NEW HORIZON
COLLEGE OF ENGINEERING

DEPARTMENT OF
MASTER OF COMPUTER APPLICATIONS

Academic Year 2024-25

MCA

Third & Fourth Semester Scheme & Syllabus
BATCH 2023-25
CREDITS:100

NEW HORIZON
COLLEGE OF ENGINEERING

Autonomous College Permanently affiliated with VTU, approved by AICTE & UGC
Accredited by NAAC with 'A' Grade, accredited by NBA

Department of Master of Computer Applications

Academic Year 2024-25

Third and Fourth Semester MCA
Scheme & Syllabus

Batch: 2023-25

Credits: 100

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NEW HORIZON COLLEGE OF ENGINEERING

VISION

To emerge as an institute of eminence in the fields of engineering, technology and management in serving the industry and the nation by empowering students with a high degree of technical, managerial and practical competence.

MISSION

To strengthen the theoretical, practical and ethical dimensions of the learning process by fostering a culture of research and innovation among faculty members and students.

To encourage long-term interaction between the academia and industry through their involvement in the design of curriculum and its hands-on implementation.

To strengthen and mould students in professional, ethical, social and environmental dimensions by encouraging participation in co-curricular and extracurricular activities.

QUALITY POLICY

To provide educational services of the highest quality both curricular and co-curricular to enable students integrate skills and serve the industry and society equally well at global level.

VALUES

- Academic Freedom
- Integrity
- Inclusiveness
- Innovation
- Professionalism
- Social Responsibility

DEPARTMENT OF

MASTER OF COMPUTER APPLICATIONS

VISION

To emerge as a department of eminence in the field of Computer Applications in serving the Information Technology Industry and the nation by empowering students with a high degree of technical, managerial and practical competence.

MISSION

To strengthen the theoretical, practical and ethical aspects of the learning while inculcating a culture of research, innovation and practical applications amongst faculty and students.

To encourage long-term interactions between the department and the IT Industry through rich involvement of the Industry in the design of the curriculum and its hands-on implementation.

To strengthen and mold students in professional, ethical, social and environmental dimensions by encouraging participation in co-curricular and extracurricular activities.

QUALITY POLICY

To provide services of the highest quality both curricular and co-curricular, so that our students can integrate their skills and serve the industry and society equally well at the global level.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1 Excel in the field of Computer Applications and contribute to academia, industry and research.

PEO2 Deliver software solutions that are socially relevant and adapt quickly to emerging technologies.

PEO3 Demonstrate professional behavior by understanding ethical and communication skills to engage in lifelong learning.

PROGRAMME OUTCOMES (POs)

PO1 **Computational Knowledge:** Apply computing knowledge, mathematical knowledge and domain knowledge to create and develop new models for real world applications.

PO2 **Problem Analysis:** Identify, formulate, review research literature and analyze complex problems using principles of mathematics, computing sciences and relevant domains.

PO3 **Design / Development of Solutions:** Design, implement, test and maintain solutions for systems, components or processes that meet specific needs with consideration for public health safety, societal and environmental issues.

PO4 **Conduct investigations of complex Computing problems:** Use Research–based knowledge to analyze and interpret data to obtain viable conclusions.

PO5 **Modern Tool Usage:** Use modern tools, techniques and skills to solve complex and critical computing problems with an understanding of their limitations.

PO6 **Professional Ethics:** Understand and apply ethical principles, cyber regulations and commit to professional computing practice and responsibilities.

PO7 **Life-long Learning:** Recognize the importance of self-learning for continual development as a computing professional.

PO8 **Project management and finance:** Demonstrate the management principles for managing projects as an individual, as a member and as a leader in a team under multidisciplinary environments.

PO9 **Communication Efficacy:** Recognize the importance of communication within the computing community and the society at large.

PO10 **Societal and Environmental Concern:** Understand and assess the local and global influence of software solutions and responsibilities related to professional computing practice.

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

PO12 **Innovation and Entrepreneurship:** Adopt standardized computer application practices with innovative ideas to succeed as an employee or an entrepreneur.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1

To master skills in computing technologies to analyze, design and develop solutions for industry-oriented real-time computer applications.

PSO2

To inculcate technical communication skills and ethics, with professional practices to strengthen research and enhance career opportunities.

PEO to Mission Statement Mapping
Correlation: 3- High, 2-Medium, 1-Low

Mission Statements	PEO1	PEO2	PEO3
To strengthen the theoretical, practical and ethical aspects of the learning while inculcating a culture of research, innovation and practical applications amongst faculty and students.	3	3	3
To encourage long-term interactions between the department and the IT Industry through rich involvement of the Industry in the design of the curriculum and its hands-on implementation.	3	2	3
To strengthen and mould students in professional, ethical, social and environmental dimensions by encouraging participation in co-curricular and extra-curricular activities.	3	3	3

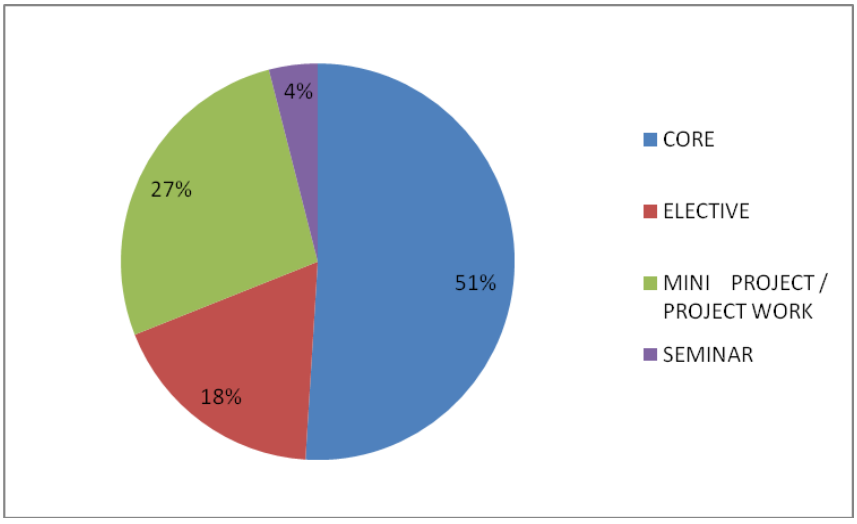
Mapping of POs to PEOs

PO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEO1	**3**	**3**	**3**	**3**	**3**	**2**	**1**	**3**	**2**	**2**	**3**	**3**
PEO2	**3**	**3**	**3**	**2**	**3**	**2**	**1**	**3**	**2**	**3**	**3**	**3**
PEO3	**2**	**2**	**3**	**2**	**2**	**3**	**3**	**2**	**2**	**3**	**2**	**2**

Correlation: 3-High, 2-Medium, 1-Low

DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS
MCA DEGREE CURRICULUM – CREDIT DISTRIBUTION TABLE
BATCH 2023-2025 SEMESTER I TO IV

SEMESTER	CORE	ELECTIVE	MINI PROJECT / PROJECT WORK	SEMINAR	TOTAL CREDITS
I	25	0	0	0	25
II	17	6	2	0	25
III	9	6	8	2	25
IV	0	6	17	2	25
TOTAL	51	18	27	4	100
% of Distribution	51%	18%	27%	4%	100%



DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS
SCHEME OF THIRD SEMESTER MCA PROGRAM
AY 2024-25

S N O	BOARD/ COURSE	COURSE CODE	COURSE	BOS	CREDIT DISTRIBUTION				OVERALL CREDITS	CONTACT HOURS WEEKLY (THEORY)	MARKS		
					L	T	P	S			CIE	SEE	TOTAL
1	MCA/PCC	23MCA31	MACHINE LEARNING	MCA	3	0	0	0	3	3	50	50	100
2	MCA/PCC	23MCA32	FULL STACK DEVELOPMENT	MCA	3	0	0	0	3	3	50	50	100
3	MCA/PEC	23MCA33X	PROFESSIONAL ELECTIVES - 3	MCA	3	0	0	0	3	3	50	50	100
4	MCA/PEC	23MCA34X	PROFESSIONAL ELECTIVES – 4	MCA	3	0	0	0	3	3	50	50	100
5	MCA/PCCL	23MCAL35	MACHINE LEARNING LAB USING PYTHON	MCA	0	0	1.5	0	1.5	3	50	50	100
6	MCA/PCCL	23MCAL36	FULL STACK LAB	MCA	0	0	1.5	0	1.5	3	50	50	100
7	MCA/SP	23MCA37	SOCIETAL PROJECT	MCA	0	0	2	0	2	-	100	-	100
8	MCA/INT	23MCA38	INTERNSHIP	MCA	0	0	6	0	6	-	50	50	100
9	MCA/SEM	23MCA39	TECHNICAL SEMINAR-1	MCA	0	0	0	2	2	-	50	50	100
TOTAL					12	0	11	2	25	18	500	400	900

Note: **PCC** - Professional Core Courses, **PEC** – Professional Elective Course (No SEE for lab component only CIE), **PCCL** - Professional Core Course Lab, **SP** - Societal Project, **INT** – Internship (06 weeks Internship to be completed in intervening vacation of Semester II and Semester III), **SEM**- SEMINAR
L – Lecture, **T**- Tutorial, **P**-Practical, **S** - Self Study

PROFESSIONAL ELECTIVES - 3								
S NO	COURSE CODE	COURSE	BOS	CREDIT DISTRIBUTION				TOTAL
				L	T	P	S	
1	23MCA331	ADVANCED WEB DESIGNING	MCA	3	0	0	0	3
2	23MCA332	CLOUD COMPUTING	MCA	3	0	0	0	3
3	23MCA333	NON-RELATIONAL DATABASES	MCA	3	0	0	0	3
4	23MCA334	INTERNET OF THINGS	MCA	3	0	0	0	3
5	23MCA335	DEEP LEARNING	MCA	3	0	0	0	3

PROFESSIONAL ELECTIVES – 4								
S NO	COURSE CODE	COURSE	BOS	CREDIT DISTRIBUTION				TOTAL
				L	T	P	S	
1	23MCA341	DATA SCIENCE	MCA	3	0	0	0	3
2	23MCA342	COMPUTER VISION	MCA	3	0	0	0	3
3	23MCA343	AUGMENTED REALITY AND VIRTUAL REALITY	MCA	3	0	0	0	3
4	23MCA344	MOBILE APPLICATION DEVELOPMENT	MCA	3	0	0	0	3
5	23MCA345	AGILE SOFTWARE DEVELOPMENT	MCA	3	0	0	0	3

DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS
SCHEME OF FOURTH SEMESTER MCA PROGRAM
AY 2024-25

S NO	BOARD/ COURSE	COURSE CODE	COURSE	BOS	CREDIT DISTRIBUTION				OVERALL CREDITS	CONTACT HOURS WEEKLY	MARKS		
					L	T	P	S			CIE	SEE	TOTAL
1	MCA/PEC	23MCA41X	PROFESSIONAL ELECTIVES – 5	MCA	3	0	0	0	3	3	50	50	100
2	MCA/OEC	20NHOPXXX	OPEN ELECTIVE COURSE	MCA	3	0	0	0	3	3	50	50	100
3	MCA/SEM	23MCA42	TECHNICAL SEMINAR -2	MCA	0	0	0	2	2	-	50	50	100
4	MCA/PROJ	23MCA43	MAJOR PROJECT	MCA	0	0	17	0	17	-	50	50	100
5	AUD/AEC	23AUD44	ONE CERTIFIED ONLINE COURSE		Classes and evaluation procedures are as per the policy of the online course providers.								PP
TOTAL					6	0	17	2	25	6	200	200	400

Note: **PEC** – Professional Elective Course, **OEC**-Industrial Open Elective Course, Credit for OEC is 03 (L: T: P:S) can be considered as(3: 0: 0 : 0). The teaching and learning of these Courses will be based on hands-on. The Course Assessment will be based on CIE and SEE in practical mode. These Courses will be offered by Centre of Excellence to students of all the branches. Registration to Industrial open electives shall be documented and monitored on college level
SEM- SEMINAR **PROJ**- Project Work, **AUD/AEC** – Audit Course / Ability Enhancement Course.
L – Lecture, **T**- Tutorial, **P**-Practical, **S** - Self Study

PROFESSIONAL ELECTIVES – 5								
S NO	COURSE CODE	COURSE	BOS	CREDIT DISTRIBUTION				TOTAL
				L	T	P	S	
1	23MCA411	PROFESSIONAL ETHICS	MCA	3	0	0	0	3
2	23MCA412	DESIGN THINKING	MCA	3	0	0	0	3
3	23MCA413	ENTREPRENEURSHIP AND INNOVATION MANAGEMENT	MCA	3	0	0	0	3
4	23MCA414	DIGITAL MARKETING	MCA	3	0	0	0	3
5	23MCA415	SOFTWARE PROJECT MANAGEMENT	MCA	3	0	0	0	3

OPEN ELECTIVE COURSES								
S NO	**COURSE CODE**	**COURSE**	**BOS**	**CREDIT DISTRIBUTION**				**TOTAL**
				L	**T**	**P**	**S**	
1	20NHOP601	BIG DATA ANALYTICS USING HP VERTICA-1	MCA	3	0	0	0	3
2	20NHOP602	VM WARE VIRTUALISATION ESSENTIALS-1	MCA	3	0	0	0	3
3	20NHOP614	BLOCKCHAIN	MCA	3	0	0	0	3
4	20NHOP728A	DATABASE ADMINISTRATION USING DB2	MCA	3	0	0	0	3

MACHINE LEARNING

Course Code	**23MCA31**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:
At the end of the course, the student will be able to:

23MCA31.1	Identify the practical implications of Machine Learning (ML) and its approaches.
23MCA31.2	Use Supervised machine learning algorithms to solve a given problem.
23MCA31.3	Apply the concepts of Regression, Clustering and ensemble learning algorithms to solve real-time applications.
23MCA31.4	Examine the reinforcement algorithms and optimization techniques of Genetic Algorithms.
23MCA31.5	Derive R Scripts for deploying Machine Learning algorithms.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
23MCA31.1	2	-	-	-	-	-	-	-	-	-	-	-	3	-
23MCA31.2	-	2	2	2	-	-	-	-	-	-	-	-	3	-
23MCA31.3	-	2	2	2	-	-	-	-	-	-	-	-	3	-
23MCA31.4	-	2	2	-	-	-	-	-	-	-	-	-	3	-
23MCA31.5	-	-	3	-	2	-	-	-	-	-	-	-	3	-

MODULE-1	**INTRODUCTION TO MACHINE LEARNING**	**23MCA31.1**	**8 Hours**

Definition, Origin, Need, Types of Learning, Uses and abuses, Ethical considerations, Abstraction and Knowledge Representation, Generalization, Assessing the Success, Steps to apply ML to data, Choosing ML algorithm, the Input Data, Types of ML Algorithms, Matching Data to an Appropriate Algorithm, ML Models, Applications, Performance Measures.

Text Book	Text Book 3: 1, 2

MODULE-2	**MACHINE LEARNING ALGORITHMS-I**	**23MCA31.2**	**8 Hours**

Decision Tree, Neural Networks - Representation, Perceptron, Multilayer Networks and Back Propagation, Bayesian Method, Naïve Bayes Classification, Instance Based Learning – K-Nearest Neighbor.

Text Book	Text Book 2: 3.2, 3.4, 4.1, 4.2, 4.3, 4.4, 4.5, 6.1, 6.2, 6.9, 8.1, 8.2, Text Book 1 : 5,7,9,11

MODULE-3	**MACHINE LEARNING ALGORITHMS-II**	**23MCA31.3**	**8 Hours**

Regression - Linear Regression, Logistic Regression, Support Vector Machine - Multi Category Generalizations, Ensemble Learning - Model Combination Schemes, Voting, Averaging, Error-Correcting Output Codes, Bagging - Random Forests, Boosting - Adaboost, Stacking. Clustering – Hierarchical Clustering, K-Means Clustering, Soft K-means, K-Mode Clustering, DBScan.

Text Book	Text Book 3: 6, 7, 9, 11
Self-study / Case Study / Applications	Case Studies of Machine Learning Applications in Retail, Hospitality, Education and Insurance Sectors

MODULE-4	**GENETIC & REINFORCEMENT ALGORITHMS**	**23MCA31.4**	**8 Hours**

Genetic Algorithms - Genetic Operator, Fitness Function and Selection, An Illustrative Example, Genetic Programming, Models of Evolution and Learning - Lamarkian Evolution, Baldwin Effect.
Reinforcement Learning, Algorithms, Learning Models of Reinforcement - Markov Decision Process, Q learning, Reinforcement Learning vs. Supervised Learning, Applications and Challenges.

Text Book	Text Book 2: 9.1, 9.2, 9.3, 9.4, 9.5, 9.6, 9.7, 13.1, 13.2

MODULE-5	**PROGRAMMING IN R AND IMPLEMENTATION OF ML ALGORITHMS USING R**	**23MCA31.5**	**8 Hours**

R Environment, R Packages and Libraries, Basics, Managing and Understanding Data, Reading Data into Data frames, Lists, Data handling, Statistical Functions & Graphics, Writing Functions, Control Statements, Loops, Strings, Data Interfaces, Charts and Graphs.

Implementation Techniques of Algorithms using R with Standard Datasets – Naïve Bayes, K-Nearest Neighbor, K-Means Clustering.	
Text Book	Text Book 4: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 16, Text Book 1: 1,2,3,16
Self-study / Case Study / Applications	**Hands-on :** R scripts to handle data, to use Statistical functions, R program to solve ML problem using Naïve Bayes, K-Nearest Neighbor, K-Means Clustering

CIE Assessment Pattern(50 Marks – Theory)

RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment (s)	MCQ's
		25	15	10
L1	Remember	5	-	3
L2	Understand	10	-	3
L3	Apply	5	5	4
L4	Analyze	5	10	-
L5	Evaluate	-	-	-
L6	Create	-	-	-

SEE Assessment Pattern(50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	20
L3	Apply	10
L4	Analyze	10
L5	Evaluate	--
L6	Create	--

Suggested Learning Resources:

Text Books:

1) Mathematics and Programming for Machine Learning with R, William B. Claster, CRC Press, Taylor & Francis, 2020, ISBN: 978-1-00-0196979.
2) Machine Learning, Tom M Mitchel, McGraw Hill Education, 2017, ISBN: 978-1-25-909695-2.
3) Machine Learning with R - Third Edition By Brett Lantz, Packt, 2013, ISBN: 978-1-78216-214-8
4) R for Everyone, Advanced Analytics and Graphics, Jared P Lander, Pearson Publication, 2017, ISBN: 978-0-13-454692-6.

Reference Books:

1) Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems" Third Edition, O'REILLY, 2022, ISBN : 978-9355421982
2) 2Machine Learning, Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, Pearson Education India, 2019, ISBN: 9789353067373.
3) Andreas Muller , "Introduction to Machine Learning with Python: A Guide for Data Scientists", Grey scale Indian Edition, O'REILLY, 2016, 978-1449369415

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=jGwO_UgTS7I&list=PLoROMvodv4rMiGQp3WXShtMGgzqpfVfbU
- https://www.youtube.com/watch?v=4b4MUYve_U8&list=PLoROMvodv4rMiGQp3WXShtMGgzqpfVfbU&index=2
- https://www.youtube.com/watch?v=nt63k3bfXS0&list=PLoROMvodv4rMiGQp3WXShtMGgzqpfVfbU&index=5

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Video demonstration of latest trends
- Contents related activities (Activity-based discussions)
  - Organizing Group wise discussions
  - Seminars

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FULL STACK DEVELOPMENT

Course Code	**23MCA32**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:
At the end of the course, the student will be able to:

23MCA32.1	Use mark-up tags with styles to design aesthetic web pages.
23MCA32.2	Illustrate client-side scripting to validate the web pages.
23MCA32.3	Apply server-side scripting for developing dynamic and responsive web applications.
23MCA32.4	Analyze React JS features for reusable and maintainable applications.
23MCA32.5	Examine development of extensive web applications.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
23MCA32.1	1	-	2	-	1	-	-	-	-	-	-	-	3	-
23MCA32.2	-	1	1	-	1	-	-	-	-	-	-	-	3	-
23MCA32.3	-	-	1	-	1	-	-	-	-	-	-	-	3	-
23MCA32.4	-	-	2	-	1	-	-	-	-	-	-	-	3	-
23MCA32.5	-	-	1	-	1	-	-	-	-	-	-	-	3	-

MODULE-1	**INTRODUCTION TO WEB PROGRAMMING AND HTML5**	**23MCA32.1**	**8 Hours**

Introduction to Full Stack Development, HTML Basic Tags - Syntax, Elements, Attributes, Headings, Paragraph, Style, Formatting, Tables, Links, Images, Lists, Media, Audio and Video, Forms. Cascading Style Sheets - Syntax, Levels of CSS, Selectors, Properties, Box Model, Span and Div, Conflict Resolution. BootStrap: Introduction, File Structure, Basic HTML Template, Default Grid System — Basic Grid HTML, Container Layouts, Responsive Design.

Self-study / Case Study / Applications	Analyze standard web applications to understand the importance of HTML tags covered in the module
Text Book	Text Book 1: 1,2,3

MODULE-2	**SCRIPTING LANGUAGE AND FRAMEWORK**	**23MCA32.2**	**8 Hours**

Overview of Javascript, Basics, Standard Input and Screen Output, Object – Creation & Modification, Math Object, Number, String Objects, Arrays, Functions, Constructors. Document Object Model - Elements Access in Java Script, Events and Event Handling.

Text Book	Text Book 1: 4,5,6

MODULE-3	**PHP**	**23MCA32.3**	**8 Hours**

PHP Framework, Applications, General Syntactic Structure, Primitives, Operations and Expressions. Control Statements, Arrays. Functions, Pattern Matching, Form Handling, File Handling, Cookies, Session Tracking, Objects, Classes and Exception Handling. Database Access with PHP and MySQL.

Text Book	Text Book 2: 1,2,3

MODULE-4	**React JS**	**23MCA32.4**	**8 Hours**

Introduction to React JS, Features, Architecture, Creating React Application, JSX ,Components, Component Life Cycle, Styling, Properties (Props), Constructor, Event Management, State Management, Forms, Lists, Keys, Hooks.

Self-study / Case Study / Applications	For a standard webpage developed using PHP analyze the usage of cookies and session tracking.
Text Book	Text Book 3: 6,7,9,10,11

MODULE-5	INTRODUCTION TO ANGULARJS	23MCA32.5	8 Hours

Directives, Expressions, Directives, Controllers, Filters, Services, Events, Forms, Validations, Examples.

Text Book	Text Book 4: 1,2,4,8,9,11,12

CIE Assessment Pattern(50 Marks – Theory)

RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment (s)	MCQ's
		25	15	10
L1	Remember	-	-	2
L2	Understand	5	5	2
L3	Apply	10	5	3
L4	Analyze	5	5	3
L5	Evaluate	5	-	-
L6	Create	-	-	-

SEE Assessment Pattern(50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	5
L2	Understand	10
L3	Apply	20
L4	Analyze	10
L5	Evaluate	5
L6	Create	-

Suggested Learning Resources:

Text Books:

1) Programming the world wide web by Sebesta, Robert W. ,Addison-Wesley Professional, 2014.
2) Bootstrap by Jake Spurlock, O'ReiIly Media, 2013
3) Adam Trachtenberg, PHP Cookbook: Solutions and Examples for PHP Programmers, Third edition, O'Reily Media, 2014.
4) AngularJS: Up And Running Shyam Seshadri and Brad Green O'Reilly Media, Inc 2018.

Reference Books:

1) Mark Meyers, A Smart way to Learn JavaScript, 2013-14 (e-book and Kindle version only).
2) Benjamin la kobus, Jason Mara h, Mastering Bootstrap4, Edition 2016, Packet Publishing.
3) Web Programming By Chris Bates , Wiley Publications HTML5 Black Book by Dreamtech
4) Ng-book: The complete guide to Angular., by Murray, Nathan, Felipe Coury, Ari Lerner, and Carlo Taborda , CreateSpace Independent Publishing Platform, 2018
5) Bampakos, Aristeidis, and Pablo Deeleman. Learning Angular: A no-nonsense guide to building web applications with Angular 15. Packt Publishing Ltd, 2023.

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=3Xly2W1Cisc
- https://www.youtube.com/watch?v=OK_JCtrrv-c
- https://html-iitd.vlabs.ac.in/exp/introduction-to-html/references.html

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Analyse existing web sites in groups to understand the usage of various full stack development tools.
- Contests on web page designing and development.

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PROFESSIONAL ELECTIVES 3

ADVANCED WEB DESIGNING			
Course Code	**23MCA331**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:
At the end of the course, the student will be able to:

23MCA331.1	Illustrate the features of framework and programming technologies used in web application development
23MCA331.2	Identify the necessary configurations to setup the IDE for the project
23MCA331.3	Draw the elementary components and associated events in an IDE
23MCA331.4	Examine various modules to develop the web application effectively
23MCA331.5	Interpret the directives and appropriate services to build the advanced web application projects

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
23MCA331.1	3	-	-	-	3	-	-	-	-	-	-	-	-	3
23MCA331.2	-	-	3	-	3	-	-	-	-	-	-	-	-	3
23MCA331.3	-	-	3	-	3	-	-	-	-	-	-	-	-	3
23MCA331.4	-	2	2	2	3	-	-	-	-	-	-	-	-	3
23MCA331.5	-	-	-	-	3	-	-	1	-	-	-	2	-	3

MODULE-1	**INTRODUCTION TO ANGULAR AND TYPESCRIPT**	**23MCA331.1**	**8 Hours**

Need for Angular, Single Page Application (SPA), Angular-CLI, Features of Angular, Differences between AngularJS and Angular.
Need for Typescript, Differences between JavaScript and Typescript, Basic Data-types, Type Assertion, Inferred Typing, Variable Scope, Operators, Decision Making, Loops, Functions, Arrays, Working with Classes and Interfaces.

Text Book	Text Book 1: 1, 2 Text Book 2: 1, 5, 6, 11 Text Book 3: 1, 2, 3

MODULE-2	**ANGULAR-CLI, ENVIRONMENT SETUP, PROJECT STRUCTURE**	**23MCA331.2**	**8 Hours**

Installation of Node.js Server, Typescript, Angular-CLI, Introduction to Angular-CLI, Steps to Setup Local Development Environment (Node/NPM), Angular Project structure, Bootstrapping, Overview on Angular Building Blocks – Modules, Components, Services, Templates, Decorator/Metadata, Data Binding, Directives, Dependency Injection, Root Angular module.

Text Book	Text Book 1: 1.1 Text Book 2: 2, 5, 6, 11 Text Book 3: 1, 2, 3

MODULE-3	**ANGULAR COMPONENTS AND DATA BINDING**	**23MCA331.3**	**8 Hours**

Components Definition, Elements of Angular Component, @Component Decorator Properties – Selector, Template-URL, Styles/Style-URLs, Creating Components, Component Lifecycle.
Data Binding, Interpolation, Property Binding, Attribute Binding, Class Binding, Style Binding, Event Binding, Two-Way Data Binding, Component Interaction in Angular Based on Parent-Child Relation.

Self-study / Case Study / Applications	**Hands-On:** • Demonstrate the Creation and Use of Angular Component • Program to Demonstrate One-way and Two-way Binding in Angular
Text Book	Text Book 1: 2.3 Text Book 2: 12, 14, 17 Text Book 3: 3, 4, 5

MODULE-4	**PIPES AND ANGULAR MODULES**	**23MCA331.4**	**8 Hours**

Built-in Pipes, Pipes and Precedence, Chaining Multiple Pipes, Parameterizing a Pipe, Filter Pipe, Impure & Pure Pipe, Async Pipes.

Need for Angular Modules, @NgModule Decorator Properties - Declarations, Imports, Providers, Bootstrap, Creating Modules, Core Module, Shared Modules.			
Self-study / Case Study / Applications	**Hands-On:** • Demonstrate the Use of Pipes • Demonstrate the Use of Angular Modules		
Text Book	Text Book 1: 2.4, 2.5 Text Book 2: 18, 21 Text Book 3: 2, 8		
MODULE-5	**DIRECTIVES, DEPENDENCY INJECTION AND SERVICES**	**23MCA331.5**	**8 Hours**
Built-in Directives, Structural Directives and Types, Attribute Directives and Types, Component Directives Introduction to Injections, Types of Injections – Constructor Injections, Property Injections, Method injections, Introduction to Services, Understanding Services, Creating Services			
Self-study / Case Study / Applications	**Hands-On:** • Demonstrate the Use of Angular Directives • Demonstrate the Use of Services and Dependency Injection		
Text Book	Text Book 1: 2.4, 2.5, 2.6 Text Book 2: 13, 15, 16, 19 Text Book 3: 6, 8		

CIE Assessment Pattern(50 Marks – Theory)

RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment (s)	MCQ's
		25	15	10
L1	Remember	5	-	2
L2	Understand	10	5	5
L3	Apply	5	5	3
L4	Analyze	5	5	-
L5	Evaluate	-	-	-
L6	Create	-	-	-

SEE Assessment Pattern(50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	20
L3	Apply	10
L4	Analyze	10
L5	Evaluate	--
L6	Create	--

Suggested Learning Resources:

Text Books:

1) Learning Angular – A no-nonsense beginner's guide to building web applications with Angular 15 And TypeScript, Aristeidid Bampakos, Pablo Deeleman, Packt Publishing, 2023, ISBN:9781803237343
2) Pro Angular 9: Build Powerful and Dynamic Web Apps, Adam Freeman, Apress, 2020, ISBN:9781484259979
3) Angular in Action, Jeremy Wilken, Manning, 2018, ISBN:9781638356004

Reference Books:

1) TypeScript Quickly, Anton Moiseev, Yakov Fain, Manning, 2020, ISBN: 9781617295942.
2) Web Development with Angular and Bootstrap, Sridhar Rao Chivukula, Aki Iskandar, Packt Publishing, 2019, ISBN: 9781838550387.
3) ng-book: The Complete Guide to Angular, Nathan Murray, Felipe Coury, Ari Lerner, Carlos Taborda, Fullstack.io, 2018, ISBN: 9781985170285

Web links and Video Lectures (e-Resources): • https://angular.io/guide/what-is-angular • https://www.tutorialspoint.com/typescript/index.htm • https://www.freecodecamp.org/news/angular-for-beginners-course/ • https://www.youtube.com/watch?v=iZ1mlcCkY8A • https://www.youtube.com/watch?v=0eWrpsCLMJQ • https://www.youtube.com/watch?v=-9VcW7MBDs8
Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning • Hands-on Sessions • Student presentations • Expert Talk on usability in Industrial Applications

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CLOUD COMPUTING

Course Code	**23MCA332**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:
At the end of the course, the student will be able to:

23MCA332.1	Use the concepts of cloud computing in real-time applications
23MCA332.2	Apply the concept of virtualization with its types
23MCA332.3	Classify the different cloud services and deployment models
23MCA332.4	Examine the different public cloud platforms and the security strategies
23MCA332.5	Analyze the various cloud programming models and apply them to solve problems in a cloud environment

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
23MCA332.1	2	1	1	-	-	-	-	-	-	-	-	-	-	3
23MCA332.2	2	-	2	-	-	-	-	-	-	-	-	-	-	3
23MCA332.3	-	2	-	-	-	-	-	-		-	-			3
23MCA332.4	2	3	2	-	-	2	-	-	-	-	-	-	-	3
23MCA332.5	3	3	3	2	2	-	-	-	-	-	-	-	-	3

MODULE-1	**DISTRIBUTED SYSTEM MODELS AND ENABLING TECHNOLOGIES**	**23MCA332.1**	**8 Hours**

Scalable Computing Service Over the Internet: Age Of Internet Computing, Scalable Computing Trends & New Paradigms, Internet of Things and Cyber-Physical Systems. System Models For Distributed and Cloud Computing: Clusters of Cooperative Computers, Grid Computing Infrastructures, Peer-to-Peer Network Families, Cloud Computing Over the Internet.
Software Environments for Distributed Systems and Clouds: Service-Oriented Architecture (SOA), Parallel & Distributed Programming Models.
Cloud Based Services and Applications- Healthcare, Transportation Systems, Manufacturing Industry, Government, Education, and Mobile Communication.

Text Book	Text Book 1: 1.5, Text Book 3: 1.1,1.2,1.3,1.4

MODULE-2	**VIRTUALIZATION AND CLOUD PLATFORM ARCHITECTURE OVER VIRTUALIZED DATA CENTRES**	**23MCA332.2 23MCA332.3**	**8 Hours**

Introduction, Characteristics of Virtualized Environments, Taxonomy of Virtualization Techniques, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples: Xen- Para Virtualization, Vmware- Full Virtualization, Microsoft Hyper-V
Cloud Computing and Service Models- Public, Private, and Hybrid Clouds, Cloud Ecosystem and Enabling Technologies, Infrastructure as a Service (Iaas), Platform and Software as a Service (Paas, Saas). Architectural Design of Compute and Storage Clouds- A Generic Cloud Architecture Design, Layered Cloud Architectural Development, Architectural Design Challenges.

Self-study / Case Study / Applications	**Hands on:** Creating a word document and store on the cloud.
Text Book	Text Book 2: 3.1,3.2,3.3,3.4,3.5,3.6, Text Book 3: 4.1,4.3

MODULE-3	**PUBLIC CLOUD PLATFORMS**	**23MCA332.4**	**8 Hours**

GAE, AWS, and Azur- Public Clouds and Service Offerings, Google App Engine (GAE), Amazon Web Service (AWS), Microsoft Windows Azure.
Inter-Cloud Resource Management- Extended Cloud Computing Services, Resource Provisioning and Platform Deployment.
Cloud Security and Trust Management- Cloud Security Defence Strategies, Distributed Intrusion/ Anomaly Detection, Data and Software Protection Techniques.

Self-study / Case Study / Applications	**Hands on:** Creating an account in AWS and working with AWS, Launching an Instance with AMI.		
Text Book	Text Book 3: 4.4,4.5,4.6		
MODULE-4	**CLOUD PROGRAMMING AND SOFTWARE ENVIRONMENTS**	**23MCA332.5**	**8 Hours**
Features of Cloud and Grid Platforms- Cloud Capabilities and Platform Features, Traditional Features Common to Grids and Clouds, Data Features and Databases, Programming and Runtime Support. Parallel and Distributed Programming Paradigms- Parallel Computing and Programming Paradigms, Map Reduce, Hadoop Library from Apache.			
Self-study / Case Study / Applications	**Hands on:** Install a C compiler on the virtual machine and execute sample programs.		
Text Book	Text Book 3: 6.1,6.2		
MODULE-5	**PROGRAMMING THE GOOGLE APP ENGINE AND EMERGING CLOUD SOFTWARE ENVIRONMENTS**	**23MCA332.5**	**8 Hours**
Google File System(GFS), Big Table, Google's NOSQL System, Chubby, Google's Distributed Lock Service. Programming on Amazon AWS and Microsoft Azure, Programming on Amazon EC2, Amazon Simple Storage Service S3, Amazon Elastic Block Store EBS and Simple DB, Microsoft Azure Programming Support. Open Source Eucalyptus and Nimbus, Open Nebula, Sector / Sphere, and Open Stack.			
Self-study / Case Study / Applications	**Hands on:** Installation and working of Google App Engine		
Text Book	Text Book 3: 6.3,6.4,6.5		

CIE Assessment Pattern(50 Marks – Theory)

RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment (s)	MCQ's
		25	15	10
L1	Remember	5	-	5
L2	Understand	5	5	5
L3	Apply	10	5	-
L4	Analyze	5	5	-
L5	Evaluate	-	-	-
L6	Create	-	-	-

SEE Assessment Pattern(50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	20
L4	Analyze	10
L5	Evaluate	--
L6	Create	--

Suggested Learning Resources:

Text Books:

1) Cloud Computing: A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, 1st Edition, The Orient Blackswan, 2014, ISBN:978-8-17-371923-3
2) Mastering Cloud Computing, Rajkumar Buyya, Christian Vecchiola, and S Thamarai Selvi, Tata McGraw Hill, New Delhi, India, 2013, ISBN: 978-1-25-902995-0

3) Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, Kai Hwang, Jack Dungaree, and Geoffrey Fox, MK Publisher, 2012, ISBN: 978-0-12-385880-1

Reference Books:

1) Cloud Computing: Theory and Practice, Dan Marinescu, 3rd Edition, MK Publications, Elsevier 2022, ISBN: 978-0-32-385277-7
2) Cloud Computing for Dummies: Judith S. Hurwitz, Daniel Kirsch, 2nd Edition, 2020, ISBN: 978-0-470-484-8.
3) Cloud Computing: Master the Concepts, Architecture and Applications with Real-world Examples and Case Studies, Kamal Kant Hiran, 1st Edition, BPB Publications, 2019, ISBN:9789388511407.
4) Cloud Computing, A Practical Approach, Anthony T. Volte,Toby J. Volte, Robert Elsenpeter, McGraw Hill, 2010, ISBN: 978-0-07-162695-8.

Web links and Video Lectures (e-Resources):

- https://onlinecourses.nptel.ac.in/noc21_cs14/preview
- https://www.youtube.com/watch?v=M988_fsOSWo
- http://localhost:8080/xmlui/handle/123456789/17251
- https://www.youtube.com/c/amazonwebservices
- https://onlinecourses.nptel.ac.in/noc21_cs15/preview

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning:

- Demonstration of cloud platforms
- Video demonstration of Amazon web services
- Hands on session on creating an account in public cloud
- Contents related activities (Activity-based discussions)
  - Seminars
  - Active participation of students in creating an account in public cloud platforms

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NON-RELATIONAL DATABASES

Course Code	**23MCA333**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:
At the end of the course, the student will be able to:

23MCA333.1	Illustrate the interface and the interacting mechanism with NoSQL database.
23MCA333.2	Categorize the primitive operations on NoSQL database.
23MCA333.3	Compute aggregation and compound operations on NoSQL database.
23MCA333.4	Examine the architecture and features of distributed data store.
23MCA333.5	Interpret the requirements of Big Data Analytics in real-world applications.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
23MCA333.1	3	-	-	-	3	-	-	-	-	-	-	-	-	3
23MCA333.2	-	2	2	-	3	-	-	-	-	-	-	-	-	3
23MCA333.3	-	-	2	2	3	-	-	-	-	-	-	-	-	3
23MCA333.4	-	2	-	2	-	-	-	1	-	-	-	-	-	3
23MCA333.5	-	-	2	2	2	-	-	-	-	-	-	1	-	3

MODULE-1	**INTRODUCTION TO NOSQL AND MONGODB**	**23MCA333.1**	**8 Hours**

Definition and Introduction, the Need for NOSQL, Difference Between SQL and NOSQL, ACID vs. BASE, Advantages and Disadvantages of NOSQL Databases, Types of NOSQL Databases- Key-Value Pair Database, Document Databases, Column Family Databases, Graph Databases.
Data Model, Query Model, Replication Model, Consistency Model.

Text Book	Text Book 1: 1, 2, 9 Text Book 2: 1.1, 1.2

MODULE-2	**GETTING STARTED WITH MONGODB**	**23MCA333.2**	**8 Hours**

Documents, Collections, Dynamic Schemas, Naming, Databases, Introduction to the Mongodb Shell, Running the Shell, a Mongodb Client, Basic Operations with the Shell, Data Types, Basic Data Types, Dates, Arrays, Embedded Documents_ Id And Objectids, Creating, Updating, Deleting Documents, Querying.

Self-study / Case Study / Applications	**HANDS-ON:** • Installation and Configuration of MongoDB • Demonstrate MongoDB CRUD Operations
Text Book	Text Book 2: 1.3, 1.4

MODULE-3	**AGGREGATION, TEXT SEARCH AND INDEXES**	**23MCA333.3**	**8 Hours**

Aggregation Pipeline, Map-Reduce, Single Purpose Aggregation, Operations
Text Indexes, Text Search Operators, Text Search in the Aggregation Pipeline
Single Field Indexes, Compound Indexes

Self-study / Case Study / Applications	**HANDS-ON:** • Demonstrate the Use of Aggregation Pipeline • Demonstrate the Use of MongoDB Indexing
Text Book	Text Book 2: 2.5, 2.6, 2.7

MODULE-4	**REPLICATION AND SHARDING**	**23MCA333.4**	**8 Hours**

Replica Set Members, Replica Set Deployment Architectures, Replica Set High Availability, Replica Set Read and Write Semantics
Sharded Cluster Components, Sharding Strategy, Data Partitioning with Chunks, Sharded Cluster Balancer

Text Book	Text Book 2: 3.10, 3.11, 3.12, 3.13, 4.14, 4.15, 4.16, 4.17

MODULE-5	INTRODUCTION TO BIG DATA AND BIG DATA MANAGEMENT	23MCA333.5	8 Hours

What is Big Data, History, Structuring Data, Elements of Big Data, Big Data Analytics, and Careers in Big Data.
Building Blocks and Components, Hadoop Architecture, Hbase, HIVE.

Text Book	Text Book 3: 1, 2, 3, 5, 7

CIE Assessment Pattern(50 Marks – Theory)

RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment (s)	MCQ's
		25	15	10
L1	Remember	5	-	2
L2	Understand	10	5	3
L3	Apply	5	5	5
L4	Analyze	5	5	-
L5	Evaluate	-	-	-
L6	Create	-	-	-

SEE Assessment Pattern(50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	5
L2	Understand	20
L3	Apply	15
L4	Analyze	10
L5	Evaluate	-
L6	Create	-

Suggested Learning Resources:

Text Books:

1) NoSQL distilled: a brief guide to the emerging world of polyglot persistence, SADALAGE, Pramod J. and Martin FOWLER, Upper Saddle River: Addison-Wesley, 2013, ISBN: 9780321826626.
2) MongoDB: The Definitive Guide, Shannon Bradshaw, Eoin Brazil, Kristina Chodorow,3rd Edition, O'Reilly Media, Inc, 2019, ISBN: 9781491954461
3) Big Data Black Book, DT Editorial Services, Dreamtech press, 2016, ISBN: 9789351199311

Reference Books:

1) Data Modeling with NoSQL Database, Singh, Ajit, and Ahmad, Sultan, N.p., Amazon Digital Services LLC - Kdp, 2021, ISBN:9798730280229
2) The Definitive Guide to MongoDB, The NOSQL Database for Cloud and Desktop Computing, Eelco Plugge, Peter Membrey and Tim Hawkins, Apress, 2010, ISBN: 978-1-4302-3052-6. (E-Book)
3) Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph, David Loshin, Morgan Kaufmann, 2013, ISBN:978-0-12-418664-4.

Web links and Video Lectures (e-Resources):

- https://www.mongodb.com/nosql-explained
- https://www.geeksforgeeks.org/introduction-to-nosql/
- https://www.guru99.com/what-is-big-data.html
- https://www.techtarget.com/searchdatamanagement/definition/big-data-management
- https://www.youtube.com/watch?v=ExcRbA7fy_A

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Hands-on Sessions
- Student presentations
- Expert Talk on usability in Industrial Applications

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INTERNET OF THINGS

Course Code	**23MCA334**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:
At the end of the course, the student will be able to:

23MCA334.1	Examine the underlying concepts of M2M and IoT
23MCA334.2	Draw the technology preparedness to connect with smart objects.
23MCA334.3	Derive the extensive features of IoT protocols and platforms.
23MCA334.4	Choose IoT pragmatics using appropriate microcontroller model.
23MCA334.5	Recommend real world IOT applications.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
23MCA334.1	3	-	-	-	-	-	-	-	-	-	-	-	-	3
23MCA334.2	-	2	3	2	-	-	-	-	-	-	-	-	-	3
23MCA334.3	-	1	-	3	1	-	-	-	-	-	-	-	-	3
23MCA334.4	-	-	3	-	3	-	-	1	-	-	-	-	-	3
23MCA334.5	1	1	3	2	2	-	-	-	-	-	-	2	-	3

MODULE-1	**INTRODUCTION TO IOT EVOLUTION OF INTERNET OF THINGS**	**23MCA334.1**	**8 Hours**

Enabling Technologies – IoT Architectures: one M2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack - Fog, Edge and Cloud in IoT, -IoT and Digitization – Convergence of IT and IoT – IoT Challenges.

Text Book	Text Book 1: 1, 2

MODULE-2	**M2M AND IOT TECHNOLOGY FUNDAMENTALS**	**23MCA334.2**	**8 Hours**

Devices and Gateways, Actuators and its Types, Data Management, Connecting Smart Objects, Everything as a Service (XaaS), M2M and IoT Analytics, Knowledge Management.

Text Book	Text Book 1: 3, 4

MODULE-3	**IOT PROTOCOLS AND PLATFORMS**	**23MCA334.3**	**8 Hours**

6LowPAN, Wi-fi, Bluetooth, COAP, MQTT, Zigbee Architecture, LoRaWAN Platforms- Components of Microsoft Azure, Google Cloud.

Text Book	Text Book 1: 5, 6

MODULE-4	**IOT PROGRAMMING**	**23MCA334.4**	**8 Hours**

Introduction to RaspberryPI, Rasbian OS, Interfacing Analog and Digital Devices, Enabling Network Connectivity, Connecting with Web Server, API Connectivity- Open Weather Map API.

Self-study / Case Study / Applications	**HANDS-ON:** • Exploring different components of RaspberryPI • Setting up of the board and booting the board. • Working with sensors on RaspberryPI • Practices on python coding
Text Book	Text Book 2: 4

MODULE-5	**APPLICATIONS OF IOT**	**23MCA334.5**	**8 Hours**

Use of Big Data and Visualization in IoT - Industry 4.0 Concepts , Web Enabled Constrained Devices, Role of Machine Learning, Monitoring Ambient Room Temperature using DHT11 Sensor, Using an RPi to Control an RGB LED, Using a PIR Motion Sensor and Detecting an Object with Raspberry Pi.

Self-study / Case Study / Applications	**HANDS-ON:** • Working with Simple IoT Applications • Project Work
Text Book	Text Book 1: 6

CIE Assessment Pattern(50 Marks – Theory)

RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment (s)	MCQ's
		25	15	10
L1	Remember	-	-	3
L2	Understand	10	5	3
L3	Apply	10	5	2
L4	Analyze	5	5	2
L5	Evaluate	-	-	-
L6	Create	-	-	-

SEE Assessment Pattern(50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	20
L4	Analyze	10
L5	Evaluate	-
L6	Create	-

Suggested Learning Resources:

Text Books:

1) Maciej Kranz," Building the Internet of Things: Implement New Business Models, Disrupt Competitors, Transform Your Industry", 1st Edition,Wiley,2021
2) David Hanes , Gonzalo Salgueiro , Patrick Grossetete, Robert Barton (Author), Jerome Henry," IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things "1st Edition, Cisco Press,2021

Reference Books:

1) Qinghao Tang (Author), Fan Du," Internet of Things Security: Principles and Practice", 1st edition,Springer,2021
2) Chandrasekar Vuppalapati, "Building Enterprise IoT Applications", 1 st Edition, Academic Press, 2019.
3) Peter Waher, "Mastering Internet of Things: Design and create your own IoT applications using Raspberry Pi 3", First Edition, Packt Publishing, 2018
4) Colin Dow, "Internet of Things Programming Projects: Build modern IoT solutions with the Raspberry Pi 3 and Python", 1st edition, Packt Publishing,2018

Web links and Video Lectures (e-Resources):

- https://www.raspberrypi.org/
- https://www.postscapes.com/internet-of-things-protocols/
- https://www.javatpoint.com/iot-tutorial
- https://onlinecourses.nptel.ac.in/noc22_cs53/preview
- https://www.coursera.org/specializations/iot

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Demonstration of working of M2M.
- Demonstration of basic IoT Protocols & IoT Programming.
- Video demonstration of latest trends in IoT applications.
- Contents related activities (Activity-based discussions)
  - For active participation of students, instruct the students to prepare IoT projects
  - Organizing Group wise discussions on issues & Expert Talk

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DEEP LEARNING

Course Code	**23MCA335**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:
At the end of the course, the student will be able to:

23MCA335.1	Examine mathematical foundations required for deep learning
23MCA335.2	Illustrate the functions of deep neural architectures
23MCA335.3	Investigate deep learning models suitable for vivid applications
23MCA335.4	Identify the optimization methods for effective deep learning networks
23MCA335.5	Interpret deep learning tools suitable for real-time applications

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
23MCA335.1	3	3	-	2	-	-	-	-	-	-	-	-	-	3
23MCA335.2	-	3	-	-	-	-	-	-	-	-	-	-	-	3
23MCA335.3	-	-	3	-	-	-	-	-	-	-	-	-	-	3
23MCA335.4	-	-	-	3	-	-	-	-	-	-	-	-	-	3
23MCA335.5	-	-	-	-	3	-	-	-	-	-	-	-	-	3

MODULE-1	**INTRODUCTION TO DEEP LEARNING AND MATHEMATICAL FOUNDATIONS**	**23MCA335.1**	**8 Hours**

Introduction, Applications, Difference between Machine Learning and Deep Learning.
Linear Algebra, Probability and Information Theory, Numerical Computation, Learning Algorithms, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Challenges, Motivations for Deep Learning.

Self-study / Case Study / Applications	Study the process of selection of various algorithm based on the type of problems and datasets.
Text Book	Text Book 1- 1 Text Book 2 – 1, 2

MODULE-2	**ARCHITECHTURES AND FUNDAMENTALS OF DEEP NETWORK**	**23MCA335.2**	**8 Hours**

Convolutional Neural Networks- Biological Inspiration, Intuition, CNN Architecture Overview, Input Layers, Convolutional Layers, Pooling Layers, Fully Connected Layer.
Neural Networks, Training Neural Networks, Defining Deep Learning, Common Architectural Principles of Deep Networks- Parameters, Layers, Activation Functions, Loss Functions, Hyper Parameters, Building Blocks of Deep Networks- RBMs, and Auto Encoders.

Self-study / Case Study / Applications	Study the different parameters applicable for each type of Convolutional Neural Networks and scenarios where the parameters need to be changed.
Text Book	Text Book 1- 2, 3 Text Book 2- 6, 9

MODULE-3	**FEED FORWARD NETWORKS AND SEQUENCE MODELLING**	**23MCA335.3**	**8 Hours**

Multilayer Perception, Gradient Descent, Back-Propagation, Empirical Risk Minimization, Regularization, Auto-Encoders.
Recurrent and Recursive Nets, Recurrent Neural Networks, Bidirectional RNNs, Deep Recurrent Networks, Echo State Networks, Applications.

Text Book	Text Book 1- 6 Text Book 2- 7, 8, 10

MODULE-4	**BETTER TRAINING OF NEURAL NETWORKS AND GENERATIVE MODELS**	**23MCA335.4**	**8 Hours**

Newer Optimization Methods for Neural Networks (Adagrad, ad delta, rmsprop, adam, NAG), Second Order Methods for Training, Saddle Point Problem in Neural Networks, Regularization Methods (Dropout, Drop Connect, Batch Normalization).
Restrictive Boltzmann Machines (RBMs), Introduction to MCMC and Gibbs Sampling, Gradient

Computations in RBMs, Deep Boltzmann Machines, Generative Adversarial Networks.			
Text Book	Text Book 1- 7, 8 Text Book 2- 7, 20, 21, 22		
MODULE-5	**DEEP LEARNING FRAMEWORKS**	**23MCA335.5**	**8 Hours**
Introduction to Keras and Tensor Flow, Deep Learning for Computer Vision - Convnets, Deep Learning for Text and Images.			
Text Book	Text Book 1- 3 Text Book 2- 12		

CIE Assessment Pattern(50 Marks – Theory)

RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment (s)	MCQ's
		25	15	10
L1	Remember	5	-	-
L2	Understand	5	5	5
L3	Apply	10	5	5
L4	Analyze	5	5	-
L5	Evaluate	-	-	-
L6	Create	-	-	-

SEE Assessment Pattern(50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	20
L4	Analyze	10
L5	Evaluate	-
L6	Create	-

Suggested Learning Resources:

Text Book:

1) Deep Learning with Python second Edition, François Chollet, Manning Publication, 2021
2) Ian Goodfellow, Yoshna Bengio, Aaron Courville, " Deep Learning", The MIT Press, 2016.

Reference Books:

1) John Krohn, Grant Beyleveld, Aglae Bassens, Deep Learning Illustrated, First edition, Pearson 2020.
2) Josh Patterson, "Deep Learning: A practitioners Approach", O'Reilly Media; 1 edition, August 2017
3) S Lovelyn Rose, L Ashok Kumar, and D Karthika Renuka, Deep Learning using Python, Wiley India Pvt. Ltd., 2019

Web links and Video Lectures (e-Resources):

- Deep Learning - Course (nptel.ac.in)- Deep Learning - Course (nptel.ac.in)
- MIT Introduction to Deep Learning | 6.S191 - YouTube- Bing Videos

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Video demonstration of latest trends in Deep Learning
- Mini Project- Implement any deep learning model in python using any online dataset
  Eg: Design a CNN model to classify iris dataset.

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PROFESSIONAL ELECTIVES 4

DATA SCIENCE

Course Code	**23MCA341**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:
At the end of the course, the student will be able to:

23MCA341.1	Apply the basics of Data Science concepts with data exploration methods.
23MCA341.2	Use random variables and probability distributions in Data Science applications.
23MCA341.3	Examine the significance of statistical data analysis for deriving inferences through hypothesis testing.
23MCA341.4	Analyse data handling and data manipulation procedures using Python libraries.
23MCA341.5	Interpret data findings through data visualization techniques.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
23MCA341.1	2	1	-	-	-	-	-	-	-	-	-	-	-	3
23MCA341.2	3	2	-	-	-	-	-	-	-	-	-	-	-	3
23MCA341.3	3	3	-	2	-	-	-	-	-	-	-	-	-	3
23MCA341.4	2	1	2	2	3	-	-	-	-	-	-	-	-	3
23MCA341.5	2	2	2	2	3	-	-	-	-	-	-	-	-	3

MODULE-1	**INTRODUCTION TO DATA SCIENCE & TYPES OF DATA**	**23MCA341.1**	**8 Hours**

Data Science-Overview, Terminologies used, Steps and Life Cycle, Applications. Structured versus Unstructured Data, Quantitative versus Qualitative Data, Basics of Data Exploration and Data Pre-Processing – Examples, Levels of Data with Mathematical Operations, Other Measures on All Levels of Data. Python Programming for Data Science – Prebuilt Python Modules.

Self-study / Case Study / Applications	Case studies for • Mathematical Operations and Measures on Data. • Data Preparation and Exploration.
Text Book	Text Book 1: 1.1, 1.2, 1.3. Text Book 2: 1.1, 1.3, 1.4 Text Book 3: 1.1 to 1.5, 2.1, 2.3, 2.4, 2.6, 3

MODULE-2	**PROBABILITY, RANDOM VARIABLES AND PROBABILITY DISTRIBUTIONS**	**23MCA341.2**	**8 Hours**

Probability - Basic Definitions, Bayesian versus Frequentist Approach, Compound Events, Rules of Probability, Advanced Probability-Bayes Theorem, Applications.
Random Variables-Types of Random Variables-Discrete and Continuous, Probability Mass Function, Probability Density Function; Probability Distributions- Discrete Distributions - Binomial, Poisson, Continuous Distributions, Examples and Applications of Binomial and Poisson Distributions in Solving Business Problems.

Text Book	Text Book 3: 5, 6

MODULE-3	**INFERENTIAL STATISTICS AND HYPOTHESIS TESTING**	**23MCA341.3**	**8 Hours**

Introduction to Statistics, Statistical Measures – Central Moments, Variation and Relative Measures. Sampling- Population and Sample, Obtaining Sample Data, Types of Sampling Methods.
Principles of Statistical Inference, Test of Hypothesis - Null and Alternative Hypothesis, Procedure for Statistical Testing, Type-I and Type-II Errors, Confidence Levels, One-Tailed and Two-Tailed Tests, Tests of Mean- One Sample, Two Sample and Paired-Sample T-Tests, Hypothesis Test for Categorical Variables – Chi-Square Goodness of Fit Test, Chi-Square Test for Association/Independence.

Text Book	Text Book 2: 2.3, 2.8, 2.10, 3.2 Text Book 3: 7, 8

MODULE-4	DATA MANIPULATION	23MCA341.4	8 Hours
Python Libraries Significance of Python Libraries for Data Science, Introduction to Numpy – Data Types in Python, Basics of Numpy Arrays, Computation on Numpy Arrays – Universal Functions, Aggregations, Comparisons, Fancy Indexing, Sorting Arrays, Numpy's Structured Arrays. Data Manipulation Pandas Objects, Data Indexing and Selection, Operating on Data in Pandas, Handling Missing Data, Hierarchical Indexing, Concat and Append, Merge and Join, Aggregation and Grouping.			
Self-study / Case Study / Applications	Case Studies on Data Manipulation using Pandas: • Finding and Replacing Missing Data in a Dataset • Merging and Grouping of Data		
Text Book	Text Book 1: 4.1, 5.1, 7.1, 8.2 Text Book 4: 2.1 to 2.5, 2.7 to 2.9, 3.1 to 3.8		
MODULE-5	**DATA VISUALIZATION WITH PLOTS**	**23MCA341.5**	**8 Hours**
Introduction to Matplotlib – Importing, Setting Styles, Displaying Plots – Simple Line Plots, Bar Plots, Pie Charts, Scatter Plots, Box Plots, Histograms and Binnings. Customizing Plot Legends, Multiple Subplots, Visualizing Errors, Density Plots and 3D Plotting in Matplotlib.			
Self-study/ Case Study/ Applications	Case Studies to Explore Various Types of Data Visualization: • Depiction of Various Types of Plots using Matplotlib • Box Plots to Understand Outliers		
Text Book	Text Book 1: 9.1 Text Book 4: 4.1 to 4.10, 4.14		

CIE Assessment Pattern(50 Marks – Theory)

RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment (s)	MCQ's
		25	15	10
L1	Remember	5	-	-
L2	Understand	5	5	4
L3	Apply	10	5	4
L4	Analyze	5	5	2
L5	Evaluate	-	-	-
L6	Create	-	-	-

SEE Assessment Pattern(50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	20
L4	Analyze	10
L5	Evaluate	--
L6	Create	--

Suggested Learning Resources:

Text Books:

1) Python for Data Analysis, Wes McKinney, 3rd Edition, 2022, O'Reilly Media, Inc. ISBN: 9781098104030.
2) Practical Statistics for Data Scientists, Peter Bruce, Andrew Bruce, Peter Gedeck, O'Reilly Publications, 2nd edition, 2020, ISBN: 8-1492072942.
3) Principles of Data Science, Sinan Ozdemir , Sunil Kakade , Marco Tibaldeschi 2nd Edition, Packt, 2018, ISBN: 9781789804546
4) Python Data Science Handbook, Jake Vander Plas, O'Reilly, 2016, ISBN: 9781491912058

Reference Books:

1) Data Science from Scratch, Joel Grus, O'Reilly publishers, 2019, ISBN: 978-9352138326.
2) An Introduction to Data Science, Jeffrey S Saltz, Jeffrey Morgan Stanton, SAGE, 2017, ISBN: 978-1506377537.
3) Probability & Statistics for Engineers & Scientists, Ronald E. Walpole & Raymond H. Myers, 9th edition, 2016, Pearson Education, ISBN-13: 9780134115856.

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=xvEKQefqQ7A
- https://www.youtube.com/watch?v=r-uOLxNrNk8
- https://www.youtube.com/watch?v=GPVsHOlRBBI
- https://www.youtube.com/watch?v=q68Qundmans
- https://www.analyticsvidhya.com/blog/2021/06/must-known-data-visualization techniques-for-data-science/

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Demonstration of data pre-processing operations
- Demonstration of data manipulation process
- Demonstration of data visualization
- Video demonstration of real time applications of data science
- Contents related activities (Activity-based discussions)
  - For active participation of students, instruct the students to import any dataset from repositories for data exploration and visualization process
  - Seminars

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COMPUTER VISION

Course Code	**23MCA342**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:
At the end of the course, the student will be able to:

23MCA342.1	Investigate the underlying principles in computer vision
23MCA342.2	Use basic image handling operations in computer vision
23MCA342.3	Apply the concepts of image transformation and operations.
23MCA342.4	Identify algorithms for feature extraction and segmentation on real-time applications.
23MCA342.5	Examine various machine learning algorithms for computer vision applications

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
23MCA342.1	2	-	-	2	-	-	-	-	-	-	-	-	-	3
23MCA342.2	2	3	-	-	-	-	-	-	-	-	-	-	-	3
23MCA342.3	2	3	3	-	-	-	-	-	-	-	-	-	-	3
23MCA342.4	-	-	-	3	-	-	-	-	-	-	-	-	-	3
23MCA342.5	-	-	-	-	3	-	-	-	-	-	-	-	-	3

MODULE-1	**INTRODUCTION TO COMPUTER VISION AND OPENCV**	**23MCA342.1**	**8 Hours**

History, Benefits and Real Time Applications, Types of Computer Vision Algorithms, Difference Between Computer Vision and Image Processing Introduction, OpenCV Library, Features of OpenCV Library, Advantages of OpenCV Software, Library Modules, API Concepts , Data Types, Installation of OpenCV for Python on Windows, Portable Graphics Toolkit, Highgui Module

Self-study / Case Study / Applications	Study the Real Time Applications of Computer Vision Algorithms.
Text Book	Text Book 1- 1 Text Book 2- 1 Text Book 3- 1, 2

MODULE-2	**IMAGE HANDLING IN OPENCV USING PYTHON**	**23MCA342.2**	**8 Hours**

Color Space, Pixels, Image Coordinate System, OpenCV Python Libraries and Tools-Matplot, Numpy, SciPy, Identification of Images, Reading and Writing Images in OpenCV, Reading and Saving Video on OpenCV, Capturing Video from Live Camera.

Self-study / Case Study / Applications	Study the different OpenCV Libraries available, various applications and scenarios where they can be used.
Text Book	Text Book 3- 3

MODULE-3	**IMAGE PROCESSING AND OPERATIONS**	**23MCA342.3**	**8 Hours**

Operations on Images- Extracting the RGB Values of a Pixel, Extracting the Region of Interest (ROI), Resizing the Image, Rotating the Image, Getting and Setting Pixels, Contrast and Brightness Enhancement, Color Conversion, Image Histogram, Histogram Equalization and Matching
Arithmetic Operation, Bitwise Operation, Image Transformation-Translation, Reflection, Rotation, Scaling, Shearing.

Text Book	Text Book 1- 2 Text Book 3- 3, 4

MODULE-4	IMAGE PREPROCESSING AND SEGMENTATION	23MCA342.4	8 Hours
Grey Scale Conversion, Binary Conversion, Edge Detection, Corner Detection- Harris Corner Detection, FAST Algorithm for Corner Detection, Shi-Tomasi Corner Detector, Shape Detection- Lines, Circle, Object Detection, Face Detection , Counter Detection Types, K Means Clustering, Otsu Thresholding, Watershed Algorithm. Features- Definition, Types of Features, Feature Extraction, HOG, Feature Descriptor, Feature Matching, Feature Transformation, SURF, SIFT.			
Text Book	Text Book 1- 5, 7 Text Book 3- 5, 6, 7		
MODULE-5	**MOTION DETECTION AND COMPUTER VISION AND MACHINE LEARNING**	**23MCA342.5**	**8 Hours**
Capturing Video from Live Camera, Reading Video Sequence, Background Subtraction, Frame Differencing, Optical Flow- Gunnar Farneback Optical Flow, Meanshift, Camshaft , Features, Applications, Working of ML, Classification of ML-Supervised, Unsupervised, Reinforcement Learning, K-Means, KNN, SVM, Decision Tree, Random Forest.			
Text Book	Text Book 1: 5, 9 Text Book 3: 8		

CIE Assessment Pattern(50 Marks – Theory)

RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment (s)	MCQ's
		25	15	10
L1	Remember	5	-	-
L2	Understand	10	5	5
L3	Apply	5	5	5
L4	Analyze	5	5	-
L5	Evaluate	-	-	-
L6	Create	-	-	-

SEE Assessment Pattern(50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	15
L3	Apply	15
L4	Analyze	10
L5	Evaluate	--
L6	Create	--

Suggested Learning Resources:

Text Book

1) Computer Vision: Algorithms and Applications, Richard Szeliski, Springer, 2021, ISBN: 978-3-030-34371-2.
2) Computer Vision in C++ with the OpenCV Library, Adrian Kaehler, O'Reilly Media Inc., 1st Edition, 2016, ISBN: 9781491937990.
3) Practical OpenCV, Samarth Brahmbhatt, Apress, 1st Edition, 2013, ISBN: 978-1-491-93799-0.

Reference Books

1) OpenCV 3: Computer Vision in C++, Adrian Kaehler, O'Reilly, 2017, ISBN: 978-1-491-93799-0.
2) OpenCV Essentials Illustrated Edition, Oscar Deniz Suarez, Packt, 2014, ISBN: 9781783984244.

Web links and Video Lectures (e-Resources):

- https://onlinecourses.nptel.ac.in/noc23_ee39/preview
- https://www.coursera.org/specializations/firstprinciplesofcomputervision

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Video demonstration of latest trends in Computer Vision using OpenCV
- Mini Project- Design python code to implement various image and video based operations

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AUGMENTED REALITY AND VIRTUAL REALITY

Course Code	**23MCA343**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:
At the end of the course, the student will be able to:

23MCA343.1	Illustrate the design modalities across digital realities.
23MCA343.2	Examine the possibility of the working of augmented reality (AR).
23MCA343.3	Illustrate the concepts of Augmented Reality(AR) and its scenarios.
23MCA343.4	Analyze the fundamental issues in AR and VR.
23MCA343.5	Evaluate the case studies in AR/VR.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
23MCA343.1	2	-	-	-	-	-	-	-	-	-	-	-	-	3
23MCA343.2	2	-	-	-	2	-	-	-	-	-	-	-	-	3
23MCA343.3	2	-	-	-	2	-	-	-	-	-	-	-	-	3
23MCA343.4	2	1	-	-	-	-	-	-	-	-	-	-	-	3
23MCA343.5	2	-	-	2	-	-	-	-	-	-	-	-	-	3

MODULE-1	**INTRODUCTION TO VR**	**23MCA343.1**	**8 Hours**

Introduction to VR, Modern Experiences, Historical Perspective. VR Applications.
Birds-Eye View for the Hardware, Sensors, Displays, Software, Virtual World Generator, Game Engines, Human Senses, Human Psychology and Perceptions.

Text Book	Text Book 1: 1, 2

MODULE-2	**GEOMETRY OF VIRTUAL WORLDS AND TRACKING**	**23MCA343.2**	**8 Hours**

Geometric Models, Changing Position and Orientation, Axis-Angle Representation of Rotation, Viewing of Transformation, Chaining the Transformation.
Tracking 2D orientation, Tracking 3D orientation, Tracking position and orientation.

Text Book	Text Book 1: 3, 9

MODULE-3	**INTRODUCTION TO AR AND DISPLAYS**	**23MCA343.3**	**8 Hours**

Introduction to AR, Examples, Related Fields. Multimodal Displays, Visual Perception, Requirements and Characteristics, Spatial Display Model, Visual Displays.

Text Book	Text Book 2: 1, 2

MODULE-4	**EVALUATING VR SYSTEMS AND EXPERIENCES, FRONTIERS**	**23MCA343.4**	**8 Hours**

Perceptual Training, Recommendations for Developers, Comfort and VR Sickness, Experiments on Human Subjects.
Frontiers, Touch and Proprioception, Smell and Taste, Robotic Interface, Brain-Machine Interface.

Self-study / Case Study / Applications	Explore the usage of real time Applications in VR.
Text Book	Text Book 1: 12, 13

MODULE-5	**USE CASES IN EMBODIED REALITY**	**23MCA343.5**	**8 Hours**

VR/AR Health Technology Application Design, Standard UX, Introduction to VR Enterprise Training Use Cases, Working of VR Training, Spherical Video, Use cases, Future of XR Training.

Self-study / Case Study / Applications	Case studies related to application of VR/AR.
Text Book	Text Book 3: 11.1, 11.2, 13

CIE Assessment Pattern(50 Marks – Theory)

RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment (s)	MCQ's
		25	15	10
L1	Remember	5	5	5
L2	Understand	10	5	5
L3	Apply	5	3	-
L4	Analyze	5	2	-
L5	Evaluate	-	-	-
L6	Create	-	-	-

SEE Assessment Pattern(50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	20
L3	Apply	10
L4	Analyze	10
L5	Evaluate	-
L6	Create	-

Suggested Learning Resources:

Text Book

1) Virtual Reality, Steven M. LaValle, Cambridge University Press, 2023, ISBN:9781108182874.
2) Augmented Reality: Principles and Practice, Dieter Schmalstieg, Tobias Hollerer, Addison-Wesley, 2016, ISBN: 9780321883575.
3) Creating augmented & virtual realities, Erin Pangillinan, SteveLukas, Vasanth Mohan, O'Reillly Media, Inc.2019, ISBN:9781492044192.

Reference Books:

1) Virtual & Augmented Reality for Dummies, Paul Mealy, 2018, ISBN: 978-1-119-48134-8.
2) Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR, Steve Aukstakalnis, Addison-Wesley Professional, 2016, ISBN: 9780134094328.

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=h3rKvsFTfPA
- https://elearn.nptel.ac.in/shop/iit-workshops/completed/foundation-course-on-virtual-reality-and-augmented-reality/
- https://youtu.be/ZFTgGi06vbM

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Contents related activities (Activity-based discussions)
  - For active participation of students, student presentations on case studies.
  - Organizing Group wise discussions on issues related to the subject matter.

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MOBILE APPLICATION DEVELOPMENT

Course Code	**23MCA344**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:
At the end of the course, the student will be able to:

23MCA344.1	Derive essential knowledge for mobile app development.
23MCA344.2	Illustrate skills to design and build mobile app interfaces.
23MCA344.3	Examine the inter-process communication concepts in mobile app development.
23MCA344.4	Identify data storage services with shared preferences.
23MCA344.5	Recommend suitable platforms for innovative mobile applications.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
23MCA344.1	3	-	-	-	-	-	-	-	-	-	-	-	-	3
23MCA344.2	-	-	3	-	3	-	-	-	-	-	-	-	-	3
23MCA344.3	-	-	3	-	3	-	-	-	-	-	-	-	-	3
23MCA344.4	-	-	-	-	3	2	-	-	-	-	-	-	-	3
23MCA344.5	-	-	-	3	3	-	-	-	-	-	-	2	-	3

MODULE-1	**INTRODUCTION TO ANDROID**	**23MCA344.1**	**8 Hours**

Android Architecture, Android Development Framework-Android SDK, Android Project Framework, User Interface, Gradle Build System, Debug and Profile Tools, Android Emulator, AVD in Android Studio, Hardware Device, Basic Building Blocks – Activities, Services, Broadcast Receivers & Content Providers, UI Components- Views & Notifications, Components for Communication -Intents & Intent Filters.

Self-study / Case Study / Applications	**HANDS-ON:** Using Android SDK display Hello world in Android.
Text Book	Text Book 1: 2.1, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8

MODULE-2	**APPLICATION STRUCTURE AND BASIC UI DESIGN**	**23MCA344.2**	**8 Hours**

Activity Lifecycle, Draw Able Resources, View Groups, Layouts – Linear Layout, Frame Layout, Grid View Using Basic View- Text View, Button, Edit Text Box, Checkbox and Radio Button, Event Handling for Views, Recycler View, Adapter and View Holder, Alert Dialog, Toast, Date Picker, Time Picker.

Self-study / Case Study / Applications	**HANDS-ON:** • Design and implement a single screen app that displays information about a small business. eg. Restaurant, Book shop etc. Your design must include: ➢ Business name ➢ Photo of business ➢ Contact information • Design and develop a Mobile App for smart phones - Unit Converter using Android Studio. Design and develop a Mobile App for smart phones - Currency Converter.
Text Book	Text Book 1: 7.1, 7.2, 7.3, 7.6, 7.7

MODULE-3	**INTENTS, SERVICE AND NOTIFICATION**	**23MCA344.3**	**8 Hours**

Concept of Intents, Implicit and Explicit Intent, Service, Overview of Services in Android, Implementing a Service, Service Lifecycle, Broadcast Receiver, Notification.

Self-study / Case Study / Applications	**HANDS-ON:** • Design an app for Tourist spot with the following three activities: Welcome page, display highlights of tourist spot and webpage of the tourist spot. • Design Android app "Play Music" in the background.
Text Book	Text Book 1: 9.1, 9.2, 9.3, 9.4,9.5,9.6

MODULE-4	DATA STORAGE, SERVICES & CONTENT PROVIDERS	23MCA344.4	8 Hours
Applications with Content Sharing, Shared Preferences, Preferences Activity, File Access, Introducing SQLite – SQLite Open Helper and Creating a Database – Opening and Closing a Database, Working with Cursors Inserts, Updates, and Deletes, Implementing a Service, Service Lifecycle, Inter Process Communication.			
Self-study / Case Study / Applications	**HANDS-ON:** • Design and develop a Mobile App "The Expense Manager" for smart phones using Android. The app should store all the expenses in a file. • Design and develop Health Monitoring App using Android. The app will store the blood pressure, blood group and glucose level of a patient in SQLite database.		
Text Book	Text Book 1: 15.1, 15.2		
MODULE-5	**ADVANCED ANDROID APP DEPLOYMENT**	**23MCA344.5**	**8 Hours**
Sending SMS Using App, Building Apps with Location-Based Services and Google Maps, Building App with Camera, Preparing for Publishing – Signing & Versioning of Apps, Using Google Play to Distribute & Monetize, Best Practices for Security and Privacy.			
Self-study / Case Study / Applications	**HANDS-ON:** • Develop an Android app to display Map of your college locality. • Develop an Android app to alert SMS to one given phone number.		
Text Book	Text Book 2: 5.1 to 5.10		

CIE Assessment Pattern(50 Marks – Theory)

RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment (s)	MCQ's
		25	15	10
L1	Remember	-	-	2
L2	Understand	10	5	3
L3	Apply	10	5	3
L4	Analyze	5	5	2
L5	Evaluate	-	-	-
L6	Create	-	-	-

SEE Assessment Pattern(50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	20
L4	Analyze	10
L5	Evaluate	-
L6	Create	-

Suggested Learning Resources:

Text Books:

1) Learn Android Studio 4, Efficient Java-Based Android Apps Development, Ted Hagos, Apress, 2020,ISBN:978-1-484-259368.
2) Mastering Android Studio: A Beginner's Guide, Sufyan bin Uzayr,Taylor & Francis Ltd; 1st edition, 2022,ISBN:978-1032134123.

Reference Books:

1) Professional Android4 Application Development, RetoMeier, Wrox, 2012.
2) Beginning iOS6 Development: Exploring the iOSSDK, DavidMark, Jack Nutting, Jeff La Mouche, and Fredric Olsson, Apress, 2013.
3) Android in Practice, Charlie Collins, Michael Galpin and Matthias Kappler, DreamTech, 2012.

Web links and Video Lectures (e-Resources):

- https://youtu.be/T0ClYrJukPA?list=PLS1QulWo1RIaRdy16cOzBO5Jr6kEagA07
- https://youtu.be/-4GgzqMVrYc
- https://youtu.be/8fuPljJ2dRI?list=PU3xHg20VI9mKFRaSs1yaic
- https://youtu.be/nj-STGrL7Zc
- https://youtu.be/TcRLJqLxRpw?list=PLfuE3hOAeWhYCPPLA75AXfd0pILeyePjv

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Demonstration of working of Android Framework.
- Demonstration of basic UI design.
- Demonstration of intent, services.
- Video demonstration of latest trends in mobile applications.
- Contents related activities (Activity-based discussions)
  - For active participation of students, instruct the students to prepare Apps
  - Organizing Group wise discussions on issues

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AGILE SOFTWARE DEVELOPMENT

Course Code	**23MCA345**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:
At the end of the course, the student will be able to:

23MCA345.1	Identify the underlying concepts in agile software engineering.
23MCA345.2	Illustrate the agile design principles for software development.
23MCA345.3	Categorize the major agile frameworks used in current scenario.
23MCA345.4	Examine the performance of a software application with a product backlog.
23MCA345.5	Justify the various testing strategies for an agile software application.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
23MCA345.1	3	-	-	-	-	-	-	-	-	-	-	-	-	3
23MCA345.2	-	-	-	1	2	-	-	-	-	-	-	-	-	3
23MCA345.3	-	-	2	-	3	-	-	2	-	-	-	-	-	3
23MCA345.4	-	2	3	1	3	-	-	2	-	-	-	-	-	3
23MCA345.5	-	3	3	3	3	-	-	-	-	-	-	-	-	3

MODULE-1	**INTRODUCTION AND PROJECT PLANNING**	**23MCA345.1**	**8 Hours**

Agile Software Development - Need, Agile Context, Manifesto, Principles, Methods, Values, Roles, Artifacts, Stakeholders and Challenges, Business Benefits of Software Agility.
Project Planning, Recognizing the Team Structure, User Stories -Definition, Characteristics and Content.

Text Book	Text Book 1: 1 Text Book 2: 1, 2, 3, 4

MODULE-2	**AGILE PROJECT DESIGN**	**23MCA345.2**	**8 Hours**

Fundamentals, Design Principles, Single Responsibility Approach, Open-Closed Principle, Liskov Substitution Method, Dependency - Inversion Principle, Interface – Segregation.

Text Book	Text Book 4: 7 – 12

MODULE-3	**COMMON AGILE TECHNIQUES**	**23MCA345.3**	**8 Hours**

Stories and Backlog Refinement, Agile Estimation, Agile Planning, Agile Testing. Agile Frame Works Major Agile Frameworks - Extreme Programming (XP), Kanban, Feature-Driven Development, Lean Software Development. Scrum Framework – Introduction, Overview, Roles, Product Owner, Scrum Master, Development Team, Scrum Activitie, Artifacts, Product Backlog, Sprints, Sprint Planning, Sprint Execution, Daily Scrum, Done, Sprint Review, Sprint Retrospective.

Text Book	Text Book 3: 1 – 5, 10 & 11, 19 - 22

MODULE-4	**PRODUCT BACKLOG**	**23MCA345.4**	**8 Hours**

Product Backlog Items, Characteristics- Detailed Appropriateness, Emergent, Estimated, Prioritized. Grooming, Definition Ready. Estimation and Velocity Portfolio Backlog Item Estimates, Product Backlog Estimates and Task Estimates. PBI Estimation - Concepts, Units, Planning Poker, Velocity Range Calculation, Velocity-Forecasting, Affecting and Misusing.

Self-study / Case Study / Applications	Explore case studies to understand the relevance of Product Backlogs.
Text Book	Text Book 3: 6 and 7

MODULE-5	**TESTING**	**23MCA345.5**	**8 Hours**

Agile Lifecycle, Impact On Testing, Test Driven Development– Acceptance Tests, Verifying Stories, Writing Acceptance Test, Developing Effective Test Suites, Continuous Integration, Code Refactoring. Risk Based Testing, Regression Tests, Test Automation.

Self-study / Case Study / Applications	Identify a Test Case Suite for an ongoing application/project.
Text Book	Text Book 3: 1, 2, 3, 4, 5, 6, 11, 13, 16

CIE Assessment Pattern (50 Marks – Theory)

RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment (s)	MCQ's
		25	15	10
L1	Remember	-	-	5
L2	Understand	10	5	3
L3	Apply	10	5	2
L4	Analyze	5	5	-
L5	Evaluate	-	-	-
L6	Create	-	-	-

SEE Assessment Pattern (50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	15
L3	Apply	15
L4	Analyze	10
L5	Evaluate	-
L6	Create	-

Suggested Learning Resources:

Text Books:

1) Ken Schawber, Mike Beedle, "Agile Software Development with Scrum", International Edition, Pearson, 2002.
2) Peter Measey, Agile Foundations: Principles, Practices and frameworks, BCS Learning &Development Limited, 2015.
3) Kenneth S. Rubin, Essential Scrum, the Addison Wesley Signature Series, Addison-Wesley and Pearson, 2012.
4) Robert C. Martin Publisher, "Agile Software Development, Principles, Patterns and Practices", Prentice Hall.

Reference Books:

1) Mark Merkow, Secure, Resilient and Agile Software Development, 1st Edition, CRC Press, 2023.
2) Lisa Crispin, Janet Gregory, "Agile Testing: A Practical Guide for Testers and Agile Teams", International edition, Addison Wesley.
3) Alistair Cockburn, "Agile Software Development: The Cooperative Game", 2nd Edition, Addison- Wesley.

Web links and Video Lectures (e-Resources):

- "The Complete Guide to Agile Software Development" https://clearbridgemobile.com/complete-guide-agile-software-development/
- "Agile Fundamentals Ebook: A Complete Guide for Beginners", https://agileken.com/agile-fundamentals-ebook/
- "Agile Software Development", https://www.coursera.org/learn/agile-software-development Accessed on August 27, 2021.

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Visit to any software industry to understand the process of agile software development
- Video demonstration of latest trends in agile software development techniques
- Contents related activities (Activity-based discussions)
  - For active participation of students, instructing students to work on a few case studies
  - Organizing Group wise discussions on challenges and issues in agile software development
  - Student Presentations

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MACHINE LEARNING LAB USING PYTHON

Course Code	**23MCAL35**	**CIE Marks**	**50**
L:T:P:S	**0:0:1.5:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**1.5**	**Exam Hours**	**03**

Course outcomes:
At the end of the course, the student will be able to:

23MCAL35.1	Analyze machine learning algorithms and their processes to solve basic real-world problems.
23MCAL35.2	Utilize appropriate datasets for applying machine learning algorithms effectively.
23MCAL35.3	Use relevant libraries and tools to design, implement, and deploy machine learning algorithms.
23MCAL35.4	Evaluate the performance of machine learning algorithms using standard metrics.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
23MCAL35.1	2	-	-	2	2	-	-	-	-	-	-	-	2	2
23MCAL35.2	2	-	-	2	3	-	-	-	-	-	-	-	2	2
23MCAL35.3	3	-	-	2	3	-	-	-	-	-	-	-	2	2
23MCAL35.4	3	-	3	3	3	-	-	-	-	-	-	-	2	2

Exp. No. / Pgm. No.	List of Programs	Hours	Cos
	Prerequisite Programs / Demo		
	• Basic Python Programming	3	NA
	PART-A		
1	Design a program to implement the Decision Tree classifier.	3	23MCAL35.1,2,4
2	Develop a program to implement the Naive Bayes classifier.	3	23MCAL35.2,3,4
3	Formulate a program to implement the K-nearest Neighbor classifier.	3	23MCAL35.1,3
4	Compose a program to implement the Linear Regression classifier.	3	23MCAL35.1,2,4
5	Construct a program to implement the Logistic Regression classifier.	3	23MCAL35.1,3,4
6	Design a program to implement the Random Forest classifier.	3	23MCAL35.1,2
7	Develop a program to implement the AdaBoost Regression classifier.	3	23MCAL35.3,4
8	Compose a program to implement the Extra Tree classifier.	3	23MCAL35.3
9	Construct a program to implement the K Means classifier.	3	23MCAL35.2
10	Formulate a program to implement the SVM classifier.	3	23MCAL35.2,3
11	Implement ensemble model using Decision Tree classifier, Linear Regression classifier and Logistic Regression classifier	3	23MCAL35.1,4
12	Implement ensemble model using SVM, K Means and Naive Bayes classifier	3	23MCAL35.1,2,3,4

PART-B

Beyond Syllabus Virtual Lab Content

(To be done during Lab but not to be included for CIE or SEE)

https://cse20-iiith.vlabs.ac.in/exp/mst-based/

https://vlab.spit.ac.in/ai/#/experiments/3/simulation

CIE Assessment Pattern (50 Marks – Lab)

RBT Levels		Test (s)	Weekly Assessment
		20	30
L1	Remember	-	-
L2	Understand	-	10
L3	Apply	10	10
L4	Analyze	5	5
L5	Evaluate	5	5
L6	Create	-	-

SEE Assessment Pattern (50 Marks – Lab)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	-
L2	Understand	05
L3	Apply	15
L4	Analyze	20
L5	Evaluate	10
L6	Create	-

Suggested Learning Resources:

Reference Books:

1) Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems" Third Edition" , O'REILLY 2022
2) Andreas Muller , "Introduction to Machine Learning with Python: A Guide for Data Scientists", Grey scale Indian Edition, O'REILLY 2016
3) Oliver Theobald, "Machine Learning for Absolute Beginners: A Plain English Introduction", First Edition, Scatterplot Press, 2017

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FULL STACK LAB			
Course Code	**23MCAL36**	**CIE Marks**	**50**
L:T:P:S	**0:0:1.5:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**1.5**	**Exam Hours**	**03**

Course outcomes:
At the end of the course, the student will be able to:

23MCAL36.1	Demonstrate mark-up tags with styles to design aesthetic web pages.
23MCAL36.2	Illustrate client-side scripting to validate the web pages.
23MCAL36.3	Apply server-side scripting for developing dynamic and responsive web applications.
23MCAL36.4	Design and evaluate web applications support with database.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
23MCAL36.1	3	-	2	-	2	-	-	-	-	-	-	-	2	2
23MCAL36.2	-	2	2	-	3	-	-	-	-	-	-	-	2	2
23MCAL36.3	-	-	2	-	3	-	-	-	-	-	-	-	2	2
23MCAL36.4	-	-	2	-	3	-	-	-	-	-	-	-	2	2

Exp. No. / Pgm. No.	List of Programs	Hours	COs
	Prerequisite Programs / Demo		
	• Basic HTML Programming • Basic PHP Programming • Basic Java Programming	3	NA
	PART-A		
1	To design a user interface for a given scenario using basic tags, lists, hyperlinks and tables using HTML.	3	23MCAL36.1
2	To design aesthetic web page for user registration using HTML forms.	3	23MCAL36.1
3	To demonstrate the concepts of CSS selectors and conflict resolution.	3	23MCAL36.1
4	To demonstrate the concepts of syntactic structures of JavaScript.	3	23MCAL36.2
5	To demonstrate the Client-side validation using JavaScript events.	3	23MCAL36.2
	PART-B		
6	To demonstrate the concepts of various UI components of Bootstrap.	3	23MCAL36.2
7	To demonstrate the working of Server-side program with forms using PHP	3	23MCAL36.3
8	To demonstrate working with MySQL (creating database and tables, populate it with data)	3	23MCAL36.3
9	Write a program to create a simple calculator Application using React JS	3	23MCAL36.3
10	Create a Simple Login form using React JS	3	23MCAL36.4
11	To demonstrate the use of directives using Angular JS.	3	23MCAL36.4
12	To demonstrate the use of services using AngularJS.	3	23MCAL36.4

PART-C
Beyond Syllabus Virtual Lab Content
(To be done during Lab but not to be included for CIE or SEE)

https://html-iitd.vlabs.ac.in/exp/webpage-layout-in-html/

CIE Assessment Pattern (50 Marks – Lab)

RBT Levels		Test (s)	Weekly Assessment
		20	30
L1	Remember	-	-
L2	Understand	5	10
L3	Apply	5	10
L4	Analyze	5	5
L5	Evaluate	5	5
L6	Create	-	-

SEE Assessment Pattern (50 Marks – Lab)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	-
L2	Understand	05
L3	Apply	15
L4	Analyze	20
L5	Evaluate	10
L6	Create	-

Suggested Learning Resources:
Reference Books:

1) Mark Meyers, A Smart way to Learn JavaScript, 2013-14 (e-book and Kindle version only).
2) Adam Trachtenberg, PHP Cookbook: Solutions and Examples for PHP Programmers, Third edition, O'ReilyMedia, 2014.
3) Benjamin la kobus, Jason Mara h, Mastering Bootstrap4, Edition 2016, Packet Publishing.

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SOCIETAL PROJECT

Course Code	**23MCA37**	**CIE Marks**	**100**
L:T:P:S	**0:0:2:0**	**SEE Marks**	**-**
Hrs / Week	**-**	**Total Marks**	**100**
Credits	**02**	**Exam Hours**	**-**

Course outcomes:
At the end of the course, the student will be able to:

23MCA37.1	Identify a problem related to societal issues.
23MCA37.2	Use design principles to formulate methodology to solve identified problem.
23MCA37.3	Analyze the usage of the skills developed in the curriculum to solve real life problems.
23MCA37.4	Examine the outcome of the project.
23MCA37.5	Compose a report for the work performed.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
23MCA37.1	-	2	-	-	-	-	-	-	-	3	2	-	-	2
23MCA37.2	2	2	2	-	-	-	-	1	-	2	2	-	-	2
23MCA37.3	1	-	1	-	1	-	-	1	-	1	2	-	-	2
23MCA37.4	1	-	-	1	-	-	-	-	-	2	1	-	-	2
23MCA37.5	-	-	-	-	-	-	-	2	3	-	2	-	-	2

Some of the domains that can be chosen for societal projects:

- Infrastructure
- Health Care
- Social security
- Security for women
- Transportation
- Business Continuity
- Remote working and Education
- Digital Finance
- Food Security
- Rural employment
- Water and land management
- Pollution
- Financial Independence
- Agricultural Finance
- Primary Health care
- Nutrition
- Child Care
- E-learning
- Distance parenting
- Mentorship Etc

GUIDELINES

1. The societal project work should be taken up during the third semester.
2. The project shall be carried out by every individual student based on the specified domains but not limited only to those domains. The projects can be domain specific or interdisciplinary too.
3. A guide will be allocated to every student to oversee the work.
4. The project may be carried out on-campus/industry/organization with prior approval from the Internal Guide and Head of the Department.
5. Each student shall prepare a relevant introductory project document, and present the work carried out.
6. The project guides to follow rubrics set by the department for project evaluation.
7. CIE marks shall be awarded by a committee comprising of HoD as Chairman, Guide/Co-Guide if any, and a senior faculty of the department.

CIE Assessment Pattern (100 Marks – Practical)

Continuous Internal Evaluation	Tests Marks
Problem Identification and literature	20
Data Sampling and Cleaning	10
Objectives	10
Developing the solution	20
Project Report	20
Project Presentation	10
Project Evaluation	10

Suggested Learning Resources:

Web links:

- https://www.cityu.edu.hk/ceng/teaching-learning/social-service-related-projects
- https://www.youtube.com/watch?v=ZRaZVLRXctU
- https://www.youtube.com/watch?v=N3N9-RLSbvo

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Surveys
- Video demonstration of latest trends in Societal Projects
- Contents related activities (Activity-based discussions)
  - For active participation of students, instruct the students to prepare Flowcharts and Handouts
  - Organizing Group wise discussions on issues
  - Seminars

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INTERNSHIP

Course Code	**23MCA38**	**CIE Marks**	**50**
L:T:P:S	**0:0:6:0**	**SEE Marks**	**50**
Hrs / Week	**-**	**Total Marks**	**100**
Credits	**06**	**Exam Hours**	**03**

Course outcomes:
At the end of the course, the student will be able to:

23MCA38.1	Identify skills to work and gain knowledge in the software industry.
23MCA38.2	Apply theoretical knowledge and practical knowledge.
23MCA38.3	Analyze real-time experience and develop code for a project.
23MCA38.4	Justify the strengths in tune with the current industry demands.
23MCA38.5	Use effective communication skills for technical presentations.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
23MCA38.1	-	2	-	-	-	1	-	-	-	-	3	-	-	3
23MCA38.2	2	2	2	-	-	-	-	1	-	-	2	-	-	3
23MCA38.3	1	-	1	-	1	-	-	1	-	-	2	-	-	3
23MCA38.4	1	-	-	1	-	-	-	-	2	-	1	-	-	3
23MCA38.5	-	-	-	-	-	-	-	2	3	-	2	-	-	3

General Guidelines:

1. The project work must be done individually in a software firm or any R & D Institution.
2. The project should be high quality simulated application project work, for a total duration of 6 weeks (which should either be taken after the completion of second semester and before the beginning of the third semester / completion of the third semester and before beginning the fourth semester.
3. Project work may be application-oriented or research-oriented as per student interest. Therefore, the project reports will vary depending on the type of project undertaken.
4. The student is expected to submit his/her synopsis within a week of time from the commencement of the internship.
5. An Internal guide will be allocated for each student.
6. The status of project progress must be updated with the internal guide every week.
7. Presentations should be given during subsequent project reviews.
8. Project verification at the place of project work must be mandatory by the external guide, for completion of the work.
9. Project report must be checked for plagiarism, similarity index must be less than or equal to 10%.
10. The CIE of the project work will be evaluated based on the well-defined rubrics during subsequent project reviews.
11. The project report will be evaluated by both internal and external guide assigned by the COE.
12. Final presentation of the project report and viva-voce will be from the SEE.
13. If the project report is not as per the format and not a high quality simulated application project, external examiners will have every right to reject the project.

CIE Assessment Pattern (50 Marks)

Semester End Examination	Tests Marks
Internship Report	20
Seminar	20
Question and Answer	10
Total Marks	50

SEE Assessment Pattern (50 Marks)

Semester End Examination	Tests Marks
Internship Report	20
Seminar	20
Question and Answer	10
Total Marks	50

Suggested Learning Resources:
Web links:

- https://www.youtube.com/watch?v=tIrGqwd8XSg
- https://www.youtube.com/watch?v=N3N9-RLSbvo

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Surveys
- Contents related activities (Activity-based discussions)
  - For active participation of students, instruct the students to prepare Flowcharts and Handouts
  - Seminar

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TECHNICAL SEMINAR – 1			
Course Code	**23MCA39**	**CIE Marks**	**50**
L:T:P:S	**0:0:0:2**	**SEE Marks**	**50**
Hrs / Week	**-**	**Total Marks**	**100**
Credits	**02**	**Exam Hours**	**03**

Course outcomes:
At the end of the course, the student will be able to:

23MCA39.1	Identify the recent trends in computing technologies to address research challenges.
23MCA39.2	Examine existing literature in the field of study.
23MCA39.3	Analyze case studies, tools, methodologies, technique, and algorithms in the selected study.
23MCA39.4	Use the communication skills and report writing skills for effective presentation.
23MCA39.5	Derive the outcomes for future study.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
23MCA39.1	3	2	-	2	-	-	-	-	-	-	-	-	-	3
23MCA39.2	3	2	1	2	-	-	-	-	-	-	-	-	-	3
23MCA39.3	3	2	-	2	2	-	-	-	-	-	-	-	-	3
23MCA39.4	1	1	1	-	-	2	1	-	3	-	-	-	-	3
23MCA39.5	2	1	-	-	-	-	1	-	1	-	2	-	-	3

Technical Seminar is based on current technological research trends.

GUIDELINES:

1. Select any broad area of research or technical topics of interest (E.g. Machine Learning/Data mining, Computer Networks, Cloud Computing, etc.)
2. Select a specific topic of inquiry. (E.g. In Data mining, one can choose cluster analysis or Classification or Association rule mining, consequently a more confined topic like Density based clustering or Grid based clustering etc. can be decided.)
3. Explore for at least 15 to 20 recent research papers (e.g. last 2-5 years in IEEE explore or Science Direct or ACM digital library, etc..) related to the specific topic chosen. From these papers, select best 5 to 8 papers, preferably Journal papers or reputed conferences.
4. Examine these selected papers systematically. Write down a summary of each paper based on their contributions (ideas), Improvements claimed, Parameters used for comparison, Experiments carried out, Tools used.
5. Write a report based on summary highlighting contributions, differences, further ideas to improve those methods, analysis and interpretation.

Technical Seminar Evaluation:

Seminar coordinators follow rubrics, which is set by the Department for evaluation of seminar work and report prepared by the students.

- Seminar reviews will be evaluated by the respective internal guides.

CIE Assessment Pattern (50 Marks)
Evaluation would be carried out in TWO phases. The evaluation criteria shall be as per the rubrics given below:

Continuous Internal Evaluation	Marks
Review: Phase 1: Selection of topic – Technical Relevance, review of literature, Sustainability and Societal Concerns, presentation of the selected study	25
Review: Phase 2: Technological developments and analysis, Presentation skills, Report writing	25

The evaluation will be done by a Senior faculty / Internal Guide from the department and ONE External member from Academia / Industry / Research Organization.
SEE evaluation: (50 Marks)

Rubrics	Marks
Topic	5
Literature Review	10
Technical relevance Sustainability and Societal Concerns	15
Presentation Skills	10
Viva- Voce	10

Suggested Learning Resources:
Web links:

- https://www.youtube.com/watch?v=KcLRApb3Pqg
- https://www.youtube.com/watch?v=GZRBN-Nz99I
- https://www.youtube.com/watch?v=lQrj_7xkeNI
- https://www.youtube.com/watch?v=rz30rRfManE&list=PLdj5pVg1kHiOypKNUmO0NKOfvoIThAv4N

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Fourth Semester MCA
AY -2024-25

PROFESSIONAL ELECTIVE 5

PROFESSIONAL ETHICS

Course Code	**23MCA411**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:
At the end of the course, the student will be able to:

23MCA411.1	Discuss the intricacies of ethical issues, ethical principles and ways to tackle with various situations.
23MCA411.2	Summarize the aspects of computer crime and IPR.
23MCA411.3	Examine the policies for regulating Internet content and technology safety.
23MCA411.4	Investigate on the computer technologies for accessibility issues.
23MCA411.5	Identify the software development strategies with engineering standards.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
23MCA411.1	-	-	-	-	-	3	-	-	-	-	-	-	-	3
23MCA411.2	-	-	-	-	-	3	-	-	-	-	-	-	-	3
23MCA411.3	-	-	-	-	-	3	-	-	-	-	-	-	-	3
23MCA411.4	-	-	-	-	-	3	-	-	-	2	-	-	-	3
23MCA411.5	-	-	-	-	-	3	-	-	-	2	-	-	-	3

MODULE-1	**COMPUTER ETHICS INTRODUCTION AND COMPUTER HACKING**	**23MCA411.1**	**8 Hours**

Introduction to Computer Ethics, An Overview, Identifying an Ethical Issue, Ethics and Law, Ethical Theories, Professional Code of Conduct, An Ethical Dilemma, A Framework for Ethical Decision Making, Computer Hacking, Introduction, Definition of Hacking, Destructive Programs, Hacker Ethics, Professional Constraints, BCS Code of Conduct, To Hack or Not to Hack, Ethical Positions on Hacking.

Text Book	Text Book 2: 1, 2, Text Book 1: 2

MODULE-2	**ASPECTS OF COMPUTER CRIME AND INTELLECTUAL PROPERTY RIGHTS**	**23MCA411.2**	**8 Hours**

Introduction to Computer Crime, Computer Security Measures, Professional Duties and Obligations, Intellectual Property Rights, The Nature of Intellectual Property, Patents, Trademarks, Trade Secrets, Software Issues, Copyright, The Extent and Nature of Software Piracy, Ethical and Professional Issues, Free Software and Open Source Code.

Self-study/ Case Study/ Applications	Study the usability of Open Source Software in professional software development , advantages and limitations (if any).
Text Book	Text Book 2: 3, 4, 6, Text Book 1: 3

MODULE-3	**REGULATING INTERNET CONTENT, TECHNOLOGY AND SAFETY**	**23MCA411.3**	**8 Hours**

Introduction, In Defence of Freedom Expression, Censorship, Laws Upholding Free Speech, Free Speech and the Internet, Ethical and Professional Issues, Internet Technologies and Privacy, Safety and Risk, Assessment of Safety and Risk, Risk Benefit Analysis, Reducing Risk.

Text Book	Text Book 2: 5, Text Book 1: 4, 5

MODULE-4	**COMPUTER TECHNOLOGIES ACCESSIBILITY ISSUES**	**23MCA411.4**	**8 Hours**

Principle of Equal Access, Obstacles to Access for Individuals, Professional Responsibility, Empowering Computers in the Workplace, Introduction to Computers and Employment, Computers and the Quality of Work, Computerized Monitoring in the Work Place, Telecommuting, Social, Legal and Professional Issues, Use of Software, Computers and Internet-based Tools, Liability for Software Errors, Documentation Authentication and Control, Software Engineering Code of Ethics and Practices.

Text Book	Text Book 2: 8

MODULE-5	SOFTWARE DEVELOPMENT AND SOCIAL NETWORKING	23MCA411.5	8 Hours

Strategies for Engineering Quality Standards, Quality Management Standards, Social Networking, Company Owned Social Network Web Site, The Use of Social Networks in the Hiring Process, Social Networking Ethical Issues, Cyber Bullying, Stalking, Online Virtual World, Crime in Virtual World, Digital Rights Management, Online Defamation, Privacy and Fraud.

Self-study/ Case Study/ Applications	Prepare a report on current trends in privacy breach and frauds.
Text Book	Text Book 2: 7, 9

CIE Assessment Pattern (50 Marks – Theory)

RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment (s)	MCQ's
		25	15	10
L1	Remember	10		5
L2	Understand	10	10	5
L3	Apply	5	5	-
L4	Analyze	-	-	-
L5	Evaluate	-	-	-
L6	Create	-	-	-

SEE Assessment Pattern(50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	20
L2	Understand	20
L3	Apply	5
L4	Analyze	5
L5	Evaluate	-
L6	Create	-

Suggested Learning Resources:

Text Books:

1) Ethics in Computing, Science and Engineering, Bary G. Bludell, Springer International publishing, 2020, ISBN: 9783030271268.
2) Ethics in Information Technology, George Reynolds, Cengage Learning, 2011.

References Books:

1) Ethics in Engineering Practice and Research, Cambridge University Press, 2011.
2) A Gift of Fire: Social, Legal, and Ethical Issues for Computing and the Internet, Sara Baase, 3rd Edition, 2008.
3) Ethical, legal and professional issues in computing, Penny Duquenoy, Simon Jones and Barry G Blundell, Middlesex University Press, 2008.

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=b_n6i1ug0tQ
- https://www.youtube.com/watch?v=pE5E3YkEyYY

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Video demonstration of latest tools and trends in design thinking
- Contents related activities (Activity-based discussions)
  - Organizing Group wise discussions on tools and issues
  - Brainstorming in groups regarding the application of professional ethics to their projects development.

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DESIGN THINKING			
Course Code	**23MCA412**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:
At the end of the course, the student will be able to:

23MCA412.1	Apply the fundamentals of design thinking.
23MCA412.2	Categorize various tools and strategies for design thinking.
23MCA412.3	Derive a strategic business plan.
23MCA412.4	Identify a business model with its essential elements.
23MCA412.5	Prioritize the designs with required Law.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
23MCA412.1	-	2	-	-	-	-	-	-	-	-	-	-	-	2
23MCA412.2	-	-	2	-	3	-	-	-	-	-	-	-	-	2
23MCA412.3	-	-	-	-	-	-	-	-	-	-	-	-	-	2
23MCA412.4	-	-	-	-	-	-	-	3	-	-	-	-	-	2
23MCA412.5	-	-	2	-	-	-	-	-	-	-	-	-	-	2

MODULE-1	**INTRODUCTION TO DESIGN THINKING**	**23MCA412.1**	**8 Hours**
Design Thinking Overview - Definition, Introduction, Customizing the Process. Building Blocks of Design Thinking - Information Gathering, Problem Analysis and Definition, Idea Generation, Synthesis through Modeling, Critical Evaluation.			
Text Book	Text Book 1: 1, 2 Text Book 2: 1		
MODULE-2	**TOOLS AND STRATEGIES FOR DESIGN THINKING**	**23MCA412.2**	**8 Hours**
Diagramming, Reflecting, Presenting. Politics and Society - Expanding the Politics of Civic Engagement, Managing Gridlocked Debates.			
Text Book	Text Book 1: 3, 4		
MODULE-3	**BUSINESS**	**23MCA412.3**	**8 Hours**
Implementing a Strategic Technology Plan, Creativity in the Culinary Arts, Empathy as a Means to Innovate in Pharmaceutical Company.			
Text Book	Text Book 1: 5		
MODULE-4	**DESIGN THINKING APPROACH IN DIVERSE DOMAINS**	**23MCA412.4**	**8 Hours**
Visioning, Listening and Diagramming at a University, Fast-Fail and Iterative, Dinner Conversation as a Model for Effective Interviews. Health and Science - Health Care Delivery, A Design Approach to Treating Cancer.			
Self-study / Case Study / Applications	Case study to prepare a design approach for treating any disease.		
Text Book	Text Book 1: 6		
MODULE-5	**PROTOTYPE DRAFTING**	**23MCA412.5**	**8 Hours**
Problem Definition, Alternatives and the Big Idea. Writing - Draft as Prototype, Writing Prose for Writing Pros.			
Self-study / Case Study / Applications	Explore case studies for prewriting, drafting.		
Text Book	Text Book 1: 7, 8 Text Book 2: 5		

CIE Assessment Pattern (50 Marks – Theory)

RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment (s)	MCQ's
		25	15	10
L1	Remember	5	-	-
L2	Understand	5	5	5
L3	Apply	10	5	5
L4	Analyze	5	5	-
L5	Evaluate	-	-	-
L6	Create	-	-	-

SEE Assessment Pattern (50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	20
L4	Analyze	10
L5	Evaluate	--
L6	Create	--

Suggested Learning Resources:

Text Books:

1) Design thinking: A guide to creative problem solving for everyone, AndrewPressman, Taylor & Francis publishers, 2019, ISBN: 9781138673472.
2) Basics of Design Thinking, Gavin Ambrose, Paul Harris, AVA Publishers, 2010, ISBN: 9782940411177.

Reference Books:

1) Complete Design Thinking Guide for successful professionals, Daniel Ling,Kindle edition, ISBN: 9789810955649.
2) Design thinking methodology Book, Emrah Yayici, Kindle Edition, 2016, ISBN: 9786058603752.

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=4nTh3AP6knM
- https://www.youtube.com/watch?v=Z4gAugRGpeY
- https://www.youtube.com/watch?v=GeUXQ_L-35M
- https://www.tutorialspoint.com/hi/design_thinking/design_thinking_tutorial.pdf

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Video demonstration of latest tools and trends in design thinking
- Contents related activities (Activity-based discussions)
  - Organizing Group wise discussions on tools and issues
  - Seminars

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ENTREPRENEURSHIP AND INNOVATION MANAGEMENT			
Course Code	**23MCA413**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:
At the end of the course, the student will be able to:

23MCA413.1	Discuss the entrepreneurial characteristics, business ideas, management and administration.
23MCA413.2	Examine opportunities by applying ideas for businesses.
23MCA413.3	Apply strategic planning for entrepreneurial management and legal forms of business.
23MCA413.4	Examine principles in management and planning process.
23MCA413.5	Formulate the Leadership qualities and managerial controls.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
23MCA413.1	-	-	-	-	-	-	-	-	-	-	-	1	-	2
23MCA413.2	-	2	-	1	-	-	-	-	-	-	-	-	-	2
23MCA413.3	-	-	-	-	-	2	-	-	-	-	-	2	-	2
23MCA413.4	-	-	-	-	-	-	-	2	-	-	-	-	-	2
23MCA413.5	-	-	-	-	-	-	-	-	-	-	-	2	-	2

MODULE-1	**ENTREPRENEURIAL PERSPECTIVE**	**23MCA413.1**	**8 Hours**

The Nature of Entrepreneurship, How Entrepreneurs Think, Entrepreneur Background and Characteristics. Role Models and Support Systems, Causes for Interest in Corporate Entrepreneurship, Managerial Versus Entrepreneurial Decision Making, Generation of New Entry Opportunity, Entry Strategy for New Entry Exploitation, Risk Reduction Strategies for New Entry Exploitation.

Text Book	Text Book 1: 1, 2, 3

MODULE-2	**IDEA TO THE OPPORTUNITY**	**23MCA413.2**	**8 Hours**

Trends, Sources of New Ideas, Methods of Generating Ideas, Creative Problem Solving, Innovation, Opportunity Recognition, Product Planning and Development Process, E-Commerce and Business Start-Up, International V/S Domestic Business, Entrepreneurial Entry Strategies, Aspects of International Trade.

Self-study / Case Study / Applications	Explore new ideas for getting opportunity for the business.
Text Book	Text Book 1: 4, 5

MODULE-3	**FROM THE OPPORTUNITY TO THE BUSINESS PLAN**	**23MCA413.3**	**8 Hours**

Planning as Part of the Business Operation, Writing the Business Plan, Using and Implementing the Business Plan, Marketing Research for the New Venture, Steps in Preparing the Marketing Plan, Legal Forms of Business, S-Corporation, Limited Liability Company Versus the S Corporation, Building the Management Team and a Successful Organization Culture, Operating and Capital Budgets.

Self-study / Case Study / Applications	Examine few businesses plan and analyses the market strategies.
Text Book	Text Book 1: 7, 8, 9

MODULE-4	**PRINCIPLES OF MANAGEMENT**	**23MCA413.4**	**8 Hours**

Nature and Functions of Management, Management - Importance, Definition, Functions or The Process, Managerial Skills & Effectiveness, Management and Administration, Importance of Planning, Types of Plans, Steps in Planning, Strategic Planning Process, Types of Decisions.

Text Book	Text Book 2: 1, 4

MODULE-5	ENTREPRENEURSHIP AND INNOVATION MANAGEMENT	23MCA413.5	8 Hours

Leadership: Characteristics, Functions and Traditional approaches, Leadership style in Indian Organization, Managerial Control: Steps, Need and Benefits, Control Techniques, Organizational change, Management of Organizational conflict and power politics.

Text Book	Text Book 2: 18, 19, 20.

CIE Assessment Pattern (50 Marks – Theory)

RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment (s)	MCQ's
		25	15	10
L1	Remember	5	5	5
L2	Understand	10	5	5
L3	Apply	5	2.5	-
L4	Analyze	5	2.5	-
L5	Evaluate	-	-	-
L6	Create	-	-	-

SEE Assessment Pattern (50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	20
L3	Apply	10
L4	Analyze	10
L5	Evaluate	--
L6	Create	--

Suggested Learning Resources:

Text Books:

1) Entrepreneurship, Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd , McGrawHill Education, 10th edition, 2018, ISBN: 9789353163457.
2) Principles of Management, P.C. Tripathi and P N Reddy, McGrawHill Education, 5th Edition, 2015, ISBN: 978-0-07-133333-7.

Reference Books:

1) Management and Entrepreneurship, T Krishna Rao, Naidu, N V R, Kindle Edition, ISBN: 978-8190675789.
2) Fundamentals for Becoming a Successful Entrepreneur: From Business Idea to Launch and Management, Malin Brannback Alan Carsrud, Pearson FT Press, 2016, ISBN: 978-0133966817.

Web links and Video Lectures (e-Resources):

- Principles of management –open stax "Principlesofmanagement-OP_rU5O3X1.pdf"
- https://onlinecourses.nptel.ac.in/noc23_mg33/preview
- https://www.coursera.org/learn/fundamentals-of-management
- https://archive.nptel.ac.in/courses/127/105/127105007/

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Brain storming session on successful marketing strategies for the undertaken case studies.
- Videos and Ted Talks from successful entrepreneurs.

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DIGITAL MARKETING

Course Code	**23MCA414**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:
At the end of the course, the student will be able to:

23MCA414.1	Apply the concepts of digital marketing as a tool.
23MCA414.2	Analyze Ad placements for creating Ad. Campaigns.
23MCA414.3	Use SEO tactics with off-page and on-page optimization.
23MCA414.4	Examine Ad campaigns.
23MCA414.5	Justify the usage of social media strategies.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
23MCA414.1	-	-	-	-	2	-	-	-	-	-	-	-	-	2
23MCA414.2	-	2	-	-	-	-	-	-	-	-	-	-	-	2
23MCA414.3	-	-	-	-	2	-	-	-	-	-	-	-	-	2
23MCA414.4	-	-	-	-	-	-	-	-	2	-	-	-	-	2
23MCA414.5	-	-	-	-	-	2	-	-	-	-	-	2	-	2

MODULE-1	**INTRODUCTION TO DIGITAL MARKETING**	**23MCA414.1**	**8 Hours**

Traditional vs Digital Marketing, Significance and Process, E-Contents - Web Site Planning and Development, Keywords, Domain and Web - Hosting. P.O.E.M. Framework, Digital Landscape, Plan and Models.

Text Book	Text Book 1: 1.1, 1.3, 1.6 Text Book 2: 1.1, 1.2, 1.4, 2.3

MODULE-2	**INTERNET MARKETING AND DIGITAL MARKETING MIX**	**23MCA414.2**	**8 Hours**

Internet Marketing, Opportunities and Challenges, Digital Marketing Framework, Digital Marketing Mix, Impact of Digital Channels on IMC, Search Engine Advertising, Campaign Report Generation, Display Marketing, Analytics Tools, YouTube Marketing.

Text Book	Text Book 1: 2.1, 2.2, 2.3, 2.7, 2.8, 2.9, 3.1, 3.2, 3.3, 3.4 Text Book 2: 3.3, 3.4, 5.2

MODULE-3	**INTRODUCTION TO SEARCH ENGINE OPTIMIZATION**	**23MCA414.3**	**8 Hours**

SEO, SEM, Web Analytics, Mobile Marketing, Trends in Digital Advertising, On-Page and Off-Page Optimization, SEO Tactics, Google Analytics, Google Adwords, Multi-Channel Attribution, Universal Analytics, Type of Tracking Codes.

Text Book	Text Book 1: 10 Text Book 2: 8.2, 8.5, 10, 11

MODULE-4	**SOCIAL MEDIA MARKETING**	**23MCA414.4**	**8 Hours**

Role of Influencer Marketing, Tools & Plan, Facebook-Business through Facebook, Creating Advertising Campaigns, Adverts, Facebook Marketing Tools, Linkedin - Marketing, Content Strategy, Analytics and Targeting, Twitter-Marketing, Instagram & Snapchat- Strategies for Marketing.

Self-study / Case Study / Applications	Facebook Marketing tools, LinkedIn Marketing tools
Text Book	Text Book 1: 4.1, 6,7, 8.1, 8.2, 9

MODULE-5	**ADDRESSING SOCIAL MEDIA CHANNELS**	**23MCA414.5**	**8 Hours**

Introduction, Traditional Media vs Social Media, Social Media Channels, Tracking Social Media Campaigns, Rules of Engagement, Advantages, Challenges, Social Media Strategy, Step-by-Step Guide to Create a Social Media Strategy, Dealing with Opportunities and Threats

Self-study / Case Study / Applications	Data collection for web analytics, Google Analytics
Text Book	Text Book 2: 6.3, 6.4, 6.5, 9.3

CIE Assessment Pattern(50 Marks – Theory)

RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment (s)	MCQ's
		25	15	10
L1	Remember	5	-	5
L2	Understand	5	5	3
L3	Apply	10	5	2
L4	Analyze	5	5	-
L5	Evaluate	-	-	-
L6	Create	-	-	-

SEE Assessment Pattern(50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	20
L4	Analyze	10
L5	Evaluate	--
L6	Create	--

Suggested Learning Resources:

Text Books:

1) Seema Gupta: Digital Marketing, 1st Edition, Mc-Graw Hill, 2017, ISBN: 9387067610, 9789387067615.
2) Puneet Singh Bhatia, Fundamentals of Digital Marketing, Pearson 1st Edition, 2017, ISBN: 978-9332587373.

Reference Books:

1) Ian Dodson: The Art of Digital Marketing, The Definitive Guide to Creating Strategic, Targeted, and Measurable Online Campaigns, Wiley, 2016, ISBN: 78-1-119-26570-2.
2) Nitin C. Kamat, Chinmay Nitin Kamat: Digital Social Media Marketing, Himalaya Publishing House Pvt. Ltd. 2018, ISBN: 978-93-5299-115-0.
3) Seema Gupta, Avadhoot Jathar : Marketing Analytics, Wiley India Pvt. Ltd. October 2021, ISBN: 9789354242625.

Web links and Video Lectures (e-Resources):

- https://onlinecourses.swayam2.ac.in/ugc19_hs26/preview
- https://www.classcentral.com/course/swayam-digital-marketing-14006
- https://www.tutorialsduniya.com/notes/digital-marketing-notes/

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Demonstration of facebook and LinkedIn marketing tools
- Hands on session
- Contents related activities (Activity-based discussions)
  - Seminars

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SOFTWARE PROJECT MANAGEMENT			
Course Code	**23MCA415**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:
At the end of the course, the student will be able to:

23MCA415.1	Categorize the activities covered in project management and related terms.
23MCA415.2	Examine key criterions used for project evaluation.
23MCA415.3	Analyze the usage of various software estimation techniques.
23MCA415.4	Derive project schedule based on project activities.
23MCA415.5	Recommend Software Configuration Management Principles.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
23MCA415.1	-	1	-	-	-	-	-	3	-	-	-	-	-	2
23MCA415.2	-	-	-	-	-	-	-	3	-	-	-	-	-	2
23MCA415.3	-	-	-	-	-	-	-	3	-	-	-	-	-	2
23MCA415.4	-	-	-	-	-	-	-	3	1	-	-	-	-	2
23MCA415.5	1	-	-	-	-	-	-	3	1	-	-	-	-	2

MODULE-1	**INTRODUCTION**	**23MCA415.1**	**8 Hours**
Types of Projects, Contract Management, Technical Project Management, Underlying Activities, Planning, Methods and Methodologies, Stakeholders, Project Objectives, Project Management Life Cycle.			
Self-study / Case Study / Applications	Study the intersection of technical project management and software development methodologies.		
Text Book	Text Book 1: 1.1, 1.2 , 1.4, 1.5, 1.6, 1.7, 1.10, 1.11, 1.16, 1.17 Text Book 2: 1,2		
MODULE-2	**PROJECT EVALUATION & MANAGEMENT**	**23MCA415.2**	**8 Hours**
Evaluation - Individual Projects, Cost–Benefit, Risks, Program Management – Allocation of Resources, Special Aids, Performance Management, Strategic Program Management and Benefits.			
Self-study / Case Study / Applications	Explore the key criteria used to evaluate individual projects, such as feasibility, return on investment, and alignment with organizational goals.		
Text Book	Text Book 1: 2.2, 2.3, 2.4 to 2.13		
MODULE-3	**SOFTWARE ESTIMATION**	**23MCA415.3**	**8 Hours**
Basis, Software Effort Estimation Techniques, Bottom-Up Estimation, Top-Down Approach and Parametric Models, Expert Judgement, Estimating by Analogy, Function Points Analysis, COCOMO - A Parametric Productivity Model.			
Self-study / Case Study / Applications	Investigate a project where the bottom-up estimating approach was employed and assess its effectiveness in achieving accurate estimations.		
Text Book	Text Book 1: 5.1, 5.5, 5.6, 5.7, 5.8, 5.9, 5.11, 5.13, 5.14		
MODULE-4	**ACTIVITY PLANNING**	**23MCA415.4**	**8 Hours**
Introduction, Objectives, Project Schedules, Projects and Activities, Work Break-Down Structure, Sequencing and Scheduling Activities, Network Planning Models, Adding Time Dimension, Forward Pass, Backward Pass and Critical Path Method.			
Self-study / Case Study / Applications	Learn about project schedules and how they are developed based on project activities.		
Text Book	Text Book 1: 6.1 to 6.12		

MODULE-5	MONITORING AND CONTROL	23MCA415.5	8 Hours

Introduction, Creating the Framework, Collecting Data, Review Visualizing Progress, Cost Monitoring; Earned Value Analysis, Prioritization of Monitoring, Project Back to Target, Change Control, Software Configuration Management (SCM).

Self-study / Case Study / Applications	Explore Software Configuration Management principles and practices, which help manage changes in software development projects.
Text Book	Text Book 1: 9.1 to 9.7, 9.10, 9.11 Text Book 2:10

CIE Assessment Pattern (50 Marks – Theory)

RBT Levels		Marks Distribution		
		Test (s)	Qualitative Assessment (s)	MCQ's
		25	15	10
L1	Remember	5	-	-
L2	Understand	5	5	5
L3	Apply	10	5	5
L4	Analyze	5	5	-
L5	Evaluate	-	-	-
L6	Create	-	-	-

SEE Assessment Pattern (50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	20
L3	Apply	10
L4	Analyze	10
L5	Evaluate	-
L6	Create	-

Suggested Learning Resources:

Text Books:

1) Software Project Management, 6th Edition, Bob Hughes, Mike Cotterel, Rajib Mall, McGraw-Hill, 2018.
2) PMP PMBOK Study Guide, Ralph Cybulski, Project Management Institute, 2020.

Reference Books:

1) Project Management Essentials You Always Wanted To Know: 4th edition 15 February 2021 by Vibrant Publishers and Kalpesh Ashar.
2) Jack Marchewka," Information Technology- Project Management", Wiley Student Version,4th Edition,2013.
3) Pankaj Jalote," Software Project Management in Practise", Pearson Education, 2002.

Web links and Video Lectures (e-Resources):

- https://onlinecourses.nptel.ac.in/noc22_cs107/preview
- edwel.com/materials/PMP-Exam-Prep-Manual-Online-Free 5_0_5.pdf
- https://youtu.be/4oDLMs11Exs

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Video demonstration of latest trends in Software Project Management
- Contents related activities (Activity-based discussions)
  - Organizing Group wise discussions on issues
  - Expert talk on topics like impact of Prompt Engineering in current Software Projects.
  - Brainstorming session on usage of tools and techniques in projects undertaken in current semester.

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TECHNICAL SEMINAR - 2			
Course Code	**23MCA42**	**CIE Marks**	**50**
L:T:P:S	**0:0:0:2**	**SEE Marks**	**50**
Hrs / Week	**-**	**Total Marks**	**100**
Credits	**02**	**Exam Hours**	**03**

Course outcomes:
At the end of the course, the student will be able to:

23MCA42.1	Identify the recent trends in computing technologies to address research challenges.
23MCA42.2	Examine existing literature in the field of study.
23MCA42.3	Analyze case studies, tools, methodologies, technique, and algorithms in the selected study.
23MCA42.4	Use the communication skills and report writing skills for effective presentation.
23MCA42.5	Derive the outcomes for future study.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
23MCA42.1	3	2	-	2	-	-	-	-	-	-	-	-	-	3
23MCA42.2	3	2	1	2	-	-	-	-	-	-	-	-	-	3
23MCA42.3	3	2	-	2	2	-	-	-	-	-	-	-	-	3
23MCA42.4	1	1	1	-	-	2	1	-	3	-	-	-	-	3
23MCA42.5	2	1	-	-	-	-	1	-	1	-	2	-	-	3

Technical Seminar is based on current technological research trends.

GUIDELINES:

1. Select any broad area of research or technical topics of interest (E.g. Machine Learning/Data mining, Computer Networks, Cloud Computing, etc.)
2. Select a specific topic of inquiry. (E.g. In Data mining, one can choose cluster analysis or Classification or Association rule mining, consequently a more confined topic like Density based clustering or Grid based clustering etc. can be decided.)
3. 3Explore for at least 15 to 20 recent research papers (e.g. last 2-5 years in IEEE explore or Science Direct or ACM digital library, etc..) related to the specific topic chosen. From these papers, select best 5 to 8 papers, preferably Journal papers or reputed conferences.
4. Examine these selected papers systematically. Write down a summary of each paper based on their contributions (ideas), Improvements claimed, Parameters used for comparison, Experiments carried out, Tools used.
5. Write a report based on summary highlighting contributions, differences, further ideas to improve those methods, analysis and interpretation.

Technical Seminar Evaluation:

Seminar coordinators follow rubrics, which is set by the Department for evaluation of seminar work and report prepared by the students.

- Seminar reviews will be evaluated by the respective internal guides.

CIE Assessment Pattern (50 Marks)
Evaluation would be carried out in TWO phases. The evaluation criteria shall be as per the rubrics given below:

Continuous Internal Evaluation	Marks
Review: Phase 1: Selection of topic – Technical Relevance, review of literature, Sustainability and Societal Concerns, presentation of the selected study	25
Review: Phase 2: Technological developments and analysis, Presentation skills, Report writing	25

The evaluation will be done by a Senior faculty / Internal Guide from the department and ONE External member from Academia / Industry / Research Organization.
SEE evaluation: (50 Marks)

Rubrics	Marks
Topic	5
Literature Review	10
Technical relevance Sustainability and Societal Concerns	15
Presentation Skills	10
Viva- Voce	10

Suggested Learning Resources:
Web links:

- https://www.youtube.com/watch?v=KcLRApb3Pqg
- https://www.youtube.com/watch?v=GZRBN-Nz99I
- https://www.youtube.com/watch?v=lQrj_7xkeNI
- https://www.youtube.com/watch?v=rz30rRfManE&list=PLdj5pVg1kHiOypKNUmO0NKOfvoIThAv4N

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MAJOR PROJECT

Course Code	**23MCA43**	**CIE Marks**	**50**
L:T:P:S	**0:0:17:0**	**SEE Marks**	**50**
Hrs / Week	**-**	**Total Marks**	**100**
Credits	**17**	**Exam Hours**	**3**

Course outcomes:
At the end of the course, the student will be able to:

23MCA43.1	Identify the problem definition statement and requirements for the project.
23MCA43.2	Apply the design methodology for the identified requirements.
23MCA43.3	Implement the functional modules with necessary interfaces.
23MCA43.4	Evaluate appropriate testing strategies and generate test cases.
23MCA43.5	Formulate all project findings in the prescribed report template.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
23MCA43.1	1	2	-	-	-	-	-	1	-	-	-	-	2	3
23MCA43.2	-	-	3	-	3	-	-	-	-	-	-	-	2	3
23MCA43.3	-	-	3	-	3	-	-	-	-	-	-	-	2	3
23MCA43.4	-	-	-	3	-	-	-	-	-	-	-	-	2	3
23MCA43.5	-	-	-	-	-	-	-	-	3	-	2	1	2	3

GUIDELINES

1. The student needs to complete the project within the stipulated time with the appropriate development methodology.
2. The project guides and project coordinator follow rubrics set by the department for project evaluation.
3. CIE marks shall be awarded by a committee comprising of HoD as Chairman, Guide/Co-Guide if any, and a senior faculty of the department.
4. The CIE marks awarded for major project, shall be based on the evaluation of Project Report subjected to plagiarism check, Project Presentation skill and performance in the viva-voce.
5. SEE will be conducted for the project work with viva-voce.
6. It is mandatory for the student to present/publish the work in international conferences or Journals.
7. The evaluation is based on the following:
   (i) Review of Objectives, Methodology and Implementation
   (ii) Design, Implementation and Testing
   (iii) Experimental Result and Analysis, Conclusions and Future Scope of Work, Report Writing and Paper Publication.
   (iv) Presentation and viva-voce

CIE- Continuous Internal Evaluation: Practical Demonstration (50 Marks)

RBT Levels		Exam Marks Distribution (50)
L1	**Remember**	-
L2	**Understand**	-
L3	**Apply**	**10**
L4	**Analyze**	**10**
L5	**Evaluate**	**10**
L6	**Create**	**20**

SEE- Continuous Internal Evaluation: Practical Demonstration (50 Marks)

RBT Levels	Exam Marks Distribution (50)
Remember	**-**
Understand	**-**
Apply	**10**
Analyze	**10**
Evaluate	**10**
Create	**20**

Suggested Learning Resources:
Web links:

- https://www.youtube.com/watch?v=-GwBNwZOPUs
- https://www.youtube.com/watch?v=9PgZCJNzY9M

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APPENDICES

APPENDIX A

Outcome Based Education

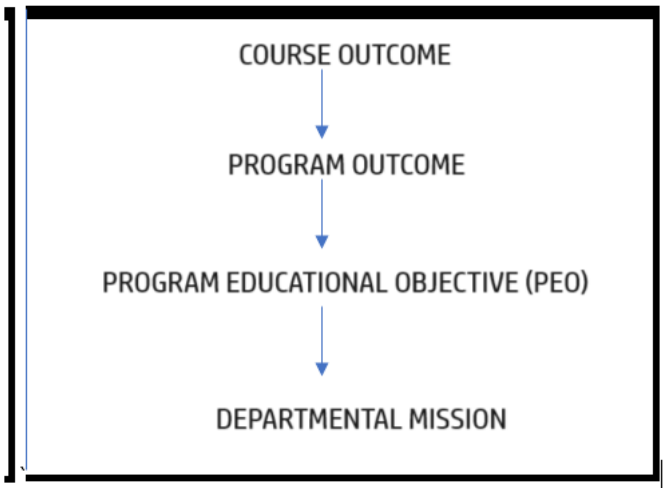
Outcome-based education (OBE) is an educational theory that bases each part of an educational system around goals (outcomes). By the end of the educational experience, each student should have achieved the goal. There is no specified style of teaching or assessment in OBE; instead, classes, opportunities, and assessments should all help students achieve the specified outcomes.

There are three educational outcomes as defined by the National Board of Accreditation: Program Educational Objectives: The Educational Objectives of the Computer Applications program are the statements that describe the expected achievements of graduate in their career and in particular, what the graduates are expected to perform and achieve during the first few years after graduation. [nbaindia.org]

Program Outcomes: What the student would demonstrate upon graduation. Graduate attributes are separately listed in Appendix B

Course Outcome: The specific outcome/s of each course/subject that is a part of the program curriculum. Each subject/course is expected to have a set of Course Outcomes.

Mapping of Outcome:



APPENDIX B

The Graduate Attributes of NBA

PO1 **Computational Knowledge:** Apply knowledge of computing fundamentals, computing specialization, mathematics, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.

PO2 **Problem Analysis:** Identify, formulate, research literature, and solve complex computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.

PO3 **Design /Development of Solutions:** Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

PO4 **Conduct Investigations of Complex Computing Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

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

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

PO7 **Life-long Learning:** Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.

PO8 **Project management and finance:** Demonstrate knowledge and understanding of the computing and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO9 **Communication Efficacy:** Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.

PO10 **Societal and Environmental Concern:** Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.

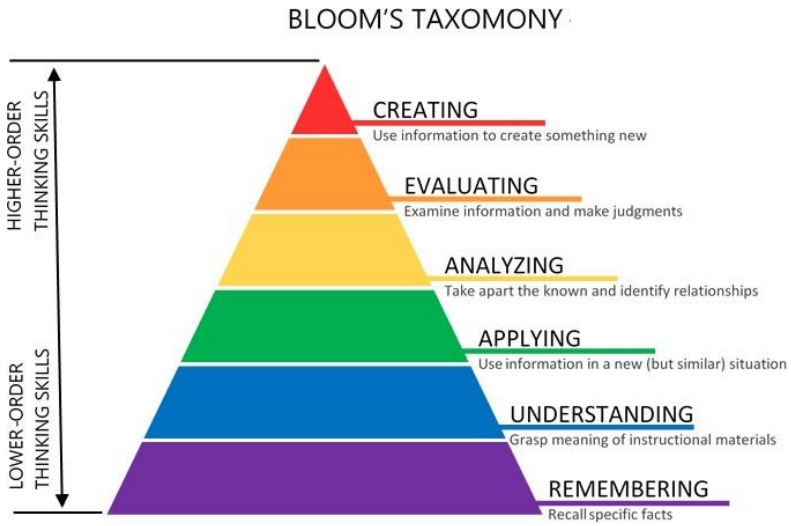
PO11 **Individual and Team Work:** Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.

PO12 **Innovation and Entrepreneurship:** Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

APPENDIX C

BLOOM'S TAXONOMY

Bloom's taxonomy is a classification system used to define and distinguish different levels of human cognition—i.e., thinking, learning, and understanding. Educators have typically used Bloom's taxonomy to inform or guide the development of assessments (tests and other evaluations of student learning), curriculum (units, lessons, projects, and other learning activities), and instructional methods such as questioning strategies.



www.newhorizonindia.edu

Ring Road, Bellandur Post, Near Marathahalli,
Bengaluru, Karnataka 560103, India.

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