RV College of Engineering®

Master of Computer Applications (MCA)

Scheme and Syllabus of III & IV Semester
(2024 Scheme)

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.	I	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

RV College of Engineering®
Mysore Road, RV Vidyaniketan Post,
Bengaluru - 560059, Karnataka, India

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RV COLLEGE OF ENGINEERING®

(Autonomous Institution Affiliated to VTU, Belagavi)

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.	MCA261IA	Full Stack Application Development	3	0	1	**4**	MCA	Theory+Lab	1.5	100+50	3	100+50
2.	MCA262IA	DevOps Automation	3	0	1	**4**	MCA	Theory+Lab	1.5	100+50	3	100+50
3.	MCA263DX	Professional Elective Course (Group-D)	3	0	0	**3**	MCA	Theory	1.5	100	3	100
4.	MCA461P	Minor Project	0	0	3	**3**	MCA	Lab	1.5	50	3	50
5.	MCA462N	*Industry Internship/Research Internship/ Projects in CoEs	0	0	6	**6**	MCA	Internship	1.5	100	1.5	100
Total Credits						**20**						

*To be undertaken after completion of 2nd sem and before commencement of 3rd semester (6 weeks duration)

List of Professional Electives: III Semester

SL No	Course Code	Elective - A
1.	MCA263D1	Advanced IoT
2.	MCA263D2	Deep Learning
3.	MCA263D3	Advanced Computer Networks
4.	MCA263D4	Principles UI/UX Design

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MASTER OF COMPUTER APPLICATIONS

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.	MCA491P	Major Project	0	0	14	**14**	MCA	Lab	1.5	50	2	100
2.	MCA492L	Technical Seminar	0	0	1	**1**	MCA	Lab	1.5	50	2	50
3.	MCA293EX	Professional Elective Course (Group-E)	3	0	0	**3**	MCA	Theory	1.5	100	3	100
		Total Credits				**18**						

List of Professional Electives: IV Semester

SL No	Course Code	Elective - B
1.	MCA293E1	Digital Marketing
2.	MCA293E2	AI in Practice
3.	MCA293E3	IT Security
4.	MCA293E4	Project Management

SEMESTER: III						
Course Code	:	MCA261IA	**Full Stack Application Development**	CIE Marks	:	100 +50
Credits L-T-P	:	3-0-1	*(Theory & Practice)*	SEE Marks	:	100 + 50
Hours	:	45L + 30P	*(Professional Elective Course with Integrated Lab) -1*	SEE Duration	:	3 Hours
Faculty Coordinator:						

UNIT - I	**9 Hours**

Introduction to Full Stack Development: Understanding Full Stack Development, Technologies associated with Full Stack

Introduction to the MERN stack: Introduction, The MVC architectural Pattern, MERN Components React, Node.js, Express, MongoDB, Advantages of MERN, Isomorphic;

Node.js - event-driven programming, JavaScript closures Node modules, Common JS modules, Node.js core modules, Node.js third-party modules, Node.js file modules Developing Node.js web application, connecting and mounting middleware;

Building Express Web Application - Introduction to Express, Installing Express, Creating your first Express application, The application, request and response objects- The application object, The request object, The response object, External middleware

UNIT - II	**9 Hours**

Understanding React and Web Server: Server setup, NVM Node JS, Project, NPM, Express, Build time JSX compilation- Separate Script File, Transform, Automate, React Library, React Components-React classes, Composing components, passing data- using properties, property validation, using children's Dynamic composition;

Understanding React State: React State: Setting state, Event handling, communicating from child to parent, Stateless components, Designing Components-state vs props, component hierarchy communication, Stateless components

UNIT - III	**9 Hours**

Introduction to MongoDB: Introduction to NoSQL, Introducing MongoDB, MongoDB sharding,

MongoDB CRUD operations-Creating a new document, Creating a document using insert(), Creating a document using update(), Creating a document using save();

Introduction to Mongoose-Introducing Mongoose ,Connecting to MongoDB, Understanding Mongoose schemas, Creating the user schema and model, Registering the User model, Creating new users using save(), Finding multiple user documents using find(), Reading a single user document using find One(), Updating an existing user document Deleting an existing user document;

Extending your Mongoose schema- Defining default values, Using schema modifiers, Predefined modifiers, Custom setter modifiers, Custom getter modifiers

UNIT - IV	**9 Hours**

Building RESTful APIs and Mongo DB: REST , HTTP method as Actions, JSON, Express, Routing Hander function , Request Object, Response objects, Middleware, The list API , The create API, Using the LIST API, Using the Create API, Error Handling

UNIT - V	**9 Hours**

Working with React Router and forms: Routing Techniques, Simple Routing, Route parameters, Route Query String, Programmatic Routing, Nested Routes, Browser history, Forms, Filter form, Get API, Edit page, UI Components, update API, Delete API.

LABORATORY / PRACTICE COMPONENT

1.Demonstrate Node .Js Application to perform CRUD operation for online Book Cart
2. Write a node.js program using Express framework to accept user name, Branch, Semester, from web page and display the information as below
   a) Handle both get and post methods
   b) Branch should be underlined
   c) Name should be in bold face.
3. Design a resume of a job aspirant using React components like Classes and Functions. Style the resume by applying CSS
4. Build student registration portal using Entities like component, state and props
5.Design and implement a React Form that collects user input for name, email, and password. Validate the form using Regular Expression.
6. Deploy connectivity between React and Node Application for Inventory Management system
7. Develop a MongoDB query for comparison selectors, Logical Selectors for Company database
8.Execute aggregation pipeline and its operation to illustrate text search on catalog data collection
9.Design an employee Management system using RESTFULL APIs in React
10. Create a React application using `react-router-dom` with multiple pages (Home, About, Contact).

Course Outcomes:

After going through this course the student will be able to:

CO1	:	Demonstrate the core concepts of the Model-View-Controller (MVC) architecture and its role in structuring web applications
CO2	:	Apply the MVC pattern in building applications using the MERN stack components
CO3	:	Design and develop full-stack web applications using the MERN stack
CO4	:	Analyze the structure and functionality of web applications by implementing the MVC framework using the MERN stack

Reference Books

1.Subramanian, V. (2019). *Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node* (2nd ed.). Apress. ISBN: 9781484243904

2.Hoque, S. (2022). *Full-Stack React Projects: Learn MERN Stack Development by Building Modern Web Apps Using MongoDB, Express, React, and Node.js* (2nd ed.). Packt Publishing. ISBN: 9781801070636

3.Ackermann, P. (2023). *Full Stack Web Development: The Comprehensive Guide* (Rheinwerk Computing). Rheinwerk Computing. ISBN: 9783969108830

4.Osmani, A. (2023). *Learning JavaScript Design Patterns: A JavaScript and React Developer's Guide* (2nd ed.). O'Reilly Media. ISBN: 9781098139872

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (CIE-Theory)

CIE will consist of TWO Quizzes (Q), TWO Tests (T), and ONE Experiential Learning (EL) component **[20 (Q) + 40 (T) + 40 (EL) = 100 marks]**

Sl.No.	COMPONENTS	MARKS
1.	**QUIZZES:** Quizzes will be conducted in online/offline mode. **TWO QUIZZES** will be conducted & each Quiz will be evaluated for 10 marks, and Final Quiz marks adding up to 20 marks. **THE SUM OF TWO QUIZZES WILL BE CONSIDERED AS FINAL QUIZ MARKS.**	**20**
2.	**TESTS:** Students will be evaluated in test consisting of 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.	**40**

	FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.	
3.	**EXPERIENTIAL LEARNING:** Students will be evaluated for their creativity and practical implementation of the problem. **Phase I (20) & Phase II (20) ADDING UPTO 40 MARKS**.	**40**
	CIE THEORY TOTAL	**100**
RUBRIC FOR CONTINUOUS INTERNAL EVALUATION (CIE-Lab)		
Q.NO.	**CONTENTS**	**MARKS**
1	Conduction of the Experiments & Lab Record	40
2	Lab Test	10
	CIE LAB TOTAL	**50**
	MAXIMUM MARKS FOR THE CIE	**150**
RUBRIC FOR SEMESTER END EXAMINATION (SEE-Theory)		
Q.NO.	**CONTENTS**	**MARKS**
1 & 2	Unit 1: Question 1 or 2	20
3 & 4	Unit 2: Question 3 or 4	20
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
	SEE THEORY TOTAL	**100**
RUBRIC FOR SEMESTER END EXAMINATION (SEE-Lab)		
Q.NO.	**CONTENTS**	**MARKS**
1	Design and Development of Project	10
2	Presentation of working model/simulation results/prototype building	30
3	Viva voce	10
	SEE LAB TOTAL	**50**
	MAXIMUM MARKS FOR THE SEE	**150**

SEMESTER: III						
Course Code	:	MCA262IA	**DevOps Automation**	CIE Marks	:	100+50
Credits L-T-P	:	3-0-1	*(Theory & Practice)*	SEE Marks	:	100+50
Hours	:	45L + 30P	*(Professional Core Course with Integrated Lab)*	SEE Duration	:	03 Hours
Faculty Coordinator:						

UNIT - I	**09 Hours**
The DevOps Culture: Getting started with DevOps **Docker Fundamentals:** Discovering Docker, 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	**09 Hours**
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	**09 Hours**
Docker and DevOps: Continuous Integration - Docker Hub automated builds, containerizing your CI process - Running the Jenkins master within a Docker container. Continuous delivery - Interacting with other teams in the CD pipeline, facilitating deployment of Docker images, Configuring your images for environments, Upgrading running containers	
UNIT - IV	**09 Hours**
First steps with Docker and Kubernetes: Creating, running, and sharing a container image, Setting up a Kubernetes cluster - Running a Local Single-Node Kubernetes Cluster with Minikube, Setting up an alias and command-line completion for kubectl, Running the first app on Kubernetes - Deploying your Node.js app, accessing your web application, The logical parts of your system, Examining what nodes your app is running on, Introducing the Kubernetes dashboard	
UNIT - V	**09 Hours**
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	
LABORATORY	**30 Hours**
1. Build a Docker Container from a Custom Dockerfile 2. Develop a Multi-Stage Dockerfile for Container Orchestration. 3. Code a Dockerized Python Flask or Node.js Application 4. Integrate Git with Docker for Source-Controlled Application Builds 5. Demonstrate CI Integration by Running Jenkins in a Docker Container 6. Deploy an Automated Build Pipeline using Docker Hub 7. Deploy a Web Application to Kubernetes using Minikube 8. Create Kubernetes Pods using YAML Descriptors 9. Organize Kubernetes Pods Using Labels and Namespaces 10.Demonstrate Kubernetes Dashboard and CLI for Cluster Monitoring	

Course Outcomes:		
After going through this course the student will be able to:		
CO1	:	Understand the fundamentals of DevOps and demonstrate the use of Docker for container creation and management.
CO2	:	Build and run Docker containers to simulate virtual environments and enable consistent development workflows.
CO3	:	Develop automated CI/CD pipelines using Jenkins and Docker Hub to streamline integration and deployment processes.
CO4	:	Deploy containerized applications on Kubernetes and manage pods, labels, and namespaces for efficient workload orchestration

Reference Books

1. Gaurav Agarwal, "Modern DevOps Practices: Implement, secure, and manage applications on the public cloud by leveraging cutting-edge tools", Packt Publishing, 2nd Edition, 2024, ISBN–9781805121824
2. Ian Miell, Aidan Hobson Sayers, "Docker in Practice", Manning Publications, 2nd Edition, 2019, ISBN–9781617294808
3. Marko Lukša, "Kubernetes in Action", Manning Publications, 2nd Edition, 2018, ISBN–9781617293726
4. Brendan Burns, Joe Beda, and Kelsey Hightower, "Kubernetes: Up and Running", 2nd Edition, 2019, ISBN–978-1-492-04653-0

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (CIE-Theory)

CIE will consist of TWO Quizzes (Q), TWO Tests (T), and ONE Experiential Learning (EL) component **[20 (Q) + 40 (T) + 40 (EL) = 100 marks]**

Sl.No.	COMPONENTS	MARKS
1.	**QUIZZES:** Quizzes will be conducted in online/offline mode. **TWO QUIZZES** will be conducted & each Quiz will be evaluated for 10 marks, and Final Quiz marks adding up to 20 marks. **THE SUM OF TWO QUIZZES WILL BE CONSIDERED AS FINAL QUIZ MARKS.**	**20**
2.	**TESTS:** Students will be evaluated in test consisting of 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 40 MARKS.**	**40**
3.	**EXPERIENTIAL LEARNING:** Students will be evaluated for their creativity and practical implementation of the problem. **Phase I (20) & Phase II (20) ADDING UPTO 40 MARKS**.	**40**
	CIE THEORY TOTAL	**100**

RUBRIC FOR CONTINUOUS INTERNAL EVALUATION (CIE-Lab)

Q.NO.	CONTENTS	MARKS
1	Conduction of the Experiments & Lab Record	40
2	Lab Test	10
	CIE LAB TOTAL	**50**
	MAXIMUM MARKS FOR THE CIE	**150**

RUBRIC FOR SEMESTER END EXAMINATION (SEE-Theory)		
Q.NO.	**CONTENTS**	**MARKS**
1 & 2	Unit 1: Question 1 or 2	20
3 & 4	Unit 2: Question 3 or 4	20
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
	SEE THEORY TOTAL	**100**
RUBRIC FOR SEMESTER END EXAMINATION (SEE-Lab)		
Q.NO.	**CONTENTS**	**MARKS**
1	Design and Development of Project	10
2	Presentation of working model/simulation results/prototype building	30
3	Viva voce	10
	SEE LAB TOTAL	**50**
	MAXIMUM MARKS FOR THE SEE	**150**

SEMESTER: II						
Course Code	:	MCA263D1	**Advanced Internet of Things**	CIE Marks	:	50
Credits L-T-P	:	3-0-0	*(Theory)*	SEE Marks	:	100
Hours	:	45L+45EL=90	*Elective D*	SEE Duration	:	3 Hours
Faculty Coordinator:						

UNIT - I	9 Hours
Advanced IoT Architecture , Ecosystem and protocols beyond MQTT IoT layered architecture (perception, network, application),Smart objects and digital twins IoT platforms comparison (AWS IoT, Azure IoT, ThingsBoard, etc.), Design considerations: interoperability, scalability, latency, Case study: Industrial IoT vs Consumer IoT CoAP, XMPP, AMQP, DDS – overview and use cases, 6LoWPAN, Zigbee, BLE Mesh, Thread LoRaWAN architecture and use cases, Edge vs Fog vs Cloud communication Interfacing protocols: I2C, SPI, UART, Modbus RTU/TCP	
UNIT - II	**9 Hours**
IoT Security and Data Integrity IoT attack surfaces and threat models, Secure communication (TLS, DTLS, VPNs) Authentication (OAuth2, API Keys, Tokenization), Secure firmware updates and boot mechanisms Privacy, identity, and data encryption techniques , Blockchain in IoT security (introduction level)	
UNIT - III	**8 Hours**
Edge AI and ML in IoT Edge AI platforms (NVIDIA Jetson, Coral, ESP32-S3),Data acquisition and feature extraction at the edge, On-device model inference (TensorFlow Lite, Edge Impulse), Real-time decision making using micro-models, Use cases: predictive maintenance, anomaly detection	
UNIT - IV	**8 Hours**
IoT Data Management and Visualization and Time-series databases (InfluxDB, TimescaleDB),Data ingestion pipelines (Node-RED, Apache NiFi) , Dashboards (Grafana, ThingsBoard etc), Event triggers and notification systems Integration with cloud storage (AWS S3, Google Firebase etc)	
UNIT - V	**8 Hours**
Advanced Application Development IoT DevOps – containerization (Docker), CI/CD, OTA updates,Multi-node coordination and orchestration, Interoperability with external APIs and ERP systems, Use of REST/GraphQL APIs for remote access, Design and development of end-to-end IoT projects	

Course Outcomes:
After going through this course the student will be able to:

CO1	:	Analyze the architecture and design considerations for advanced IoT systems, including industrial applications.
CO2	:	Compare and implement various IoT communication protocols beyond MQTT for efficient and secure data transmission.
CO3	:	Develop secure IoT applications incorporating encryption, authentication, and firmware integrity mechanisms and Deploy machine learning models on edge devices to enable local decision-making in IoT systems.
CO4	:	Design data ingestion, storage, and visualization pipelines for real-time monitoring

		and analytics and Integrate cloud and edge systems to create full-stack, intelligent, and secure IoT solutions.

Reference Books

1. Practical Internet of Things Networking: Understanding IoT Layered Architecture, Springer January 2023,DOI:10.1007/978-3-031-28443-4, ISBN: 978-3-031-28442-7, Rolando Herrero, Northeastern University

2. AI at the Edge: Solving Real-World Problems with Embedded Machine Learning, Daniel Situnayake (Author), Jenny Plunkett , (2023),ISBN-13. 978-1098120207 ; 1st Edition. ; Publisher. O'Reilly Media

3. IoT and OT Security Handbook: Assess Risks, Manage Vulnerabilities, and Deploy Secure Systems Packt Publishing. ISBN 978-180461980, by Smita Jain, Vasantha Lakshmi , Dr Rohini Srivathsa(2023)

4. Shaping the Future of IoT with Edge Intelligence, Edited ByRute C. Sofia, John Soldatos, 1st Edition 2024,River Publishers, DOIhttps://doi.org/10.1201/9781032632407

5. Introduction to Industrial Internet of Things and Industry 4.0, Sudip Misra , Chandana Roy , Anandarup Mukherjee, (2021)

URL resources

Node-RED Docs	https://nodered.org/docs/
Mosquitto MQTT Broker	https://mosquitto.org/
LoRaWAN Protocol Overview	https://lora-alliance.org/lorawan-specification/
CoAP Protocol (RFC 7252)	https://datatracker.ietf.org/doc/html/rfc7252
ESP32 Technical Reference Manual	https://www.espressif.com/en/support/download/documents
Edge Impulse (ML on Microcontrollers)	https://docs.edgeimpulse.com/docs
ThingsBoard IoT Platform	https://thingsboard.io/docs/
Grafana Visualization Platform	https://grafana.com/docs/grafana/latest/
TensorFlow Lite for Microcontrollers	https://www.tensorflow.org/lite/microcontrollers
OpenCV for Embedded Vision	https://opencv.org/platforms/embedded/
OWASP IoT Top 10 Security Risks	https://owasp.org/www-project-internet-of-things/

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (CIE-Theory)

CIE will consist of TWO Quizzes (Q), TWO Tests (T), and ONE Experiential Learning (EL) component **[20 (Q) + 40 (T) + 40 (EL) = 100 marks]**

Sl.No.	COMPONENTS	MARKS
1.	**QUIZZES:** Quizzes will be conducted in online/offline mode. **TWO QUIZZES** will be conducted & each Quiz will be evaluated for 10 marks, and Final Quiz marks adding up to 20 marks. **THE SUM OF TWO QUIZZES WILL BE CONSIDERED AS FINAL QUIZ MARKS.**	**20**
2.	**TESTS:** Students will be evaluated in test consisting of 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 40 MARKS.**	**40**

3.	**EXPERIENTIAL LEARNING:** Students will be evaluated for their creativity and practical implementation of the problem. **Phase I (20) & Phase II (20) ADDING UPTO 40 MARKS**.	**40**
	CIE THEORY TOTAL	**100**
RUBRIC FOR SEMESTER END EXAMINATION (SEE-Theory)		
Q.NO.	**CONTENTS**	**MARKS**
1 & 2	Unit 1: Question 1 or 2	20
3 & 4	Unit 2: Question 3 or 4	20
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
	SEE THEORY TOTAL	**100**

SEMESTER: III						
Course Code	:	MCA263D2	**Deep Learning**	CIE Marks	:	100
Credits L-T-P	:	3-0-0	*(Theory)*	SEE Marks	:	100
Hours	:	45L	(Professional Elective Course) - D	SEE Duration	:	3 Hours
Faculty Coordinator:						

UNIT - I	**9 Hours**

Neural Networks: Introduction to NN, models of neuron and network architectures. Learning Processes: Different types of learning processes, Learning with and without teacher, Memory, statistical learning theory.

Single layer perceptron: Adaptive filter problem, least mean square algorithm, learning rate, Learning rate, annealing techniques, perceptron and perceptron convergence theorem.

Multilayer Perceptron: Back propagation algorithm, Sequential and batch modes of training, stopping criteria, XOR problem, and some numerical problems

UNIT - II	**9 Hours**

Convolutional Neural Networks: Introduction, Historical Perspective and Biological Inspiration.

Basic Structure of a Convolutional Network: Padding, Strides, Typical Settings, The ReLU Layer, Pooling, Fully Connected Layers, The Interleaving Between Layers, Local Response Normalization, Multiplications, Data Augmentation.

Training a Convolutional Network: Back propagating Through Convolutions, Back propagation as Convolution with Inverted/Transposed Filter, Convolution/Back propagation as Matrix

UNIT - III	**9 Hours**

Convolutional Architectures: AlexNet, ZFnet VGG, GoogLeNet, ResNet Effect of Depth, Pretrained Models.

Applications of CNN: Content based image retrieval, Object Localization, Object Detection, Natural Language and sequence learning, and Video classification

UNIT - IV	**9 Hours**

Recurrent Neural Networks: Introduction and expressiveness of RNN. Basic Structure of a RNN: Language Modeling Example of RNN, Generating a Language Sample, Back propagation Through Time, Bidirectional Recurrent Networks, Multilayer Recurrent Networks. Echo-State Networks, Long Short-Term Memory (LSTM), Gated Recurrent Units (GRUs)

Applications of Recurrent Neural Networks: Automatic Image Captioning, Temporal Recommender Systems, Secondary Protein Structure Prediction, End-to-End Speech Recognition, Handwriting Recognition

UNIT - V	**9 Hours**

Deep Reinforcement Learning : Introduction Stateless Algorithms: Multi-Armed Bandits: Naïve Algorithm, Greedy Algorithm, Upper Bounding Methods The Basic Framework of Reinforcement Learning: Challenges of Reinforcement Learning, Simple Reinforcement Learning for Tic-Tac-Toe, Role of Deep Learning and a Straw-Man Algorithm

Course Outcomes:

After going through this course the student will be able to:

CO1	:	Apply basic concepts of neural network, its applications and various learning models
CO2	:	Analyse different Network Architectures, learning tasks, convolutional networks, and deep learning models
CO3	:	Assess neural networks model and learning techniques to solve problems related to society and industry

CO4	:	Demonstrate a prototype application developed using any NN tools and APIs

Reference Books

1. Neural Networks – A Comprehensive Foundation, Simon Haykin, 2nd Edition, PHI, 2005.

2. Neural Networks and Deep learning: A Textbook ,Charu C Aggarwal, Springer International Publishing AG, ISBN 978-3-319-94462-3 ISBN 978-3-319-94463-0 (eBook), https://doi.org/10.1007/978-3-319-94463-0, 2018

3. Introduction to Artificial Neural Networks, Gunjan Goswami, S.K. Kataria & Sons; 2012 Edition, ISBN-13:978-9350142967.

4. Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms, Nikhil
Buduma, by O'Reilly Publications, 2016 Edition, ISBN-13: 978-1491925614.

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (CIE-Theory)

CIE will consist of TWO Quizzes (Q), TWO Tests (T), and ONE Experiential Learning (EL) component **[20 (Q) + 40 (T) + 40 (EL) = 100 marks]**

Sl.No.	COMPONENTS	MARKS
1.	**QUIZZES:** Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & each Quiz will be evaluated for 10 marks, and Final Quiz marks adding up to 20 marks. THE SUM OF TWO QUIZZES WILL BE CONSIDERED AS FINAL QUIZ MARKS.	**20**
2.	**TESTS:** Students will be evaluated in a test consisting of 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 40 MARKS**. **Students should score minimum 50% in TEST & QUIZ to clear CIE**	**40**
3.	**EXPERIENTIAL LEARNING:** Students will be evaluated for their creativity and practical implementation of the problem. **Phase I (15) & Phase II (25) ADDING UPTO 40 MARKS.**	**40**
	MAXIMUM MARKS FOR THE CIE	**100**

RUBRIC FOR SEMESTER END EXAMINATION (SEE-Theory)

Q.NO.	CONTENTS	MARKS
1 & 2	Unit 1: Question 1 or 2	20
3 & 4	Unit 2: Question 3 or 4	20
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
	MAXIMUM MARKS FOR THE SEE	**100**

SEMESTER: III						
Course Code	:	MCA263D3	**Advanced Computer Networks**	CIE Marks	:	100
Credits L-T-P	:	3-0-0	*(Theory)*	SEE Marks	:	100
Hours	:	45L	Professional Elective Course -D	SEE Duration	:	3 Hours
Faculty Coordinator:						

UNIT - I	**9 Hours**
Internet Protocol- Introduction, Error and Control Messages (ICMP): The Internet Control Message Protocol, Error Reporting vs Error Correction, Testing Destination Reachability and status, Echo Request and Reply Message Format. Classless and Subnet Address Extension (CIDR) : Review of Relevant Facts, Proxy ARP, Subnet Addressing, Subnet Mask Representation, Broadcasting the Subnets, A Classless Addressing example	
UNIT - II	**9 Hours**
Wireless LANS and PANS – Fundamentals of WLAN's, 802.11 Standards, HIPERLAN Standard, Blue tooth specifications, Transport Protocol group, ZigBee Specification Wireless WANS and MANS – The Cellular Concept and Cellular Architecture- Capacity enhancement, Channel Allocation Algorithms	
UNIT - III	**9 Hours**
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 - IV	**9 Hours**
Advanced Internetwork Router Implementation: The Global Internet-Routing Areas, Inter domain Routing (BGP), IP Version 6(IPv6), Multiprotocol Label Switching (MPLS)- Destination Based forwarding, Explicit Routing, Network Interconnection- NAT, VPN-Introduction	
UNIT - V	**9 Hours**
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.	

Course Outcomes:

After going through this course the student will be able to:

CO1	:	Apply the advanced networking concepts
CO2	:	Apply various networking classifications in day to day computing
CO3	:	Analyze the importance of routing and congestion control principles
CO4	:	Access the different routing protocol methods in the networking support layers

Reference Books

1. James F. Kurose and Keith W. Ross,"Computer Networking: A Top-Down Approach", 8th edition, 2023, Pearson Education, ISBN: 978-0136685208
2. William Stallings, "Wireless Communications & Networks", 7th Edition, 2020, Pearson Education ISBN: 978-0134799085.
3. Patricia Marechal and Giovanni Chiola, "Software Defined Networking: Design and Deployment", 2023, Springer International Publishing, ISBN: 978-3031234567, First Edition.

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (CIE-Theory)		
CIE will consist of TWO Quizzes (Q), TWO Tests (T), and ONE Experiential Learning (EL) component **[20 (Q) + 40 (T) + 40 (EL) = 100 marks]**		
Sl.No.	**COMPONENTS**	**MARKS**
1.	**QUIZZES:** Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & each Quiz will be evaluated for 10 marks, and Final Quiz marks adding up to 20 marks. THE SUM OF TWO QUIZZES WILL BE CONSIDERED AS FINAL QUIZ MARKS.	**20**
2.	**TESTS:** Students will be evaluated in a test consisting of 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 40 MARKS**. **Students should score minimum 50% in TEST & QUIZ to clear CIE**	**40**
3.	**EXPERIENTIAL LEARNING:** Students will be evaluated for their creativity and practical implementation of the problem. **Phase I (15) & Phase II (25) ADDING UPTO 40 MARKS.**	**40**
	MAXIMUM MARKS FOR THE CIE	**100**

RUBRIC FOR SEMESTER END EXAMINATION (SEE-Theory)		
Q.NO.	**CONTENTS**	**MARKS**
1 & 2	Unit 1: Question 1 or 2	20
3 & 4	Unit 2: Question 3 or 4	20
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
	MAXIMUM MARKS FOR THE SEE	**100**

SEMESTER: III						
Course Code	:	MCA263D4	**Principles of UI/UX Design**	CIE Marks	:	100
Credits L-T-P	:	3-0-0	*(Theory)*	SEE Marks	:	100
Hours	:	45L	Professional Elective Course -D	SEE Duration	:	3 Hours
Faculty Coordinator:						

UNIT - I	**9 Hours**

Elements of UX Design-I- Introduction, from product design to user experience design, designing for experience, User experience and the web, Building from bottom to top.
Strategy Plane: Product Objectives, Business goals, Brand Identity, Success Metrics and User Needs, User Segmentation, Usability and User Research, Creating Personas
Scope Plane: Defining the Scope, Functional specifications, Content requirements.

UNIT - II	**9 Hours**

Elements of UX Design -II
Structure Plane: Interaction Design, Conceptual Models, Error Handling, Information Architecture
Skeleton Plane: Interface Design, Navigation Design, Information Design, Wireframes
Surface Plane: Sensory Design, Making Sense of the Senses, Contrast and Uniformity, Internal and External Consistency, Color Palettes and Typography, Design Comps and Style Guides.

UNIT - III	**9 Hours**

UI Design Process
Usability of Interactive Systems: Introduction, Usability Goals and Measures, Usability Motivation, Universal Usability, Guideline, principles, and theories
Managing Design Processes: Introduction, Organizational Design to support Usability, The Four Pillars of Design, Development methodologies, Ethnographic Observation, Participatory Design, Scenario Development

UNIT - IV	**9 Hours**

User Interface Evaluation and Interacting Styles
Evaluating Interface Design: Introduction, Expert Reviews, Usability Testing and Laboratories, Survey Instruments, Acceptance tests, Evaluation during Active Use, Controlled Psychologically Oriented Experiments.
Menu Selection, Form Filling and Dialog Boxes: Introduction, Task-Related Menu Organization, Single Menus, Combination of Multiple Menus, Content Organization, Fast Movement Through, Menus, Data Entry with Menus, Form Filling, Dialog Boxes and Alternatives, Audio Menus and Menus for Small Displays

UNIT - V	**9 Hours**

Patterns For Effective Interaction Design
Using social media: The Patterns-Editorial Mix, Personal Voices, Repost and Comment, Inverted Nano-pyramid, Sharing Widget, Content Leaderboard.
Going Mobile: Patterns-Vertical Stack, Touch Tools, Bottom Navigation, Thumbnail-and-Text List, Loading Indicators, Richly Connected Apps.
Visual Style and Aesthetics: Visual Design for Desktop applications, The Patterns Deep Background, Few Hues Many Values, Contrasting Font Weights Skins and Themes
Case Study: To explore the UI/UX using Digital tools, dark Patterns

Course Outcomes:
After going through this course the student will be able to:

CO1	:	Apply the theoretical foundations and awareness of User Interface and User Experience Design
CO2	:	Design based on the knowledge of features, approach, and patterns for designing

		UI and UX for cross platform applications
CO3	:	Identify and Apply various Design Skills in UI and UX for real world Applications
CO4	:	Evaluate UI/UX design Process/ artifacts for building products

Reference Books

1. Jesse James Garrett, The Elements of User Experience: User-Centered Design for the Web and Beyond, New Riders Publishers ,2nd Edition, 2011, ISBN-13: 978-0321683687
2. Ben Shneiderman, Plaisant, Cohen, Jacobs, Designing the User Interface, Pearson Education,
5th Edition, 2014, ISBN-10: 9332518734 ISBN-13: 978-9332518735
3. Bill Buxton, Sketching User Experiences: Getting the Design Right and the Right Design, Morgan Kaufmann,2007, ISBN-10: 0123740371 ISBN-13: 978-0123740373
4. Jenifer Tidwell, Charles Brewer, and Aynne Valencia, Designing Interfaces- Patterns for Effective Interaction Design, O'Reilly®, 3rd Edition, ISBN 978-1492051916
5. Jeff Gothelf and Josh Seiden, Lean UX: Applying Lean Principles to Improve User Experience O'Reilly Media ISBN 978-1492080359, 3rd Edition, 2021

E-Resources
https://maze.co/collections/ux-ui-design/tools/#list
https://careerfoundry.com/en/blog/ux-design/dark-patterns-ux/

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (CIE-Theory)

CIE will consist of TWO Quizzes (Q), TWO Tests (T), and ONE Experiential Learning (EL) component **[20 (Q) + 40 (T) + 40 (EL) = 100 marks]**

Sl.No.	COMPONENTS	MARKS
1.	**QUIZZES:** Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & each Quiz will be evaluated for 10 marks, and Final Quiz marks adding up to 20 marks. THE SUM OF TWO QUIZZES WILL BE CONSIDERED AS FINAL QUIZ MARKS.	**20**
2.	**TESTS:** Students will be evaluated in a test consisting of 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 40 MARKS**. **Students should score minimum 50% in TEST & QUIZ to clear CIE**	**40**
3.	**EXPERIENTIAL LEARNING:** Students will be evaluated for their creativity and practical implementation of the problem. **Phase I (15) & Phase II (25) ADDING UPTO 40 MARKS.**	**40**
	MAXIMUM MARKS FOR THE CIE	**100**

RUBRIC FOR SEMESTER END EXAMINATION (SEE-Theory)

Q.NO.	CONTENTS	MARKS
1 & 2	Unit 1: Question 1 or 2	20
3 & 4	Unit 2: Question 3 or 4	20
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
	MAXIMUM MARKS FOR THE SEE	**100**

SEMESTER: III					
MINOR PROJECT (Practice)					
Course Code	**:**	**MCA461P**	**CIE**	**:**	**50 marks**
Credits: L:T:P	**:**	**0:0:3**	**SEE**	**:**	**50 marks**
Hours/Week	**:**	**06**	**SEE Duration**	**:**	**3.00 Hours**

GUIDELINES

1. Student can form group of two to execute the Minor Project.
2. The student shall undertake minor project depending on the electives / Research based / Industry Oriented
3. Allocation of the guides preferably in accordance with the expertise of the faculty
4. Minor project topics could aligned to any of the Centre of Excellence (CoE)/ Center of Competence (CoC) domain. The details of these could be obtained by visiting the website https://rvce.edu.in/rvce-center-excellence
5. Minor project has to be implemented/executed in-house, using the resources available in the department/college/CoE/CoC.
6. Students have to note the periodic progress in the Minor Project Diary and report the work carried to their respective guides.
7. Students have to present the Minor project work to the departmental committee and only upon approval by the committee, the student can proceed to prepare and submit the hard copy of the final Minor project report.

The reports shall be printed on A4 size with 1.5 spacing and Times New Roman with font size 12, outer cover of the report (wrapper) has to be softbound in Ivory.

Course Outcomes:
After going through this course, the students will be able to

CO1	Analyze the research gaps, formulate the problem definition, conceptualize the objectives and design solution to cater to specific problems.
CO2	Apply higher order thinking skills and develop skill competencies specific to program specialization to implement real world problems with professional ethical standards.
CO3	Demonstrate the skill and knowledge by applying appropriate tools and techniques specific to their domain.
CO4	Communicate, work in teams and demonstrate the learning through oral presentations and report writing.

The evaluation criteria shall be as per the rubrics given below:

Phase	Activity	Weightage
I	Approval of the selected topic, formulation of Problem Statement and Objectives along with Synopsis submission	10%
II	Demonstrate the skill and knowledge by applying appropriate tools/techniques to design solution specific to the problem.	30%
III	Demonstrates the work carried out through experimental results, analysis and testing. Exhibits writing and communication skills through presentations, report writing and paper publication.	60%

Scheme for Semester End Evaluation (SEE):

The SEE examination shall be conducted by an external examiner (domain expert) and an internal examiner. Evaluation shall be done in batches, not exceeding 6 students per batch.

Sl. No	Contents	Marks
1	Write Up	20%
2	Demonstration of Internship Work	60%
3	Viva Voce	20%

SEMESTER: III					
INTERNSHIP (Practice)					
Course Code	**:**	**MCA462N**	**CIE**	**:**	**100 marks**
Credits: L:T:P	**:**	**0:0:6**	**SEE**	**:**	**100 marks**
Hours/Week	**:**	**12**	**SEE Duration**	**:**	**3.00 Hours**

GUIDELINES

1.Students can opt for undergoing internship at the industry or research organizations like BEL, DRDO, ISRO, NAL, etc.

2. Students must submit letter from the industry/research organizations, clearly specifying the candidate's name and the duration of the internship on the company letter head with authorized signature.

3. The duration of the internship shall be for a period of 6 weeks on full time basis after II semester final exams and before the commencement of III semester.

4. Students can approach the Centre of Excellence (CoE) in various domains and Center of Competence (CoC) hosted by RVCE for registering and working on relevant domain for training/internship. The details of these could be obtained by visiting the website https://rvce.edu.in/rvce-center-excellence

5. Internship must be related to the field of specialization of the respective PG program in which the student has enrolled

6. Students undergoing internship training are advised to report their progress and submit periodic progress reports/diary to their respective guides.

7. Students have to present the internship activities carried out to the departmental committee and only upon approval by the committee, the student can proceed to prepare and submit the hard copy of the final internship report.

8. The reports shall be printed on A4 size with 1.5 spacing and Times New Roman with font size 12, outer cover of the report (wrapper) has to be softbound in Ivory.

Course Outcomes: After going through this course, the student will be able to	
CO1	Explore the workplace, operating procedures of the department/company and its products, and other organizational concepts
CO2	Learn and improve writing and communication skills, research and technology, work in a team, and develop leadership skills
CO3	Apply higher order thinking skills - critical thinking, analysis, synthesis and evaluate complex problems to solve real world problems with professional ethical standards.
CO4	Develop and demonstrate skill competencies and knowledge specific to program specialization by applying appropriate tools and techniques.

Scheme of Continuous Internal Evaluation (CIE):

The evaluation committee shall consist of a Guide, Professor/Associate Professor and Assistant Professor. The committee shall assess the presentation and the progress reports in two reviews.

Reviews	Activity	Weightage
Review I	Ability to comprehend the functioning/operating procedures of the Organization/Departments. Application of Engineering knowledge, Critical thinking and analysis to solve problems.	40%
Review II	Demonstrates skill competencies, Resource Management and Sustainability. Exhibits writing and communication skills through presentations and report writing.	60%

Scheme for Semester End Evaluation (SEE): The SEE examination shall be conducted by an external examiner and an internal examiner. Evaluation shall be done in batches, not exceeding 6 students per batch.

Sl. No	Contents	Marks
1	Write Up	20%
2	Demonstration of Internship Work	60%
3	Viva Voce	20%

SEMESTER: IV					
MAJOR PROJECT (Practice)					
Course Code	**:**	**MCA491P**	**CIE**	**:**	**100 Marks**
Credits L:T:P	**:**	**0:0:14**	**SEE**	**:**	**100 Marks**
Hrs/Week	**:**	**28**	**SEE Duration**	**:**	**3.00 Hours**

GUIDELINES

1. Major Project is to be carried out for a duration of 18 weeks
2. Student have to implement the Major Project individually.
3. Allocation of the guides preferably in accordance with the expertise of the faculty
4. Major Project could be implemented in Industry/Research organizations after providing the letter of approval. Students can also implement Major Project, in-house using the resources available in the department/college/ Centre of Excellence (CoE)/ Center of Competence (CoC). The details of these could be obtained by visiting the website https://rvce.edu.in/rvce-center-excellence
5. Students have to adhere to the Project Presentation Schedule note the periodic progress in the Major Project Diary and report the work carried to their respective guides.
6. It is mandatory for the students to present/publish their project work in National/International Conferences/Journals
7. Students have to present the Major Project work to the departmental committee and only upon approval by the committee, the student can proceed to prepare and submit the hard copy of the final Major Project report.

   Major Project report has to be printed on A4 size with 1.5 spacing and Times New Roman with font size 12, outer cover of the report (wrapper) has to be Hardbound in Ivory color.

Course Outcomes:

After going through this course, the students will be able to

CO1	Analyze the research gaps, formulate the problem definition, conceptualize the objectives and design solution to cater to specific problems.
CO2	Apply higher order thinking skills and develop skill competencies specific to program specialization to implement real world problems with professional ethical standards.
CO3	Demonstrate the skill and knowledge by applying appropriate tools and techniques specific to their domain.
CO4	Communicate, work in teams and demonstrate the learning through oral presentations and report writing.

Scheme of Continuous Internal Examination (CIE)

Evaluation will be carried out in THREE Phases. The evaluation committee will comprise of guide and members appointed by Director, MCA

The evaluation criteria shall be as per the rubrics given below:

Phase	Activity	Weightage
I	Approval of the selected topic, formulation of Problem Statement and Objectives along with Synopsis submission	10%
II	Demonstrate the skill and knowledge by applying appropriate tools/techniques to design solution specific to the problem.	30%
III	Experimental result & analysis, testing, Conclusions and Future Scope of Work, Dissertation Report. Exhibits writing and communication skills through presentations, report writing and paper publication.	60%

Note -.

(a) 50% CIE is the prerequisite to appear for SEE

(b) Two hard bound dissertation reports are to be submitted.

(c) Certificate sheet having the signatures of Guide, Director and Principal must be included.

(d) Plagiarism report must be <20% and to be included in the report.

Scheme for Semester End Examination (SEE):

Major Project SEE evaluation shall be conducted in two stages. This is initiated after fulfilment of submission of Project Report and CIE marks.

Stage-1 Report Evaluation: Evaluation of Project Report shall be done by the Guide and an External examiner.

Stage-2 Project Viva-voce: Major Project Viva-voce examination is conducted after receipt of evaluation reports from Guide and External examiner.

The evaluation will be done by ONE Senior faculty / Internal Guide from the department and ONE External member from Academia / Industry / Research Organization. Evaluation will be done in batches not exceeding SIX students per batch.

SEE procedure is as follows:

	Internal Examiner	**External Examiner**	**Total**	
Report Evaluation	100 marks (A)	100 marks(B)	(A) + (B) = 200/2 = 100 (C)	
			(C)	100 marks
Viva Voce	Jointly Evaluated by Internal and External Examiner		(D)	100 marks
		Total Marks		**[(C)+(D)]/2 = 100**

Final Marks / Grades = (CIE+SEE)/2

SEMESTER: IV					
TECHNICAL SEMINAR (Practice)					
Course Code	**:**	**MCA492L**	**CIE**	**:**	**50 Marks**
Credits: L:T:P	**:**	**0:0:1**	**SEE**	**:**	**50 Marks**
Hrs/Week	**:**	**2**	**SEE Duration**	**:**	**2.00 Hours**

GUIDELINES

1. The seminar presentation shall be done by individual students.
2. The topic for seminar should be in one of the thrust areas relevant to industry or on-going research with in-depth technical review and analysis.
3. The topic can also be an extension of the Major project.
4. The student must be able to highlight or relate the technological developments with societal relevance and sustainability.
5. The students must mandatorily address professional computing practices relevant to the topic of study.
6. The student shall try to perform financial / cost analysis or apply project management tools as related to his/her topic of study.
7. Each student must submit both hard and soft copy of the presentation and report.

Course Outcomes: After going through this course, the students will be able to	
CO1	Identify topics in recent trends in computing technology
CO2	Perform literature / market / product survey and analyse information in the field of study
CO3	Enhance communication skills and report writing skills
CO4	Exhibit creative thinking abilities

Scheme of Continuous Internal Evaluation (CIE): Evaluation would be carried out in TWO phases. The evaluation committee shall comprise of guide and senior faculty members. The evaluation criteria shall be as per the rubrics given below:
The evaluation criteria shall be as per the rubrics given below:

Reviews	**Activity**	**Weightage**
Phase 1	Selection of topic – Technical Relevance, review of literature, Presentation skills, Sustainability and Societal Concerns	50%
Phase 2	Technological developments, key competitors, Presentation skills, Report writing	50%

Scheme for Semester End Evaluation (SEE):
The evaluation will be done by ONE Senior faculty / Internal Guide from the department and ONE External member from Academia / Industry / Research Organization. Evaluation will be done in batches, 6 students per batch.

Rubrics for SEE evaluation.

- Topic 10%
- Literature Review 20%
- Technical relevance, Sustainability and Societal Concerns 30%
- Presentation Skills 20%
- Viva- Voce 20%

SEMESTER: IV						
Course Code	:	MCA293E1	**Digital Marketing**	CIE Marks	:	100
Credits L-T-P	:	3-0-0	*(Theory)*	SEE Marks	:	100
Hours	:	45L	Professional Elective Course -E	SEE Duration	:	3 Hours
Faculty Coordinator:						

UNIT - I	**9 Hours**

Digital Marketing in Digital World: What Is Digital Marketing? , Evolution and Environment of Digital Marketing, Types of Digital Marketing, Digital Marketing Value,The Digital Marketing Mix, Digital Marketing Objectives, Digital Marketing Analytics

Creating Value through Digital Marketing Strategy: Introduction to Digital Marketing Strategy, The Strategic Digital Marketing Planning Process, Basic Digital Marketing Strategies and Tactics, The Strategic Digital Marketing Plan,

UNIT - II	**9 Hours**

Digital Consumer Behavior and Customer Relationship and Experience Management : Digital Consumer Behavior and Influences, Digital Customer Relationship Management, Digital Customer Experience (DCX) Management,

Website Marketing Strategy: Website Evolution and Value, Website Marketing Objectives, Website Marketing Considerations, Strategies, and Tactics, Website Content Strategies, Website Marketing Analytics;

Search Engine Optimization (SEO) Strategy: Evolution and Value of Search Engine Optimization, SEO Objectives, SEO Considerations, Strategies, and Tactics, SEO Analytics,

UNIT - III	**9 Hours**

Search Engine Marketing (SEM) Strategy : SEM Objectives, SEM Considerations, Strategies, and Tactics, SEM Content Strategies and Tactics,

Email Marketing Strategy: Evolution and Value of Email Marketing, Email Marketing Considerations, Strategies, and Tactics, Email Marketing Content and Design Strategies and Tactics, Email Marketing Analytics,

Mobile Marketing Strategy: Evolution and Value of Mobile Marketing, Mobile Marketing Considerations, Strategies, and Tactics, Mobile Marketing Content Strategies and Tactics, Mobile Marketing Analytics

UNIT - IV	**9 Hours**

Digital Brand, Trust, and Reputation Management Strategy: Brand Switching Online, Social Media and Community Marketing Strategy: Evolution and Value of Social Media and Community Marketing, Social Media and Community Marketing Considerations, Strategies, and tactics, Social Media and Community Marketing Content Strategies and Tactics, Social Media and Community Marketing Analytics,

UNIT - V	**9 Hours**

Digital Marketing Legal, Ethical, Privacy, and Security: Digital Marketing Legal and Ethical Framework, Digital Marketing Legal and Ethical Considerations, Strategies, and tactics,

Trends and the Future of Digital Marketing, Digital Marketing Trends and Future Considerations, Strategies, and Tactics

Course Outcomes:

After going through this course the student will be able to:

CO1	:	Understand the core concepts, evolution and environment of digital marketing and strategies
CO2	:	Apply various digital marketing tools and techniques such as SEO, SEM, email, and mobile marketing to design stategic campaigns

CO3	:	Analyze digital consumer behaviour, website metrics and digital marketing analytics to evalatue campaign effectiveness
CO4	:	Design and formualte an integrated digital marketing strategy considering legal, ethical and branding actors.

Reference Books

1. Raj Sachdev, "Digital Marketing", Tata McGraw Hill , Copyright 2024, ISBN 978-1-266-14309-0
2. Seema Gupta, "Digital Marketing", 3rd Edition, 2022, McgRAW-hILL, India, ISBN-9789355320483
3. Dave Chaffey, Fiona Ellis-Chadwick, "Digital Marketing- Strategy, Implementation and Practice" , 6th Edition, 2016, Pearson, 978-1-292-07761-1

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (CIE-Theory)		
CIE will consist of TWO Quizzes (Q), TWO Tests (T), and ONE Experiential Learning (EL) component **[20 (Q) + 40 (T) + 40 (EL) = 100 marks)**		
Sl.No.	**COMPONENTS**	**MARKS**
1.	**QUIZZES:** Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & each Quiz will be evaluated for 10 marks, and Final Quiz marks adding up to 20 marks. **THE SUM OF TWO QUIZZES WILL BE CONSIDERED AS FINAL QUIZ MARKS.**	**20**
2.	**TESTS:** Students will be evaluated in test consisting of 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 40 MARKS. Students should score minimum 50% in TEST & QUIZ to clear CIE**	**40**
3.	**EXPERIENTIAL LEARNING:** Students will be evaluated for their creativity and practical implementation of the problem. **Phase I (15) & Phase II (25) ADDING UPTO 40 MARKS**.	**40**
	MAXIMUM MARKS FOR THE CIE	**100**

RUBRIC FOR SEMESTER END EXAMINATION (SEE-Theory)		
Q.NO.	**CONTENTS**	**MARKS**
1 & 2	Unit 1: Question 1 or 2	20
3 & 4	Unit 2: Question 3 or 4	20
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
	MAXIMUM MARKS FOR THE SEE	**100**

SEMESTER: IV						
Course Code	:	MCA293E2	**AI in Practice**	CIE Marks	:	100
Credits L-T-P	:	3-0-0	*(Theory)*	SEE Marks	:	100
Hours	:	45L	Professional Elective Course	SEE Duration	:	3 Hours

UNIT - I	**9 Hours**
Fundamentals of AI- Core of AI, Fields of Application, Ethics and Fairness of AI **Drivers of Artificial Intelligence**-Moores' law and effects of Exponentiality, Digitalization and Dematerialization of products, services and processes, New Technologies **Data, Law and Responsibility**-AI and law, Tsunamy of the information Society, AI Regulation, Protection of Personal Data, Red flags in handling AI Tools	
UNIT - II	**9 Hours**
Unveiling Generative AI: A new frontier- What Is Generative AI? How Does Generative AI Work? What Can Generative AI Do? The Impact of Generative AI. **Revolutionizing societies and business ecosystems**-Transforming Sectors and Society, Reshaping Business Models, Innovating Products and Services, Refining Business Processes, Generative AI in Daily Life.	
UNIT - III	**9 Hours**
Generative AI in Practice-a new dawn in media and entertainment- Generative AI and Journalism, Enhancing Sports Broadcasting and Fan Engagement with Generative AI, Storytelling: Generative AI in Books, Audiobooks, and Podcasts, Generative AI in Film, Generating Music with AI, AI in Art **Personalized Learning:** the future of education- Rethinking how learners learn, and how teachers teach, transforming *what* we teach.	
UNIT - IV	**9 Hours**
Implementing Generative AI: Key for Success- Fostering right culture and mindset, Right skills and Talent, Data as another key building block, Getting right Technology at Place. **Glimpses of the Future:** Predicting the trajectory of Generative AI**-** Are we moving closer to general AI?, combining generative AI with robots, Brain–Computer Interfaces will allow for more intuitive Interactions, using generative AI for a better world.	
UNIT - V	**9 Hours**
Case Studies: Advertising and Marketing, Healthcare Transformation, Banking and Financial services, AI in Design and Development: Video Game Design, Drug Discovery. Note: Case studies will be discussed in alignment with the concepts introduced in unit1-4. Students are expected to apply knowledge from previous units to analyse and solve case study based problems.	

Course Outcomes:

After going through this course the student will be able to:

CO1	:	Apply AI foundational concepts to understand real-world systems and their strategic value.
CO2	:	Analyze industrial challenges and domain-specific problems to identify suitable AI technologies and frameworks for optimal solutions.
CO3	:	Design AI-based solutions using case studies and frameworks for business processes
CO4	:	Assess the impact of different AI applications in various sectors, identifying benefits and possible pitfalls.

Reference Books

1.Ralf T. Kreutzer, Marie Sirrenberg, Understanding Artificial Intelligence: Fundamentals, Use Cases and Methods for a Corporate AI Journey (Management for Professionals), 1St

edition , Springer, 2020, ISBN13: 978-3030252700
2. Bernard Marr, "Generative AI in Practice: 100+ Amazing Ways Generative Artificial Intelligence is Changing Business and Society",Wiley, ISBN: 978-1-394-25424-8, March 2024
3. Amit Bahree, "Generative AI in Action", Manning, September 2024, ISBN 9781633436947
4. David Foster, "Generative Deep Learning: Teaching Machines to Paint, Write, Compose, and Play", June 2023, O'Reilley, ISBN-13978-1098134181

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (CIE-Theory)		
CIE will consist of TWO Quizzes (Q), TWO Tests (T), and ONE Experiential Learning (EL) component **[20 (Q) + 40 (T) + 40 (EL) = 100 marks)**		
Sl.No.	**COMPONENTS**	**MARKS**
1.	**QUIZZES:** Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & each Quiz will be evaluated for 10 marks, and Final Quiz marks adding up to 20 marks. **THE SUM OF TWO QUIZZES WILL BE CONSIDERED AS FINAL QUIZ MARKS.**	**20**
2.	**TESTS:** Students will be evaluated in test consisting of 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 40 MARKS.** **Students should score minimum 50% in TEST & QUIZ to clear CIE**	**40**
3.	**EXPERIENTIAL LEARNING:** Students will be evaluated for their creativity and practical implementation of the problem. **Phase I (15) & Phase II (25) ADDING UPTO 40 MARKS**.	**40**
	MAXIMUM MARKS FOR THE CIE	**100**

RUBRIC FOR SEMESTER END EXAMINATION (SEE-Theory)		
Q.NO.	**CONTENTS**	**MARKS**
1 & 2	Unit 1: Question 1 or 2	20
3 & 4	Unit 2: Question 3 or 4	20
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
	MAXIMUM MARKS FOR THE SEE	**100**

SEMESTER: IV						
Course Code	:	MCA293E3	**IT Security**	CIE Marks	:	100
Credits L-T-P	:	3-0-0	*(Theory)*	SEE Marks	:	100
Hours	:	45L	(Professional Elective Course) -E	SEE Duration	:	03 Hours
Faculty Coordinator:						

UNIT - I	**09 Hours**
Introduction to Information Security - Data and Information, Information Classification, Information Security, Other Applicable Attributes of Information Security, Logical Security, Advantages & Disadvantages of organization's information security programme, Goals of Information security, Types of information security, The services of information security **Security Threats Overview -** Threats, Cyber Espionage, Cyber Terrorism	
UNIT - II	**09 Hours**
Corporate IT Security Policies - Meaning of Corporate IT Security, Need for a Corporate IT Security Policy, Legal Requirements, Essential Features of Corporate IT Security Policy, Physical Security Policy, Methodology of Framing an IT Security Policy, Awareness Initiatives, Aspects of security measurement. **Organisational Security** - Organisational Security, Public Sector Organisation, Right to Information Act, 2005, Risk Metrics, Downstream, Liability	
UNIT - III	**09 Hours**
Security Governance - Concepts, Policies, Framework, Key Responsibility Areas, Security Governance in Public Sector Undertakings, Security Governance in Banks, Compliance to Policies is a Must in Any Organization, Monitoring. **Software and Operational Security** - Concepts, Cloud Computing, Operational Security, User Level Controls, Software Security Techniques.	
UNIT - IV	**09 Hours**
Security Standards and Best Practices - ISO 27000 Standards, ISO – ISMS, Benefits of ISO 27001, Cobit-Control Objectives in IT, CIA triad - Confidentiality, Integrity, Availability, Importance of Confidentiality, Components of Confidentiality, Different types of Confidentialities	
UNIT - V	**09 Hours**
Fault Tolerant Systems - High Availability (HA), Services Oriented Architecture (SOA), The primary aspects of Service-Oriented Architecture. **Business Continuity and Disaster Recovery Management** - Downtime, Phase I, Backups, Who Should Call 'Disaster'? Phase II, Phase III.	

Course Outcomes:

After going through this course the student will be able to:

CO1	:	**Explore the** foundational concepts of information security
CO2	:	**Demonstrate** the ability to frame and interpret corporate IT security policies, legal frameworks, and physical security measures
CO3	:	**Analyze** the role of security governance, frameworks, and confidentiality principles in assessing an organization's security posture.
CO4	:	**Evaluate** modern security threats and **formulate** effective strategies for business continuity and disaster recovery using fault-tolerant systems.

Reference Books
1. Indian Institute of Banking & Finance (IIBF), "IT Security", Taxmann, 2024 Edition, 2024, ISBN: 9789357788571
2. Tyler Wrightson, "Advanced Persistent Threat Hacking", Mc Graw Hill Education, 2014 Edition, 2014, ISBN: 9780071828376
3. Ian Neil, "CompTIA Security+ Certification Guide", Packt Publication, 2018 Edition, ISBN: 9781789348019
4. Dafydd Stuttard and Marcus Pinto, *The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws*, 2e Edition, Wiley, **2011**, ISBN: **9781118026472**

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (CIE-Theory)		
CIE will consist of TWO Quizzes (Q), TWO Tests (T), and ONE Experiential Learning (EL) component **[20 (Q) + 40 (T) + 40 (EL) = 100 marks)**		
Sl.No.	**COMPONENTS**	**MARKS**
1.	**QUIZZES:** Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & each Quiz will be evaluated for 10 marks, and Final Quiz marks adding up to 20 marks. **THE SUM OF TWO QUIZZES WILL BE CONSIDERED AS FINAL QUIZ MARKS.**	**20**
2.	**TESTS:** Students will be evaluated in test consisting of 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 40 MARKS.** **Students should score minimum 50% in TEST & QUIZ to clear CIE**	**40**
3.	**EXPERIENTIAL LEARNING:** Students will be evaluated for their creativity and practical implementation of the problem. **Phase I (15) & Phase II (25) ADDING UPTO 40 MARKS**.	**40**
	MAXIMUM MARKS FOR THE CIE	**100**

RUBRIC FOR SEMESTER END EXAMINATION (SEE-Theory)		
Q.NO.	**CONTENTS**	**MARKS**
1 & 2	Unit 1: Question 1 or 2	20
3 & 4	Unit 2: Question 3 or 4	20
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
	MAXIMUM MARKS FOR THE SEE	**100**

SEMESTER: IV						
Course Code	:	MCA293E4		CIE Marks	:	100
Credits L-T-P	:	3-0-0	**Project Management**	SEE Marks	:	100
Hours	:	45L	(Professional Elective Course) -E	SEE Duration	:	3 Hours
Faculty Coordinator:						

UNIT - I	9 Hours

Strategic Project Management and Selection:
Introduction , The Definition of the Project, Why Project Management?, The Project Life Cycle, Project Strategic and Selection, Organisational Project Management and Governance, Project Portfolio Management (PPM),Case Studies

UNIT - II	9 Hours

Project Organization Structure and Activity Planning:
Projects in a functional organization, Projects in a Projectized Organization, Projects in a Matrix Organization, Projects in Composite Organization Structures, Selecting a Project Form, Project Team , Human Factors and the Project Team, Traditional Project Activity Planning, Coordination through Integration Management, Case Studies

UNIT - III	9 Hours

Project Budgeting, Scheduling and Resource Allocation:
Estimating Project Budgets, Better Cost Estimation and Bidding, Project Risk Management, Network techniques (PERT),Critical Path Method (CPM), Resource Allocation Problem, Resource Loading, Resource Leveling, Constrained Resource Scheduling, Case Studies

UNIT - IV	9 Hours

Project monitoring, Control and Auditing:
The Planning-Monitoring-Controlling Cycle, Information Needs and Reporting, Earned Value Analysis, Fundamental Purposes of Control, Three Types of Control Processes, Design of Control Systems, Purposes of Evaluation, The Project Audit, Project Audit Life Cycle, Some Essentials of an Audit, Measurement, Case Studies

UNIT - V	9 Hours

Project Management in Software Environment and Project Closures
Software Projects versus other types of Project, Activities covered by software project management, Plans, methods & Methodologies, Project Success and Failure, Managing People – Understanding Organizational Behavior, Motivation, Stress, Health & Safety, Ethical and Professional Concerns
The Varieties of the Project Closures , When to close a Project, The Closure Process

Course Outcomes:
After going through this course the student will be able to:

CO1	:	Demonstrate the principles involved from project initiation to Project Closure in Project Management
CO2	:	Apply Project Management Approaches and techniques to solve Real World Problems
CO3	:	Analyze various organizational structures, risk factors, and control mechanisms in managing projects across different environments
CO4	:	Evaluate effective project planning, Scheduling, monitoring, auditing, and closure strategies in both traditional and software project contexts

Reference Books

1. Jack R. Meredith, Scott M. Shafer, Samuel J. Mantel Jr. Project Management: A Managerial Approach, 11th Edition ISBN: 978-1-119-80381-2 ,2021

2. .Bob Hughes, Mike Cotterell, Rajib Mall, Software Project Management, 6th Edition, 2017, Tata McGraw-Hill Education, ,ISBN 13:9789387067189,ISBN 109387067181.

3. A Guide to the Project Management Body of Knowledge (PMBOK Guide), 6th Edition, 2017,Project Management Institute, Inc, ISBN: 978-1-62825-184-5

4. Harold Kerzner, Project MAnagement ,13th Edition, Wiley, 2022, ISBN 9781119805397

RUBRIC FOR SEMESTER END EXAMINATION (SEE-Theory)		
Q.NO.	**CONTENTS**	**MARKS**
1 & 2	Unit 1: Question 1 or 2	20
3 & 4	Unit 2: Question 3 or 4	20
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7 & 8	Unit 4: Question 7 or 8	20
9 & 10	Unit 5: Question 9 or 10	20
	MAXIMUM MARKS FOR THE SEE	**100**

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	MAXIMUM MARKS FOR THE CIE	**100**

PROGRAMME OUTCOMES (PO)

MCA Graduates will be able to:

PO1 Foundation Knowledge: Apply knowledge of mathematics, programming logic and coding fundamentals for solution architecture and problem solving**.**

PO2 Problem Analysis: Identify, review, formulate and analyze problems for primarily focusing on customer requirements using critical thinking frameworks.

PO3 Development of Solutions: Design, develop and investigate problems with as an innovative approach for solutions incorporating ESG/SDG goals.

PO4 Modern Tool Usage: Select, adapt and apply modern computational tools such as development of algorithms with an understanding of the limitations including human biases.

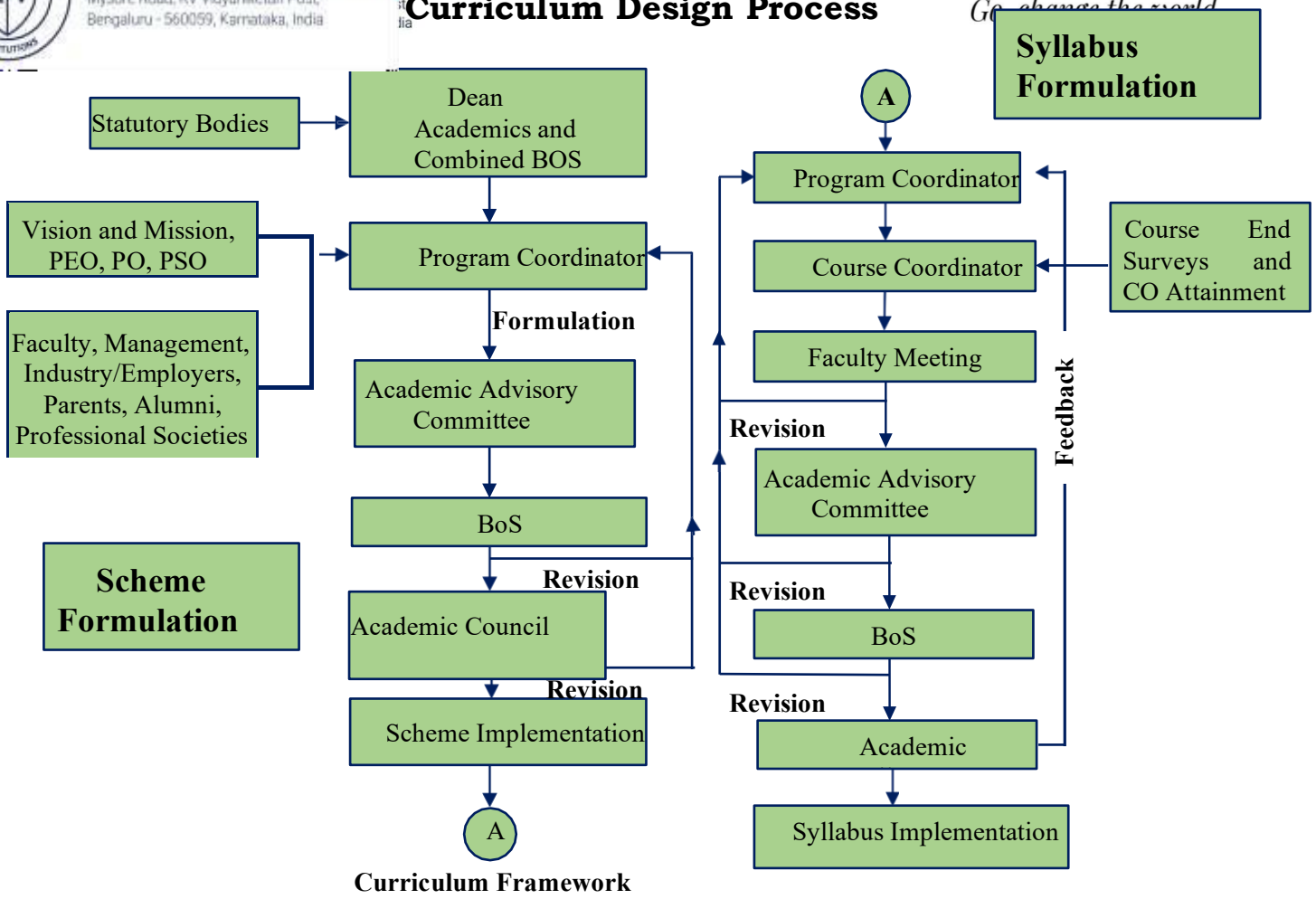
PO5 Individual and Teamwork: Function and communicate effectively as an individual or a team leader in diverse and multidisciplinary groups. Use methodologies such as agile.

PO6 Project Management and Finance: Use the principles of project management such as scheduling, work breakdown structure and be conversant with the principles of Finance for profitable project management

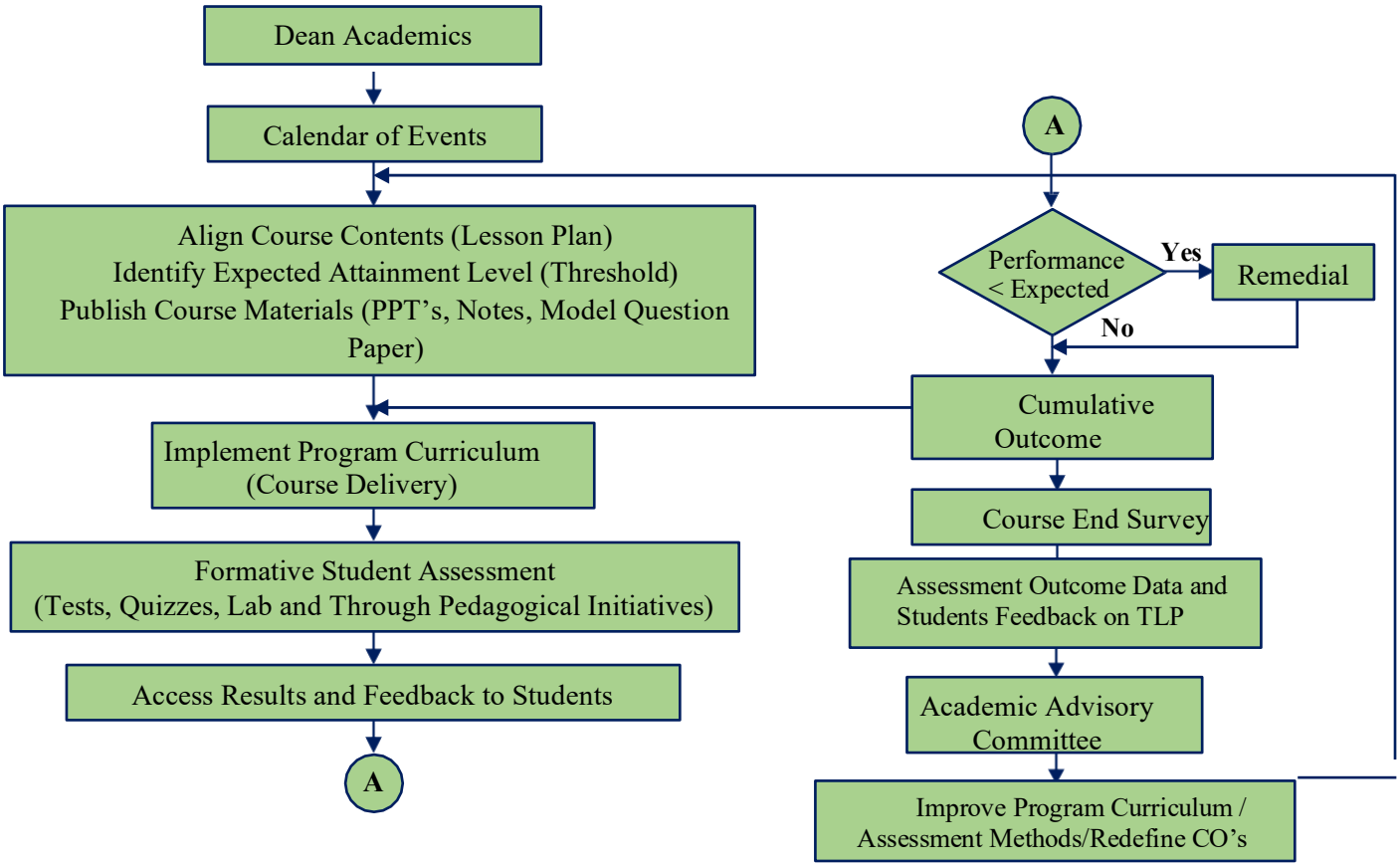
PO7 Ethics: Commit to professional ethics in managing software projects with financial aspects. Learn to use new technologies for cyber security and insulate customers from malware

PO8 Life-long learning: Change management skills and the ability to learn, keep up with contemporary technologies and ways of working.

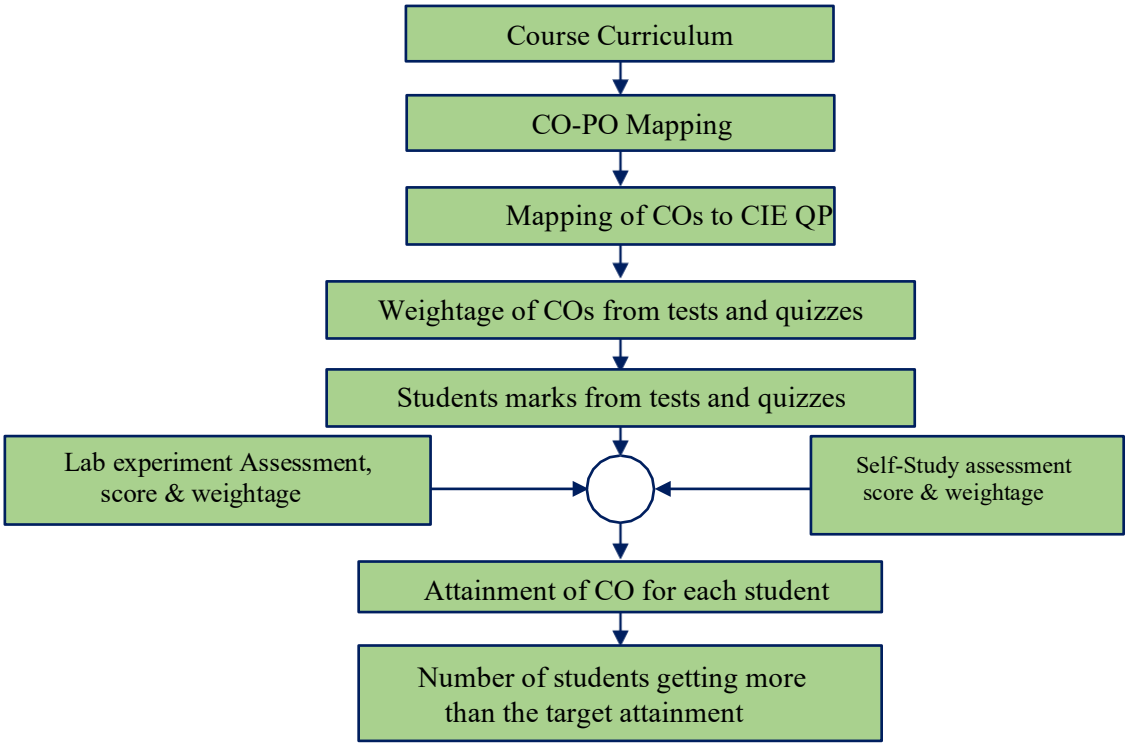
Curriculum Design Process



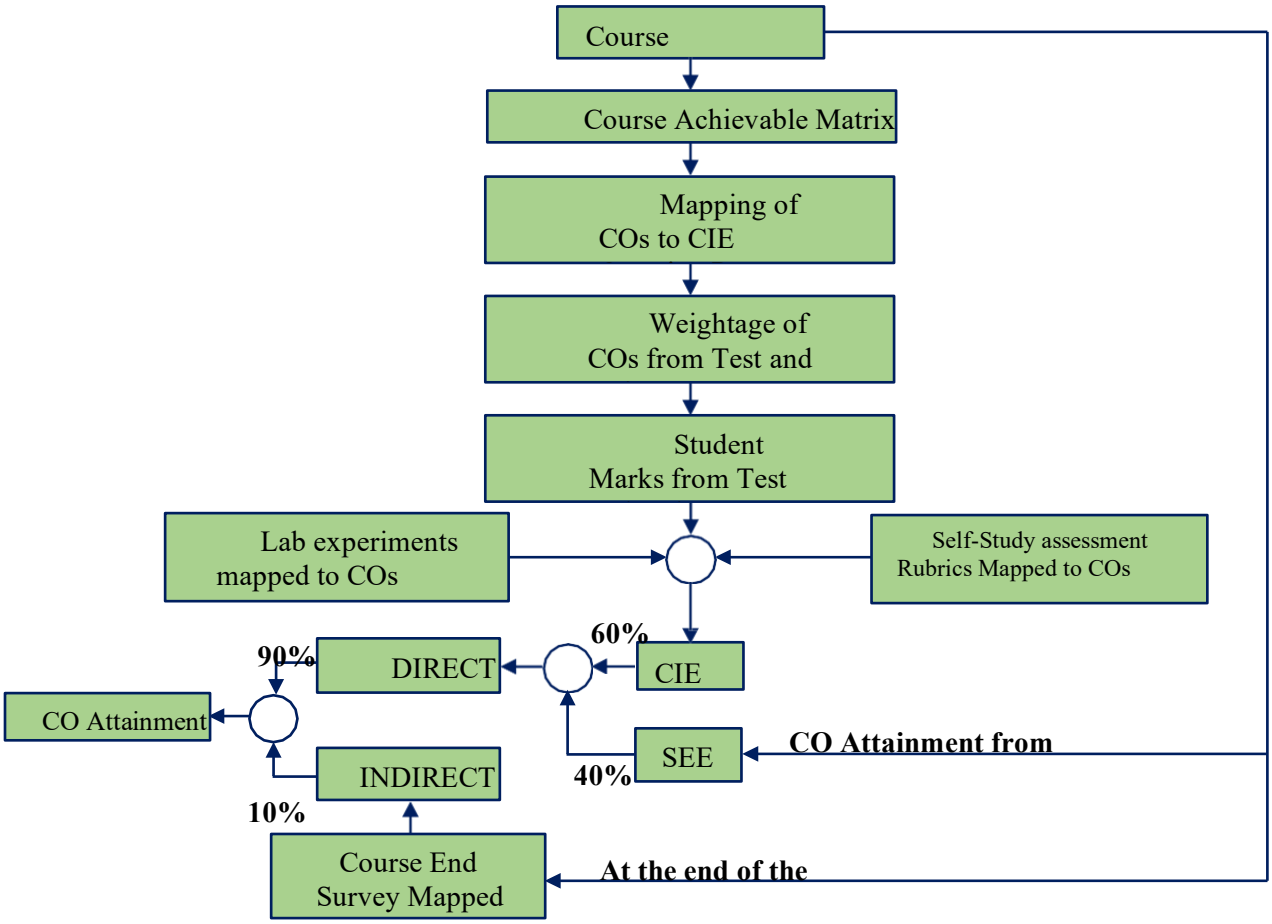
Academic Planning and Implementation



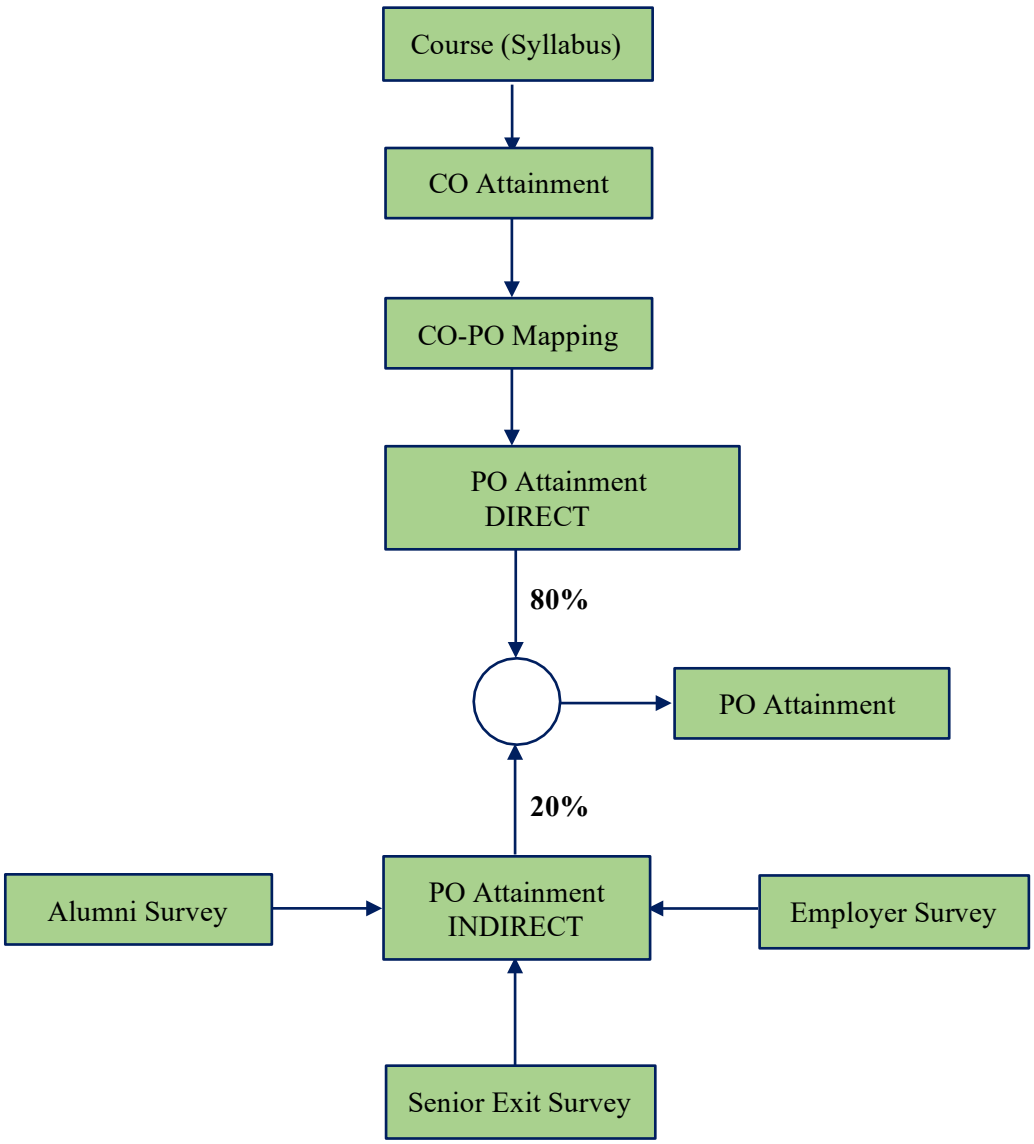
Process for Course Outcome Attainment



Final CO Attainment Process



Program Outcome Attainment Process



KNOWLEDGE & ATTITUDE

- **WK1:** A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.
- **WK2:** Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.
- **WK3:** A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.
- **WK4:** Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.
- **WK5:** Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.
- **WK6:** Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.
- **WK7:** Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.
- **WK8:** Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.
- **WK9:** Ethics, inclusive behaviour and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

INNOVATIVE TEAMS OF RVCE

Ashwa Mobility Foundation (AMF): Designs and fabricates Formula-themed race cars and mobility solutions to address urban transportation issues.

Astra Robotics Team: Focuses on designing and building application-specific robots.

Coding Club: Helps students gain coding skills and succeed in competitions like GSoC and ACM-ICPC.

Entrepreneurship Development Cell (E-Cell): Promotes entrepreneurship through workshops, speaker sessions, and mentoring for startups.

Frequency Club Team: Works on software and hardware, emphasizing AI and Machine Learning.

Team Garuda: Develops a supermileage urban concept electric car and E-mobility products.

Team Jatayu: Builds low-cost UAVs with autonomous capabilities for various tasks.

Solar Car Team: Aims to create a solar electric vehicle for sustainable transportation.

Team Antariksh: Focuses on space technology and the development of operational rockets.

Team Chimera: Builds a Formula Electric Car through R&D in E-Mobility.

Helios Racing Team: Designs and tests All-Terrain Vehicles, participating in SAE's BAJA competitions.

Team Hydra: Develops autonomous underwater vehicles for tasks like water purification.

Team Krushi: Creates low-cost farming equipment to assist farmers in cultivation and harvesting.

Team Vyoma: Designs and tests radio-controlled aircraft and UAVs.

Team Dhruva: Engages in astronomy-related activities and collaborates on projects with organizations like

Ham Club: Promotes Amateur Radio and explores technical innovations in communications, especially for disaster response.

Cultural Activity Teams

1. AALAP (Music club)
2. DEBSOC (Debating society)
3. CARV (Dramatics club)
4. FOOTPRINTS (Dance club)
5. QUIZCORP (Quizzing society)
6. ROTARACT (Social welfare club)
7. RAAG (Youth club)
8. EVOKE (Fashion team)
9. f/6.3 (Photography club)
10. CARV ACCESS (Film-making

NSS of RVCE

NCC of RVCE

VISION

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

MISSION

- To deliver outcome based Quality education, emphasizing on experiential learning with the state of the art infrastructure.
- To create a conducive environment for interdisciplinary research and innovation.
- To develop professionals through holistic education focusing on individual growth, discipline, integrity, ethics and social sensitivity.
- To nurture industry-institution collaboration leading to competency enhancement and entrepreneurship.
- 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