ISBN-13:9781466560680
2	Bayo Erinle, Performance Test with JMeter, PACKT Publishing, Copyright © 2013 , ISBN 978-1-78216-584-2
3	Arnon Axelrod, Complete Guide to Test Automation, Apress, Copyright © 2018, ISBN-13 (pbk): 978-1-4842-3831-8, ISBN-13 (electronic): 978-1-4842-3832-5
4	Antonio Gomes Rodrigues, Bruno Demion (Milamber), Master Apache JMeter - From Load Testing to DevOps: Master performance testing with JMeter ,PACKT publishing, 1st Edition,2019, ISBN-13:978-1839217647

Scheme of Continuous Internal Evaluation (CIE) Theory: 20 + 50 + 30 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analysing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding up to 100 Marks. Final test marks will be reduced to 50 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (30), Video based seminar/presentation/demonstration (30) adding up to 60 marks. Final EL marks will be reduced to 30 Marks.

Laboratory (CIE): 40 + 10 = 50

Conduction of laboratory exercises, Lab report & observation & analysis (50 Marks), Lab Test (50 Marks), adding up to 100 marks. Final marks will be reduced to 40 & Innovative Experiment/Concept Design & Implementation (10 Marks) adding up to 50 Marks.

Scheme of Semester End Examination (SEE) Theory for 100 marks:

The question paper will have FIVE full questions with internal choice from each unit. Each question will carry 20 marks. Student will have to answer one full question from each unit.

Scheme of Semester End Examination (SEE) Laboratory for 50 marks :

SEE for practical will be jointly conducted and evaluated by two examiners. The duration of practical examination is 3 hours and is evaluated for 50 marks. The break up for conduction of practical examination is (i) Procedure and Write up : 20% of max marks, (ii) Conducting the practical: 60% of max marks, (iii) Viva Voce: 20% of max marks

Rubric for CIE & SEE for Integrated Theory courses with Laboratory					
RUBRIC for CIE			***RUBRIC for SEE***		
SL.NO	**Contents**	**Marks**	**Q.NO**	**Contents**	**Marks**
1	QUIZZES – Q1 & Q2	20	Every unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit [unit 1 to 5]		
2	TESTS – T1 & T2	50	1 & 2	Unit 1:Question 1 or 2	20
3	Experiential Learning – EL1 & EL2	30	3 & 4	Unit 2: Question 3 or 4	20
4	Laboratory	50	5 & 6	Unit 3:Question 5 or 6	20
	Total Marks	**150**	7 & 8	Unit 4:Question 7 or 8	20
			9 & 10	Unit 5:Question 9 or 10	20
				Theory Exam Marks	**100**
				Laboratory Exam Marks	**50**
				Total Marks	**150**

SEMESTER: II					
2D & 3D MODELING (Theory and Practice)					
Course Code	**:**	**22MCA254TL**	**CIE**	**:**	**100 + 50 Marks**
L:T:P	**:**	**4:0:1**	**SEE**	**:**	**100 + 50 Marks**
Total Hours	**:**	**52L+26P**	**SEE Duration**	**:**	**3.00 Hours**

UNIT–I	10 Hrs
Conventions and Standards: Standard sizes of drawing sheets, Lines, Dimensioning terms and notations, general rule for dimensioning, Scales, conventions for materials, simple geometrical constructions (Regular Polygons), perspective projection, orthographic projection, bill of materials	
Unit–II	**10 Hrs**
Orthographic reading and conversion of views: Conversion of pictorial views into orthographic view, screws and threads, riveted joints and welding joints. **Computer aided modeling and drafting (Solidworks):** Terminology, User Interface, Design Process, Design Method, Sketches, Part modeling, Assembly: Assembly Design Methods, Mates, Drawings: Drawing documents	
UNIT –III	**12 Hrs**
Understanding the interface: Interacting with interface, Editors - Workspaces – Themes, Objects in 3D view editor, Editing objects, Editing tools **Modifiers:** Editing with generate modifiers, Editing with deform modifiers **Editing Techniques**: Examples, The Outliners and collections,3D text, Viewport shading, Scene lighting and cameras Examples, The Outliners and collections,3D text, Viewport shading, Scene lighting and cameras	
UNIT –IV	**10 Hrs**
Materials textures nodes, Textures, Rendering, Animation, Constraints	
UNIT –V	**10 Hrs**
Physics and simulation, Particle system, Armature and character rigging, Installing Add-Ons, Making a movie, Cycles and workbench render	

LABORATORY	
1.	Practice lab- General Interface introduction and playing with shapes
2.	Custom 3D object Creation
3.	Color shading/Texturing the object
4.	Custom logo
5.	Develop Animating logo
6.	Explosive product animation
7.	Record explosive product animation from different angles using "Render Animation"
8.	Terrain for natural forest with camp
9.	Baking rain animation and fire camp animation
10.	Rigging an armature to human character with dancing animation

Course Outcomes: After going through this course, the student will be able to	
CO1	Understand the basic concept of 2D and 3D modeling
CO2	Outline the components of models using basic geometric principle
CO3	Apply the constructs to easily modify models and implement design changes
CO4	Analyze the design constraints and the design intent of the model

Reference Books	
1.	N D Bhatt, Engineering drawing, fiftieth edition, Charotar Publishing House, 2011, ISBN 978-80358-17-8
2.	Dassault Systèmes, Introducing Solidworks, Dassault Systèmes S.A. company, 175 Wyman Street, Waltham, Mass. 02451 USA. All Rights Reserved.1995-2014
3.	John M. Blain, The Complete Guide to Blender Graphics Computer Modeling & Animation,7th Edition, 2022, ISBN 9781003226420, A K Peters/CRC Press
4.	Romain Caudron, Pierre-Armand Nicq, Enrico Valenza, Blender 3D: Designing Objects,2016, Packt Publishing Ltd, ISBN 978-1-78712-719-7

Scheme of Continuous Internal Evaluation (CIE) Theory: 20 + 50 + 30 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. Final test marks will be reduced to 50 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (30), Video based seminar/presentation/demonstration (30) adding upto 60 marks. Final EL marks will be reduced to 30 Marks.

Laboratory (CIE): 40 + 10 = 50

Conduction of laboratory exercises, Lab report & observation & analysis (50 Marks), Lab Test (50 Marks), adding up to 100 marks. Final marks will be reduced to 40 & Innovative Experiment/Concept Design & Implementation (10 Marks) adding up to 50 Marks.

Scheme of Semester End Examination (SEE) Theory for 100 marks:

The question paper will have FIVE full questions with internal choice from each unit. Each question will carry 20 marks. Student will have to answer one full question from each unit**.**

Scheme of Semester End Examination (SEE) Laboratory for 50 marks :

SEE for practical will be jointly conducted and evaluated by two examiners. The duration of practical examination is 3 hours and is evaluated for 50 marks. The break up for conduction of practical examination is (i) Procedure and Write up : 20% of max marks, (ii) Conducting the practical: 60% of max marks, (iii) Viva Voce: 20% of max marks

Rubric for CIE & SEE for Integrated Theory courses with Laboratory					
RUBRIC for CIE			***RUBRIC for SEE***		
SL.NO	**Contents**	**Marks**	**Q.NO**	**Contents**	**Marks**
1	QUIZZES – Q1 & Q2	20	Every unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit [unit 1 to 5]		
2	TESTS – T1 & T2	50	1 & 2	Unit 1:Question 1 or 2	20
3	Experiential Learning – EL1 & EL2	30	3 & 4	Unit 2: Question 3 or 4	20
4	Laboratory	50	5 & 6	Unit 3:Question 5 or 6	20
	Total Marks	**150**	7 & 8	Unit 4:Question 7 or 8	20
			9 & 10	Unit 5:Question 9 or 10	20
				Theory Exam Marks	**100**
				Laboratory Exam Marks	**50**
				Total Marks	**150**

SEMESTER:II					
DEVOPS (Theory)					
Course Code	**:**	**22MCA261T**	**CIE**	**:**	**100 Marks**
Credits: L:T:P	**:**	**3:1:0**	**SEE**	**:**	**100 Marks**
Total Hours	**:**	**39L+ 26T**	**SEE Duration**	**:**	**3.00 Hours**

UNIT–I	08 Hrs
Docker Fundamentals: Discovering Docker, the what and why of Docker, Building a Docker application. Understanding Docker - Docker's architecture, The Docker daemon, The Docker client, Docker registries, The Docker Hub	
UNIT–II	**08 Hrs**
Docker and Development: Using Docker as a lightweight virtual machine - From VM to container, Saving and restoring your work, Environments as processes, Building images, Running containers	
UNIT–III	**08 Hrs**
Docker and DevOps: Continuous integration - Docker Hub automated builds, Containerizing your CI process. Continuous delivery - Interacting with other teams in the CD pipeline	
UNIT–IV	**07 Hrs**
First steps with Docker and Kubernetes: Creating, running, and sharing a container image, Setting up a Kubernetes cluster, Running the first app on Kubernetes	
UNIT–V	**08 Hrs**
Pods: Introducing Pods, Creating pods from YAML or JSON descriptors, Organizing pods with labels, Listing subsets of pods through label selectors, Annotating pods, Using namespaces to group resources, Stopping and removing pods	

Course Outcomes: After going through this course, the student will be able to	
CO1	Understand of Docker basics, installation and learn to work with containers
CO2	Use containers and move applications across environments with continuous integration and delivery
CO3	Leverage Docker to perform automated builds and make Kubernetes to work on container images
CO4	Explore the Kubernetes architecture to set up and use entire lifecycle-based clusters and pods

Reference Books	
1.	Ian Miell, Aidan Hobson Sayers, "Docker in Practice", Manning Publications, 2nd Edition, 2019, ISBN–9781617294808
2.	Marko Lukša, "Kubernetes in Action", Manning Publications, 2nd Edition, 2018, ISBN–9781617293726
3.	James Turnbull, "The Docker Book", Turnbull Press, 2nd Edition, 2017, ISBN–9780988820203
4.	Brendan Burns, Joe Beda, and Kelsey Hightower, "Kubernetes: Up and Running", 2nd Edition, 2019, ISBN–978-1-492-04653-0

Scheme of Continuous Internal Evaluation (CIE): 20 + 50 + 30 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. Final test marks will be reduced to 50 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (30), Video based seminar/presentation/demonstration (30) adding up to 60 marks. Final EL marks will be reduced to 30 Marks.

Scheme of Semester End Examination (SEE) for 100 marks:

The question paper will have FIVE full questions with internal choice from each unit. Each question will carry 20 marks. Student will have to answer one full question from each unit...

Rubric for CIE & SEE Theory courses

RUBRIC for CIE			***RUBRIC for SEE***		
SL.NO	**Contents**	**Marks**	**Q.NO**	**Contents**	**Marks**
1	QUIZZES – Q1 & Q2	20	Every unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit [unit 1 to 5]		
2	TESTS – T1 & T2	50	1 & 2	Unit 1:Question 1 or 2	20
3	Experiential Learning – EL1 & EL2	30	3 & 4	Unit 2:Question 3 or 4	20
	Total Marks	**100**	5 & 6	Unit 3:Question 5 or 6	20
			7 & 8	Unit 4:Question 7 or 8	20
			9 & 10	Unit 5:Question 9 or 10	20
				Total Marks	**100**

SEMESTER: II					
ADVANCED COMPUTER NETWORKS (Theory)					
Course Code	**:**	**22MCA262T**	**CIE**	**:**	**100 Marks**
Credits: L:T:P	**:**	**3:1:0**	**SEE**	**:**	**100 Marks**
Total Hours	**:**	**39L+ 26T**	**SEE Duration**	**:**	**3.00 Hours**

UNIT–I	**08 Hrs**
Introduction to Internet Protocol and Classless and Subnet Address Extension (CIDR) **Wireless LANS and PANS** : Fundamentals of WLAN's, 802.11 Standards, HIPERLAN Standard, Bluetooth specifications, Transport Protocol group, ZigBee Specification Wireless WANS and MANS – The Cellular Concept and Cellular Architecture- Capacity enhancement .Channel Allocation Algorithms	
UNIT–II	**08 Hrs**
Mobile IP : Introduction, Mobility, Routing and Addressing, Mobile IP Characteristics, Overview of Mobile IP Operations, Mobile Addressing Details, Foreign Agent Discovery, Agent Registration, registration message format, communication with a foreign agent, datagram transmission and reception, two- crossing problem, communication with computers on the home network Private	
UNIT–III	**07 Hrs**
Parallel and Distributed Systems: Level of Parallel Computing, challenges in handling concurrency, Distributed Systems, characteristics, properties, design goals, Types of distributed systems. **Virtualization:** Introduction, Hardware virtualization, Hypervisors, Network function virtualization, **Implementation:** Installing the virtualization packages, Creating virtual machines, Network configuration	
UNIT–IV	**08 Hrs**
SDN: Introduction, Centralized and Distributed Control and Data Planes- Introduction, Control plane, Data plane, Moving Information Between Planes, Distributed Control Planes, IP and MPLS, Convergence Time, Load Balancing, High Availability	
UNIT–V	**08 Hrs**
Cloud computing: Introduction, Characteristics of Cloud Computing, Cloud Models, Cloud Service Examples, Load Balancing, Scalability & Elasticity, Deployment, Replication, Monitoring, **Cloud Application Design:** Design characteristics for cloud application, Reference architecture for cloud application, Cloud application design methodologies	

Course Outcomes: After going through this course, the student will be able to	
CO1	Understand the advanced networking concepts
CO2	Identify the various advances in networking
CO3	Analyse the advances in networking for cloud computing
CO4	Apply advanced networking concepts in cloud

Reference Books	
1.	C. Siva Ram Murthy, B. S. Manoj, Ad Hoc Wireless Networks Architecture and Protocols, Pearson Publication, 2011, ISBN 978–81-317-5905-9
2.	Douglas E Comer, Internetworking with TCP/IP, Pearson Education India, 6th Edition, 2015, ISBN: 978-9332550100
3.	Maarten van Steen and Andrew S.Tanenbaum, Distributed systems, Pearson Education, 3rd Edition, 2017, ISBN: 978-90-815406-2-9
4.	Arshadeep Bahga, Vijay Madisetti, Cloud Computing A Hands-On Approach, University Press, 2014, ISBN: 9788173719233

Scheme of Continuous Internal Evaluation (CIE): 20 + 50 + 30 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. Final test marks will be reduced to 50 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (30 marks), Video based seminar/presentation/demonstration (30 marks) adding upto 60 marks. Final EL marks will be reduced to 30 Marks.

Scheme of Semester End Examination (SEE) for 100 marks:

The question paper will have FIVE full questions with internal choice from each unit. Each question will carry 20 marks. Student will have to answer one full question from each unit.

Rubric for CIE & SEE Theory courses

RUBRIC for CIE			***RUBRIC for SEE***		
SL.NO	**Contents**	**Marks**	**Q.NO**	**Contents**	**Marks**
1	QUIZZES – Q1 & Q2	20	Every unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit [unit 1 to 5]		
2	TESTS – T1 & T2	50	1 & 2	Unit 1:Question 1 or 2	20
3	Experiential Learning – EL1 & El2	30	3 & 4	Unit 2:Question 3 or 4	20
	Total Marks	**100**	5 & 6	Unit 3:Question 5 or 6	20
			7 & 8	Unit 4:Question 7 or 8	20
			9 & 10	Unit 5:Question 9 or 10	20
				Total Marks	**100**

SEMESTER:II					
CRYPTOGRAPHY AND NETWORK SECURITY (Theory)					
Course Code	**:**	**22MCA263T**	**CIE**	**:**	**100 Marks**
Credits: L:T:P	**:**	**3:1:0**	**SEE**	**:**	**100 Marks**
Total Hours	**:**	**39L+ 26T**	**SEE Duration**	**:**	**3.00 Hours**

UNIT–I	**08 Hrs**
Introduction: Computer Security Concepts, OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security. Case study **Classic Encryption Technique-** Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography.	
UNIT–II	**07 Hrs**
Block Ciphers and the Data Encryption Standard: Traditional Block Cipher Structure, The Data Encryption Standard, A DES Example, The Strength of DES, Block Cipher Design Principles **Tools:** NMAP, Wire shark	
UNIT–III	**08 Hrs**
Advanced Encryption Standard: Finite Field Arithmetic, AES Structure, AES Transformation Functions. **Public-Key Cryptography and RSA:** Principles of Public-Key Cryptosystems, The RSA Algorithm, Diffie-Hellman Key Exchange, Message Authentication **Tools:** OWASP	
UNIT–IV	**08 Hrs**
Cryptographic Hash Functions: Applications, Two Simple hash Functions, Requirements and Security. Digital Signatures, Elliptic Curve Digital Signatures Algorithm. **Network Security:** Email, PGP, S/MIME, SSL architecture, handshake protocol, change cipher spec protocol.	
UNIT–V	**08 Hrs**
Network Security: Transport layer security. IPSecurity, security policy, Internet key exchange Wireless Security, Mobile Device security **Contemporary Issues and Trends** : Case Study	

Course Outcomes: After going through this course, the student will be able to	
CO1	Understand the basics of Cryptography and Network Security standards.
CO2	Understand public-key cryptography, RSA and other public-key cryptosystems
CO3	Analyse and design algorithms and digital signatures
CO4	Build for the key management, distribution schemes and design

Reference Books	
1.	William Stallings, "Cryptography and Network Security-Principles and Practice" Pearson, 7th Global Edition, 2017, ISBN 13: 978-1-292-15858-7.
2.	Behrouz A. Forouzan "Introduction to Cryptography and Network Security", McGraw-Hill Forouzan Networking Series, 2008, ISBN 978–0–07–287022–0
3.	Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Wiley Publications, 2003, ISBN 0-470-85285-2 2.
4.	Charlie Kaufman and Radia Perlman, Mike Speciner, "Network Security, 2nd Edition, Private Communication in Public World", PHI, 2002, ISBN-13: 978-0130460196

Scheme of Continuous Internal Evaluation (CIE): 20 + 50 + 30 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

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EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (30 marks), Video based seminar/presentation/demonstration (30 marks) adding upto 60 marks. Final EL marks will be reduced to 30 Marks.

Scheme of Semester End Examination (SEE) for 100 marks:

The question paper will have FIVE full questions with internal choice from each unit. Each question will carry 20 marks. Student will have to answer one full question from each unit.

Rubric for CIE & SEE Theory courses

RUBRIC for CIE			***RUBRIC for SEE***		
SL.NO	**Contents**	**Marks**	**Q.NO**	**Contents**	**Marks**
1	QUIZZES – Q1 & Q2	20	Every unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit [unit 1 to 5]		
2	TESTS – T1 & T2	50	1 & 2	Unit 1:Question 1 or 2	20
3	Experiential Learning – EL1 & EL2	30	3 & 4	Unit 2:Question 3 or 4	20
	Total Marks	**100**	5 & 6	Unit 3:Question 5 or 6	20
			7 & 8	Unit 4:Question 7 or 8	20
			9 & 10	Unit 5:Question 9 or 10	20
				Total Marks	**100**

SEMESTER:II					
DIGITAL MARKETING (Theory)					
Course Code	**:**	**22MCA264T**	**CIE**	**:**	**100 Marks**
Credits: L:T:P	**:**	**3:1:0**	**SEE**	**:**	**100 Marks**
Total Hours	**:**	**39L+ 26T**	**SEE Duration**	**:**	**3.00 Hours**

UNIT–I	07 Hrs
Introduction to Digital Marketing: Evolution of Digital Marketing from traditional to modern era, Role of Internet; Current trends, Info graphics, implications for business & society; Emergence of digital marketing as a tool; Drivers of the new marketing environment; Digital marketing strategy; Paid, Owned, Earned Media framework, Digital landscape, Digital marketing plan, Digital marketing models. Careers in Digital Marketing, Case studies	
UNIT–II	**07 Hrs**
Internet Marketing and Digital Marketing Mix: Internet Marketing, opportunities, and challenges; Digital marketing framework; Digital Marketing mix, Impact of digital channels on IMC; **Search Engine Advertising**- Pay for Search Advertisements, Ad Placement, Ad Ranks, Creating Ad Campaigns, Campaign Report Generation Display marketing- Types of Display Ads - Buying Models - Programmable Digital Marketing - Analytical Tools - YouTube marketing. Case studies	
UNIT–III	**10 Hrs**
Social Media Marketing: Role of Influencer Marketing, Tools & Plan– Introduction to social media platforms, penetration & characteristics; Building a successful social media marketing strategy Facebook Marketing: - Business through Facebook Marketing: Creating Advertising Campaigns, Adverts, Facebook Marketing Tools LinkedIn Marketing: Introduction and Importance of LinkedIn Marketing, Framing LinkedIn Strategy, Lead Generation through LinkedIn, Content Strategy, Analytics and Targeting and Mobile Marketing: Mobile Advertising, Forms of Mobile Marketing, Features, Mobile Campaign Development, Mobile Advertising Analytics Introduction to social media metrics. Case studies	
UNIT–IV	**08 Hrs**
Search Engine Optimization (SEO): Web Analytics, Mobile Marketing, Trends in Digital Advertising–Introduction and need for SEO, how to use Internet & search engines; search engine and its working pattern, On-page and off-page optimization, SEO Tactics - SEM Web Analytics - Google Analytics and Google Ad Words; data collection for web analytics, multichannel attribution, Universal analytics, Tracking code Trends in digital advertising. Case studies	
UNIT–V	**07 Hrs**
Social Media Strategy: Introduction, Key terms, and concepts. Using social media to solve business challenges. Step-by-step guide to creating a social media strategy. Documents and processes. Dealing with opportunities and threats. Step-by-step guide for recovering from an online brand attack. Social media risks and challenges. Case studies	

Course Outcomes: After going through this course, the student will be able to	
CO1	Understand Digital marketing theories and practices
CO2	Foster Analytical and critical thinking abilities for decision making
CO3	Build global and economical communication strategies for E-marketing
CO4	Analyse, communicate global, economic aspects of E-marketing

Reference Books	
1.	Seema Gupta "Digital Marketing" Mc-Graw Hill ISBN:978-9355320407 1st Edition, 2022
2.	Nitin C. Kamat, Chinmay Nitin Kamat," Digital Social Media Marketing", Himalaya Publishing House Pvt. Ltd. Latest Edition
3.	Ian Dodson, "The Art of Digital Marketing" Wiley Latest Edition
4.	Damian Rayan, "Marketing Strategies for Engaging the Digital Generation", Brilliance Audio 4th Edition,2016978-0749453893.

Scheme of Continuous Internal Evaluation (CIE): 20 + 50 + 30 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding up to 100 Marks. Final test marks will be reduced to 50 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (30 marks), Video based seminar/presentation/demonstration (30 marks) adding upto 60 marks. Final EL marks will be reduced to 30 Marks.

Scheme of Semester End Examination (SEE) for 100 marks:

The question paper will have FIVE full questions with internal choice from each unit. Each question will carry 20 marks. Student will have to answer one full question from each unit.

Rubric for CIE & SEE Theory courses

RUBRIC for CIE			***RUBRIC for SEE***		
SL.NO	**Contents**	**Marks**	**Q.NO**	**Contents**	**Marks**
1	QUIZZES – Q1 & Q2	20	Every unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit [unit 1 to 5]		
2	TESTS – T1 & T2	50	1 & 2	Unit 1:Question 1 or 2	20
3	Experiential Learning – EL1 & EL2	30	3 & 4	Unit 2:Question 3 or 4	20
	Total Marks	**100**	5 & 6	Unit 3:Question 5 or 6	20
			7 & 8	Unit 4:Question 7 or 8	20
			9 & 10	Unit 5:Question 9 or 10	20
				Total Marks	**100**

SEMESTER: II					
DESIGN THINKING (Practice)					
Course Code	**:**	**22MCA27L**	**CIE**	**:**	**50 Marks**
Credits: L:T:P	**:**	**0:0:2**	**SEE**	**:**	**50 Marks**
Total Hours	**:**	**52P(26 contact hrs+ 26 Non-contact hrs)**	**SEE Duration**	**:**	**3.00 Hours**

STAGE–I
Empathy: The Empathy phases of the process are focused on understanding the experiences, emotions and motivations of others. Designers use specific empathy methods to learn more about the needs of the users for whom they are designing. **Methods:** Interviewing Probes and Observations.
STAGE–II
Define: The Define phase of the process is focused on developing a point of view about the need of your user. During this stage of process, designers narrow from lots of information to a statement that is inspiring and specific **Methods:** Empathy Mapping, Point of View.
STAGE–III
Ideate: The Ideate phase of the process is focused on generating as many solutions to a problem as possible. Once many solutions have been generated, students will select one to move forward to prototyping **Methods :** Brainstorming and Selection
STAGE–IV
Prototype: The Prototype phase is where designers construct representation of their solutions. These representations are intended to elicit feedback and answer specific questions about a concept. **Methods :** Improve, Rapid and Experiential Prototyping
STAGE–V
Test: The Test phase of the process is focused on getting specific feedback about how ideas can improve. It is important to remember during this phase that prototypes are imperfect but feedback is gift. **Methods:** Testing

Course Outcomes: After going through this course, the student will be able to	
CO1	Learn to use different modes of thinking to understand the problem instead of finding answers/solutions for questions/problems
CO2	Acquire adductive reasoning to find new problems
CO3	Sow the seed of creativity to look for innovative solutions for a problem
CO4	Adopt human centric approaches while developing new solutions, products or services.

Guidelines for Design Thinking Lab:	
1.	The Design Thinking Lab (DTL) is to be carried out by a team of two-three students.
2.	Each student in a team must contribute equally in the tasks mentioned below
3.	Each group has to select a theme that will provide solutions to the challenges of societal concern. The topics should be in line with the Sustainable Development Goals (SDG)
4.	The above five stages specified will be evaluated in three phases
5.	For every Phase of evaluation, the committee constituted by the department along with the coordinators would evaluate for CIE. The committee shall consist of respective coordinator & two senior faculty members as examiners. The evaluation will be done for each student separately.
6.	The team should prepare a Digital Poster and a report should be submitted after incorporation of any modifications suggested by the evaluation committee.

Scheme of Continuous Internal Examination (CIE)

Evaluation of the work will be done by the committee appointed by the director, Dept of MCA. The student should submit report on the Case Study.

Evaluation will be carried out in THREE Phases.

Phase	Activity	Marks
I	Phase I	10
II	Phase II	15
III	Phase III	25

Scheme for Semester End Examination (SEE)

The evaluation will be done by Internal and External examiners. The following weightage would be given for the examination.

1	Written presentation of synopsis: Write up	05 Marks
2	Presentation / Demonstration of the project Idea / Solution	15 Marks
3	Demonstration of the Prototype	20 Marks
4	Viva- Voce	05 Marks
5	Report	05 Marks

Curriculum Design Process

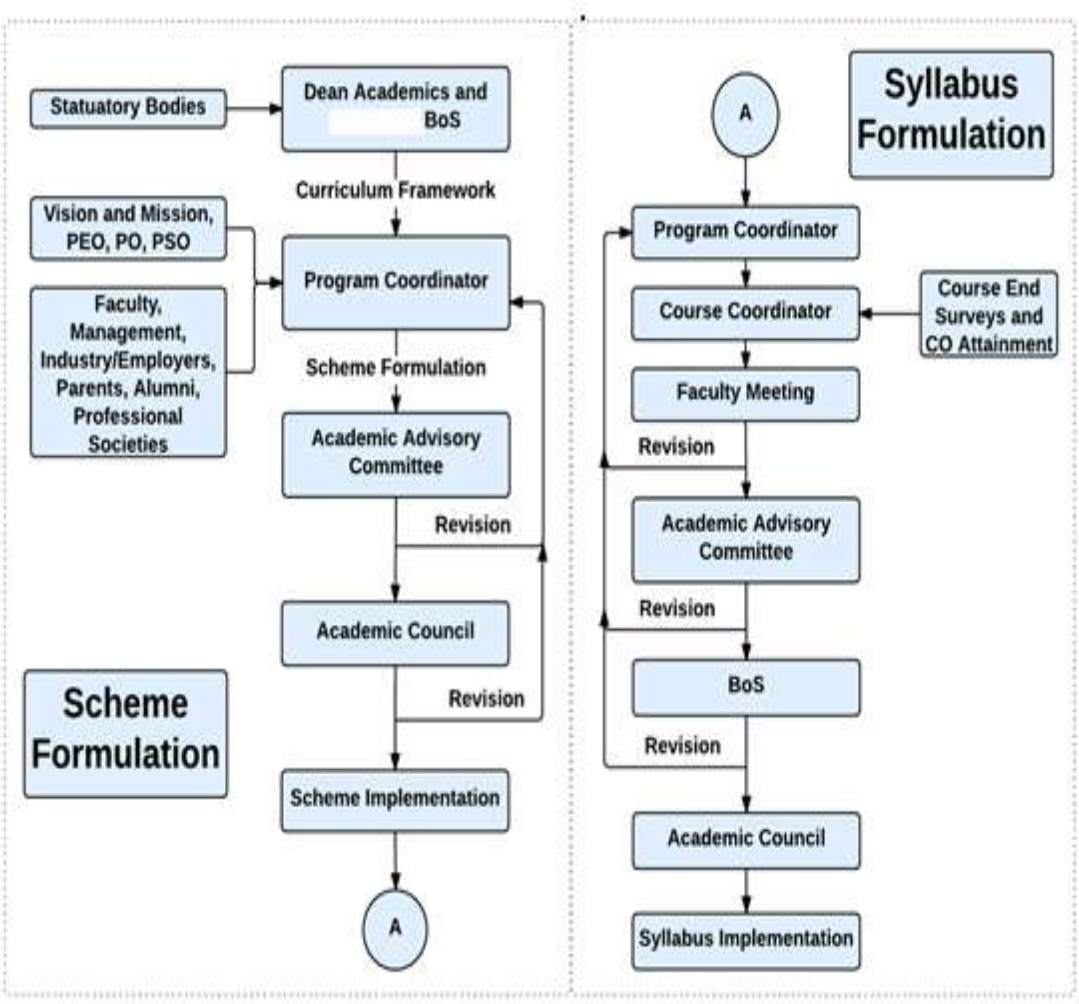

Figure 1: Curriculum Design Process

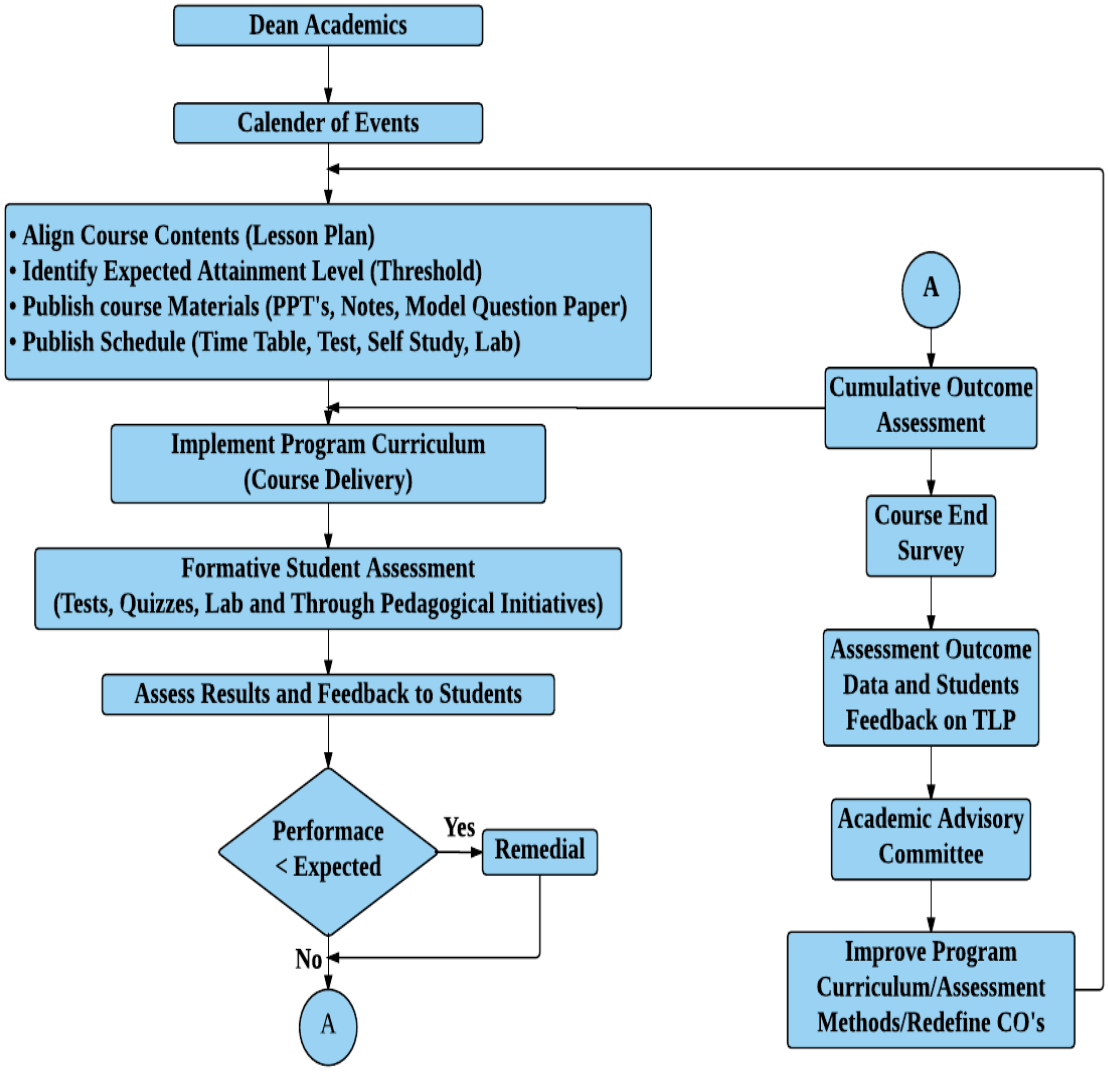

Figure 2: Academic Planning and Implementation

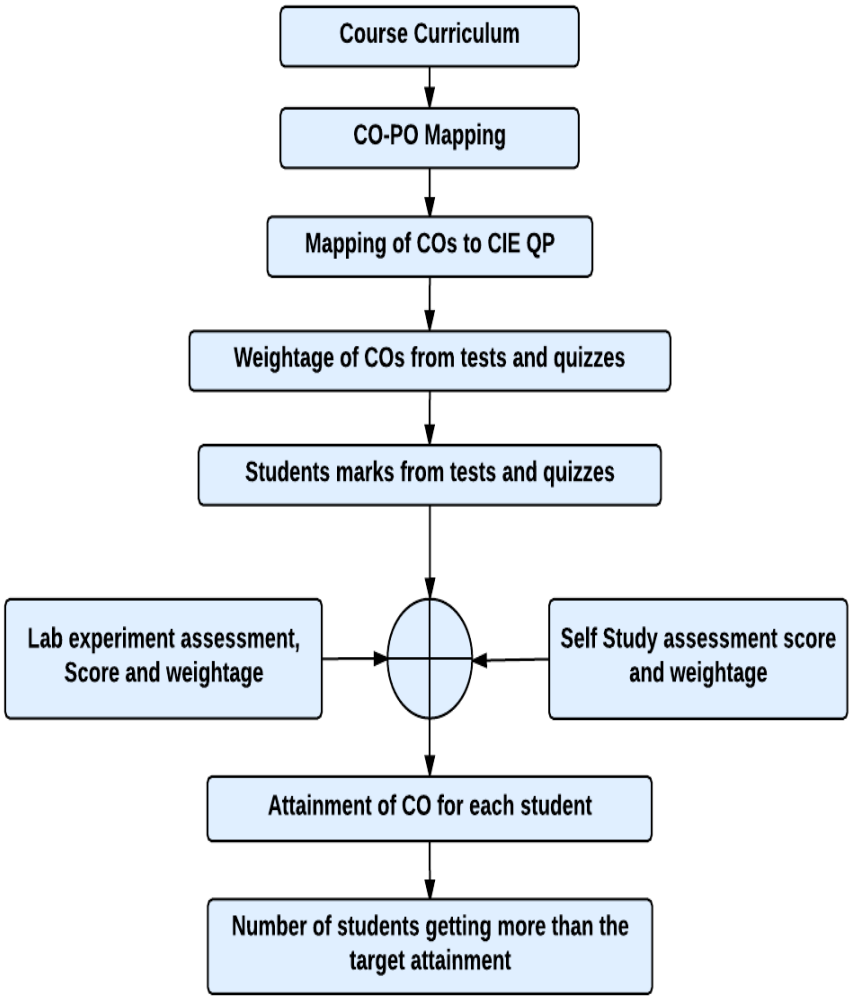

Figure 3: Process for Course Outcome Attainment

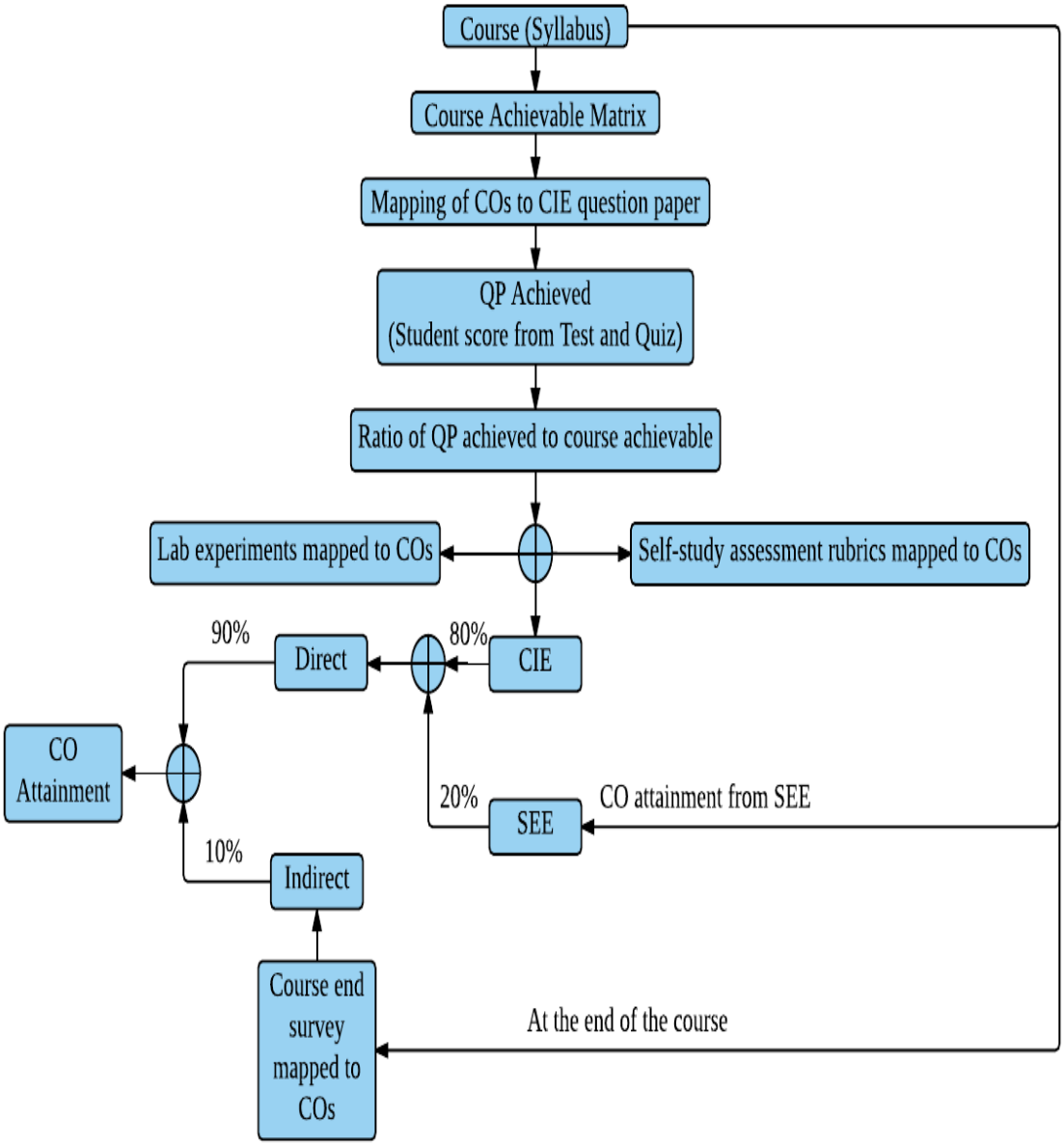

Figure 4: Final CO Attainment Process

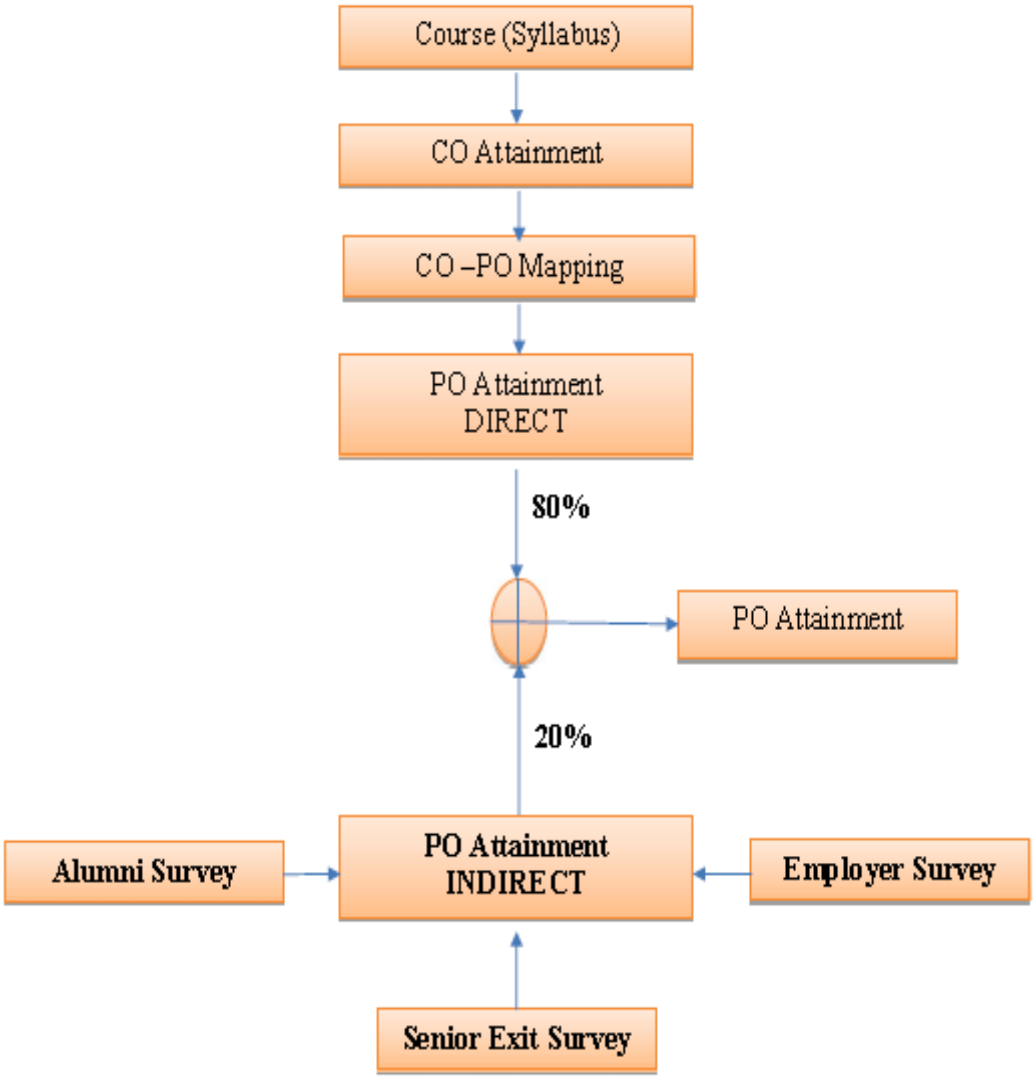

Figure 5: Program Outcome Attainment Process

PROGRAMME OUTCOMES (PO)

MCA Graduates will be able to:

PO1 **Computational Knowledge:** Acquire in-depth computational knowledge and mathematics with an ability to abstract and conceptualize models from defined problems and requirements

PO2 **Problem Analysis:** Identify, formulate, conduct literature survey and solve complex computing problems through analysis as well as provide optimal solutions

PO3 **Design / Development of Solutions:** Design and evaluate solutions for complex problems, components or processes that meet specified needs after considering public health and safety, cultural, societal, and environmental factors

PO4 **Conduct investigations of complex Computing problems:** Conduct literature survey to analyze and extract information relevant to unfamiliar problems and synthesize information to provide valid conclusions and interpret data by applying appropriate research methods, tools and design experiments

PO5 **Use of Modern Tool**: Create, select, adapt and apply appropriate techniques, resources, and modern IT tools to complex computing system activities, with an understanding of the limitations

PO6 **Professional Ethics:** Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practices

PO7 **Life-long Learning:** Engage in lifelong learning independently for continual development to improve knowledge and competence as a computing professional

PO8 **Project management and finance:** Demonstrate knowledge and understanding of management principles and apply these to multidisciplinary software development as a team member and manage projects efficiently as a leader considering economical and financial factors

PO9 **Communication Efficacy:** Understand and communicate effectively with the computing community and with society at large, regarding complex computing systems activities confidently and effectively by writing effective reports and design documentations by adhering to appropriate standards, make effective presentations and give / receive clear instructions

PO10 **Societal and Environmental Concern:** Understand responsibilities and consequences based on societal, environmental, health, safety, legal and cultural issues within local and global contexts relevant to professional computing practices

PO11 **Individual and Team Work:** Function effectively as an individual, as a member or leader in diverse teams in multidisciplinary environments

PO12 **Innovation and Entrepreneurship:** Identify a timely opportunity for entrepreneurship and use innovation to pursue and create value addition for the betterment of the individual and society at large