KARNATAK LAW SOCIETY'S
GOGTE INSTITUTE OF TECHNOLOGY
"JNANA GANGA" UDYAMBAG, BELAGAVI-590008,
KARNATAKA, INDIA.
Approved by AICTE & UGC
Permanently Affiliated and Autonomous Institution Under
Visvesvaraya Technological University, Belagavi
www.git.edu

ESTD. 1939

ESTD. 1979

2022-23 Scheme
Department: MCA
Programme: MCA

1st to 4th Semester Scheme of Teaching and Examination

1st and 2nd Semester Syllabus

INSTITUTION VISION

Gogte Institute of Technology shall stand out as an institution of excellence in technical education and in training individuals for outstanding caliber, character coupled with creativity and entrepreneurial skills.

MISSION

To train the students to become Quality Engineers with High Standards of Professionalism and Ethics who have Positive Attitude, a Perfect blend of Techno-Managerial Skills and Problem solving ability with an analytical and innovative mindset.

QUALITY POLICY

- Imparting value added technical education with state-of-the-art technology in a congenial, disciplined and a research oriented environment.
- Fostering cultural, ethical, moral and social values in the human resources of the institution.
- Reinforcing our bonds with the Parents, Industry, Alumni, and to seek their suggestions for innovating and excelling in every sphere of quality education.

DEPARTMENT VISION

The department of Master of Computer Applications shall strive to stand out as par excellence in generating and grooming, technically competent and skilled intellectual professionals to meet the challenges of the modern computing industry.

MISSION

To train the graduates to become IT professionals having strong fundamental knowledge in the field of computer application with ethical values to meet increasing global challenges of ever evolving technologies.

OUTCOME BASED EDUCATION (OBE)
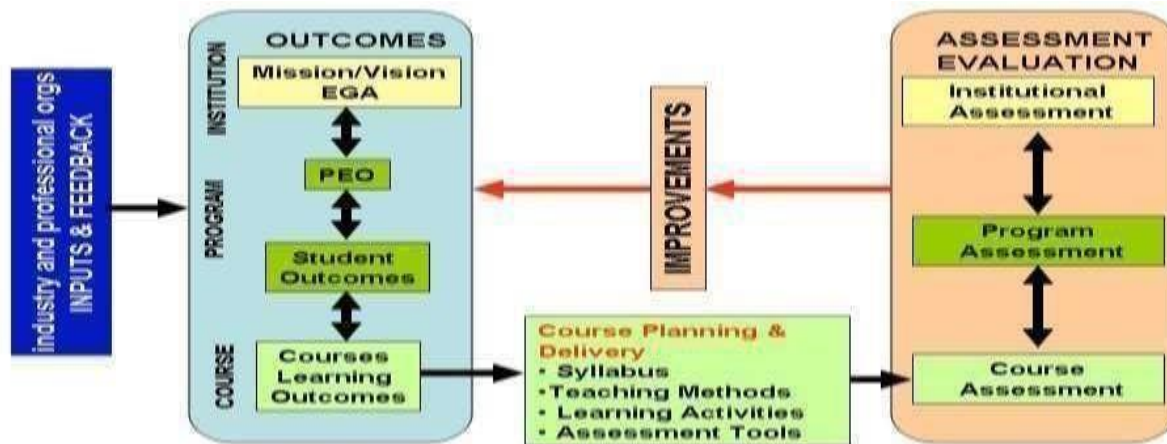
PROGRAM OUTCOMES (POs) :	
1.	Apply the knowledge of mathematics and computing fundamentals to abstract and conceptualize models from defined problems and requirements.
2.	Ability to identify, formulate and conduct literature review to solve complex computing problems for obtaining optimal inference.
3.	Design and develop solutions for complex computing problems, components or processes to meet the specified needs after considering public health and safety, cultural, societal, and environmental factors.
4.	Apply research-based knowledge and methods to design experiments, analyze and interpret data with synthesis of information to provide valid conclusions.
5	Ability to create, select, adapt and apply appropriate techniques using modern computing tools with an understanding of the limitations.
6	Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practices.
7	Ability to engage in independent and lifelong learning in the context of technological advancements for continual development as a computing professional
8	Demonstrate knowledge and understanding of the computing and management principles as a member and leader in a team, to manage projects in multidisciplinary environments
9.	Ability to communicate effectively on complex computing activities with computing community and the society at large.
10.	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
11.	Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments
12.	Ability to identify an opportunity and execute innovative ideas to create value and sustainable well-beings for the individual and society at large

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

PEO1: Real Life Problem Solving: Postgraduates of the programme will develop solutions to the real world problems by developing computer applications using the knowledge of mathematics, computer science and engineering in the diverse field of Information Technology.

PEO2: High-Quality Computer Professionals: The postgraduates shall practice and grow as computer professionals by conducting research, design, develop, test and maintain projects in varied fields of computer science and engineering using the state-of-the-art tools and technologies.

PEO3: Leadership Skills: The postgraduates will exhibit their leadership skills with ethics, integrity, competency and social responsibility.

PEO4: Lifelong Learning: The postgraduates shall always stand out of the crowd by enhancing their abilities in their profession through lifelong learning.

BLOOM'S TAXONOMY OF LEARNING OBJECTIVES

Bloom's Taxonomy in its various forms represents the process of learning. It was developed in 1956 by Benjamin Bloom and modified during the 1990's by a new group of cognitive psychologists, led by Lorin Anderson (a former student of Bloom's) to make it relevant to the 21stcentury. The **revised taxonomy** given below emphasizes what a learner "Can Do".

Lower order thinking skills(LOTS)		
L1	Remembering	Retrieve relevant knowledge from memory.
L2	Understanding	Construct meaning from instructional material including oral, writtenand graphic communication.
L3	Applying	Carry out or use a procedure in a given situation – using learnedknowledge.
Higher order thinking skills(HOTS)		
L4	Analyzing	Break down knowledge into its components and determine the relationships of the components to one another and then how they relateto an overall structure or task.
L5	Evaluating	Make judgments based on criteria and standards, using previouslylearned knowledge.
L6	Creating	Combining or reorganizing elements to form a coherent or functionalwhole or into a new pattern, structure or idea.
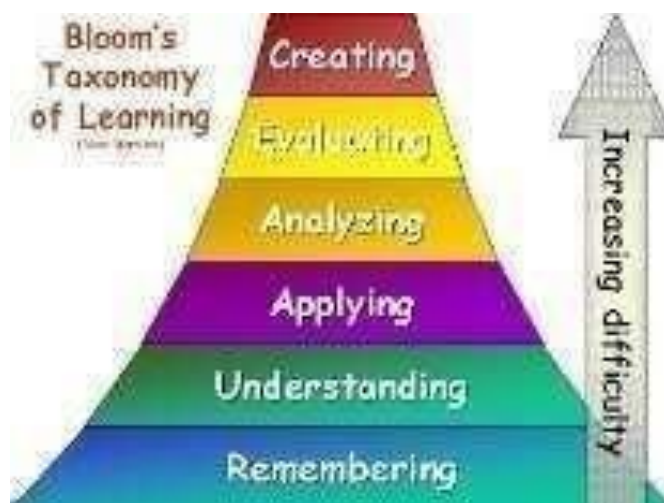
Scheme of Teaching and Examination -1ˢᵗ to 4ᵗʰSemester MCA

As per the guidelines of UGC CBCS the courses can be classified into:

(**i**) **Professional Courses (PC)**: This is the course which is to be compulsorily studied by a student as a core requirement to complete the requirements of a program in a said discipline of study. These courses will have 4 credits per course.

(**ii**) **Foundation Courses**: The Foundation Courses are of two kinds:

Compulsory Foundation: These courses are the courses based upon the content that leads to Knowledge enhancement. These courses provide opportunities to improve technological knowledge before entering industry as well as preparing students for higher degrees in technological subjects. They are mandatory for all disciplines. These courses will have 4 credits per course.

Foundation Electives: These are value based courses aimed at man making education. The course is related to **Humanities and Social Science Courses (HS).**

(**iii**)**Elective Courses:** This is course, which can be chosen from the pool of papers. It may be supportive to the discipline/ providing extended scope/enabling an exposure to some other discipline / domain / nurturingstudent proficiency skills.

(**iv**)**Mandatory Non-Credit Courses (MNC)**: These courses are mandatory for students joining MCA Program and students have to successfully complete these courses before the completion of degree.

Scheme for 2022 M.C.A.

Total credits for M.C.A. Program

	Semester	Credits per Semester	Total credits
1st year	1	24	49
	2	25	
2nd year	3	25	51
	4	26	
	Total	100	100

Curriculum framework:

Sl. No.	Course		Credits
1.	Professional Core	PC	71
2.	General Elective	GE	12
3.	Compulsory Foundation	CF	11
4.	Academic Writing	SC	4
5.	Societal Project	SP	2
	Total		100

Credit definition:
Lecture (L): One Hour /week – 1 credit
Tutorial (T): Two hour /week – 1 credit
Practical (P): Two hours/week –1credit

I Semester

S. No.	Course Code	Course Title & Category		Contact Hours L– T-P	Contact Hours/ week	Credit Allocation			Total credit	Marks				
						L	T	P		CIE		SEE		TOTAL
										Theory	Lab	Theory	Lab	
1.	22MCA11	Python Programming(I)	PC	4 – 0 – 2	6	4	0	1	5	60	40	100	NA	200
2.	22MCA12	Database Management System (I)	PC	4 – 0 – 2	6	4	0	1	5	60	40	100	NA	200
3.	22MCA13	Computer Networks and Communication(I)	PC	4 – 0 – 2	6	4	0	1	5	60	40	100	NA	200
4.	22MCA14	Research Methodology	CF	4 – 0 – 0	4	4	0	0	4	100	NA	100	NA	200
5.	22MCA15	Mathematical Foundations	CF	4 – 2– 0	6	4	1	0	5	100	NA	100	NA	200
		Total			32				24	380	120	500	NA	1000

CIE: Continuous Internal Evaluation **SEE:** Semester End Examination **L:** Lecture **T:** Tutorial **P:** Practical **PC:** Professional Course **CF:** Compulsory Foundation **I:** Integrated course **MNC:** Mandatory Non-Credit Course **GE:** General Elective **SP:** Societal Project

#Bridge course as per University Guidelines

I Semester

Course Code	Course Title & Category		Contact Hours L– T-P	Contact Hours/ week	Credit Allocation			Total credit	Marks				
					L	T	P		CIE		SEE		TOTAL
									Theory	Lab	Theory	Lab	
22MCA16	Basics of Programming Languages – Bridge Course (I)	PC	4 – 0 – 2	6	-	-	-	MNC	60	40	100	NA	200

S. No.	Course Code	Course Title & Category		Contact Hours L– T–P	Contact Hours/ week	Credit Allocation			Total credit	Marks				
										CIE		SEE		TOTAL
						L	T	P		Theory	Lab	Theory	Lab	
1.	22MCA21	Web Design and Development (I)	PC	4 – 0 – 2	6	4	0	1	5	60	40	100	NA	200
2.	22MCA22	Data Structures and Algorithms (I)	PC	3 – 2 – 2	7	3	1	1	5	60	40	100	NA	200
3.	22MCA23	Programming using Java and J2EE (I)	PC	4 – 0 – 2	6	4	0	1	5	60	40	100	NA	200
4.	22MCA24	IT Infrastructure Management	PC	4 – 0 – 0	4	4	0	0	4	100	NA	100	NA	200
5.	22MCA25X	Elective-1	GE	4 – 0 – 0	4	4	0	0	4	100	NA	100	NA	200
6.	22MCA26	Professional Communication and Ethics	CF	0 – 0 – 2	2	0	0	1	1	100	NA	NA	NA	100
7.	22MCA27	Employability Skill	CF	3 – 0 – 0	3	1	0	0	1	100	NA	NA	NA	100
		Total			32				25	580	120	500	NA	1200

II semester

CIE: Continuous Internal Evaluation **SEE:** Semester End Examination **L:** Lecture **T:** Tutorial **P:** Practical **PC:** Professional Course **CF:** Compulsory Foundation **I:** Integrated course **MNC:** Mandatory Non-Credit Course **GE:** General Elective **SP:** Societal Project.

Certification Course:

- One certification is compulsory and need to be completed before start of 4th semester.
- Choose certifications, which have industrial acceptance.
- Students must submit the certificate with valid score of the certifications they have completed to the department during 4th semester. **This is mandatory for the award of the credits and degree.**
- These certifications are evaluated by a panel formed at college level during 4th semester for the award of 2 credits.

Professional Practice (Internship)

The students have to undergo a mandatory professional practice of **6 weeks duration**. This activity should be carried out during the vacation between 2nd and 3rd semester or between 3rd and 4th semester.

Societal Project

Working out solutions for societal problems. Applying the technology to solve the societal problems. Those, who have not pursued /completed the Societal Project, shall be declared as fail in the that course. There is no SEE (University examination) for this course.

Elective-1

Sl. No.	Course Code	Course Title
1	22MCA251	NoSQL
2	22MCA252	Cloud Computing
3	22MCA253	Cyber Security and Cyber Laws
4	22MCA254	Data Analysis with R**
5	22MCA255	Information Network Security

NOTE: The courses with the '**' mark indicate that the courses will be **Project Based Learning (PBL).** For these courses the Semester End Examination will be a project.

S. No.	Course Code	Course Title & Category		Contact Hours L– T-P	Contact Hours/ week	Credit Allocation			Total credit	Marks				
						L	T	P		CIE		SEE		TOTAL
										Theory	Lab	Theory	Lab	
1.	22MCA31	C# Programming using .NET (I)	PC	4 – 0 – 2	6	4	0	1	5	60	40	100	NA	200
2.	22MCA32	Machine Learning(I)	PC	4 – 0 – 2	6	4	0	1	5	60	40	100	NA	200
3.	22MCA33	Big Data Paradigm(I)	PC	4 – 0 – 2	6	4	0	1	5	60	40	100	NA	200
4.	22MCA34X	Elective-2	GE	4 – 0 – 0	4	4	0	0	4	100	NA	100	NA	200
5.	22MCA35X	Elective-3	GE	4 – 0 – 0	4	4	0	0	4	100	NA	100	NA	200
6.	22MCA36	Societal Project	SP	0 – 0 – 3	3	0	0	3	2	100	NA	NA	NA	100
		Total			**32**				**28**	**580**	**120**	**600**	**NA**	**1300**

The table header "III semester" spans the top.

CIE: Continuous Internal Evaluation **SEE:** Semester End Examination **L:** Lecture **T:** Tutorial **P:** Practical **PC:** Professional Course **CF:** Compulsory Foundation **I:** Integrated course **MNC:** Mandatory Non-Credit Course **GE:** General Elective **SP:** Societal Project

Elective-2

Sl. No.	Course Code	Course Title
1	22MCA341	Block Chain Technology
2	22MCA342	Management and Entrepreneurship for IT Industry
3	22MCA343	Full Stack Development**
4	22MCA344	Internet of Things**
5	22MCA345	Advanced Database Management System

Elective-3

Sl. No.	Course Code	Course Title
1	22MCA351	Django Framework**
2	22MCA352	DevOps
3	22MCA353	Artificial Intelligence
4	22MCA354	Software Project Management
5	22MCA355	Ethical Hacking**

Open Electives (FOR OTHER BRANCHES).

Sl. No.	Course Code	Course Title
1	22MCA361	Introduction to Python
2	22MCA362	Introduction of Data Mining
3	22MCA363	Data Analytics using R
4	22MCA364	Software Testing

NOTE: The courses with the '**' mark indicate that the courses will be **Project Based Learning (PBL).** For these courses the Semester End Examination will be a project.

SI. No.	Course Code	Course Title& Category		Contact Hours/Week	Credits	Marks			Total Marks
						CIE	**SEE**		
							Demonstration, Presentation and Viva	Dissertation	
1	22MCA41	Professional Practice	PC	--	5	100	100	NA	200
2	22MCA42	Project Work	PC	FT	15	100	50	50	200
3	22MCA43	Academic Writing	SC	1	4	100	NA	NA	100
4	22MCA44X	Technical Certification	PC	8 Weeks	2	NA	NA	NA	--
			Total	--	26	300	150	50	500

IV Semester

CIE: Continuous Internal Evaluation **SEE:** Semester End Examination **L:** Lecture **T:** Tutorial **P:** Practical **PC:** Professional Course **CF:** Compulsory Foundation **I:** Integrated course **MNC:** Mandatory Non-Credit Course **GE:** General Elective **SP:** Societal Project.

22MCA43: Academic Writing
The seminar presented, may be published in a reputed peer reviewed or Scopus journals.
22MCA44X: Certification Course
Please refer to the II (Second) semester Scheme for guidelines

C# Programming with .NET (I)

Course Code	22MCA31	Course type	Integrated	Credits L-T-P	4 - 0 - 1
Hours/week: L - T- P	4- 0 - 2			Total credits	5
Total Contact Hours	L = 52 Hrs; T = 0 Hrs; P = 24 Hrs Total = 76 Hrs			CIE Marks	100
				SEE Marks	100

Course learning objectives

1.	To give an insight of .NET Framework and introduce C# as a .NET aware language to create console application, windows application and web application.
2.	To impart the knowledge of Object Oriented Programming concepts using C#.
3.	To explore and study the WPF (Windows Presentation Foundation) to develop front-end windows application and connect it to the back-end using ADO.NET (ActiveX Data Objects) technology.
4.	To introduce ASP.NET (ActiveX Server Pages) for developing dynamic web application.

Required Knowledge: Basics of Programming

Unit – I	Contact Hours = 10 Hours
Introduction to .NET Framework 4.5 and C# 5.0	

Evolution of .NET, Benefits of .NET Framework and Components of .NET Framework

Introducing C# 5.0.

C# Pre-processor directive, Identifiers & Keywords, Data types, Variables & Constants, Expressions & Operators.

Control Flow Statements, Exception Handling and Checked & Unchecked Statements.

Textbook 1: Chapter 1, 3, 7.

Unit – II	Contact Hours = 10 Hours
Object Oriented Concepts in C#	

Namespaces, Classes, Objects and Structs

Namespaces, The System Namespace, Classes & Objects, Constructors & Destructors, Static Classes & Static Class Members, Properties, Indexers and Structs.

Encapsulation, Inheritance, Polymorphism, Abstraction and Interfaces.

Textbook1: Chapter 4, 5.

Unit – III	Contact Hours = 12 Hours
Introduction to WPF (Windows Presentation Foundation) and ADO.NET (ActiveX Data Objects)	
Working with WPF 4.5 controls	

The Container Controls, The Simple Controls, The Content Controls, The Container Control, The Headered Content Controls, The Item Controls and The Headered Item Controls.

Architecture of ADO.NET, Type & Untyped Dataset, DataReader, Creating Connecting Strings, Creating a Connection to a Database, Creating a Command Object, Working with Data Adapter, Using DataRaeder to work with Databases.

Textbook 1: Chapter 9, 12.

Unit – IV	Contact Hours = 12 Hours

Introduction to ASP.Net (Active Server Pages)

Specifying a location for a web application, Code Render Blocks and ASP.NET Coding Models. The Label Control, The Button Control, The TextBox Control, The Literal Control, The PlaceHolder Control, The HiddenField Control, The FileUpload Control, The Image Control, The Image Button Control, The Image Map Control, The ListBox Control, The DropDown List Control, The Bulleted List Control, The HyperLink Control, The Link Button Control, The CheckBox Control, The Radio Button Control and The Table Control.

Textbook 1: Chapter 19, 21.

Unit – V	Contact Hours = 8 Hours

Validation Control and Master Pages

Unobtrusive validations in ASP.NET Web Forms, The BaseValidator Class, RequiredFieldValidator Control, The RangeValidator Control, The RegularExpression Validator Control, The CompareValidator Control, The CustomValidator Control, The ValidationSummary Control.

Understanding the need for Master Pages & Themes, Understanding Master Pages, Simple Master Page and Nested Master Page.

Textbook 1: Chapter 22, 26.

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	1	1. Checked and Unchecked exceptions
2	5	2. Encapsulation using Properties
		3. Polymorphism using Indexer
		4. Inheritance
		5. Interfaces
		6. Operator overloading
3	1	7. Windows Application with Database Connectivity
4, 5	1	8. Web application with Database Connectivity and Validation Controls

Books	
Text Books	
1.	.NET 4.5 Programming (6-in-1), Black Book, Kogent Learning Solutions Inc., Wiely - Dream Tech Press
Reference Books	
1.	Anne Boehm, Joel Murach, Murach"s ASP.NET 4 web programming with C# 2010, Mike Murach & Associates Inc.; 4th Edition.
E-resourses (NPTEL/SWAYAM.. Any Other)- mention links	
1.	https://dotnet.microsoft.com/en-us/learn/csharp
2.	https://dotnet.microsoft.com/en-us/learn/aspnet

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/Project/Seminar
3.	Practice session/Demonstrations in Labs	3.	Lab Test
		4.	Semester End Examination

Course Outcomes (COs)			
At the end of the course, the student will be able to		**Learning Level**	**PO(s)**
CO1	**Explain** console based applications using C#.	L2	PO1
CO2	**Apply** the object oriented concepts using C#.	L3	PO1, PO5
CO3	**Develop** windows application using C# by selecting appropriate database using ADO.NET technology.	L3	PO5, PO8
CO4	**Analyse** and Build dynamic and rich web applications with consistent look and authentic validations using ASP.NET technology.	L4	PO5, PO8

Scheme of Continuous Internal Evaluation (CIE):

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)			LAB (40 marks)		
IA test 1	IA test 2	Other Assessment (OBA/Seminar/Project)	Conduction	Lab test	Total
25 marks	25 marks	10 marks	15 marks	25 marks	100 marks

IA Test:

1. No objective part in IA question paper

2. All questions descriptive

Conduct of Lab:

1. Conducting and execution: 5 marks

2. Viva-Voce: 5 marks

3. Lab record write-up: 5 marks

Lab test: (Batch wise with 15 students/batch)

1. Test will be conducted at the end of the semester

2. Timetable, Batch details and examiners will be declared by Exam section

3. Write Up: 5 marks

4. Conduction, Calculations, results and graphs (if applicable): 10 marks

5. Viva voce: 10 marks

Eligibility for SEE:

1. 50% and above (30 marks and above) in theory component

2. 50% and above (20 marks and above) in lab component

3. **Lab test is COMPULSORY**

4. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass: 40% of the maximum marks i.e. 40 out of 100. In aggregate the students have to secure 50% total marks of the course (CIE + SEE).**

Rubrics:

Levels	Target
1 (Low)	Low (L): If 60% of marks are scored by less than 50% of the students.
2 (Medium)	Medium (M): If 60% of marks are scored by 50% to 70% of the students.
3 (High)	High (H): If 60% of marks are scored by 70% of the students.

Course Articulation Matrix												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
1	✓											
2	✓				✓							
3					✓			✓				
4					✓			✓				
Tick mark the CO and PO mapping												

S.No.	Skill & Competence enhanced afterundergoing the course	Applicable Sectors & Domains	Job roles students can takeup after undergoing the course
1.	The student will enhance his/her critical thinking and problem solving ability and with this, the student will have the ability to create windows applications and web applications with efficient controls, security, and robust technology for scalable, better, and faster deployment.	Any IT Company/Sector that uses .NET technologies in the development of the following applications: 1. Web Applications 2. Desktop Applications 3. Mobile Applications	1. Windows Application Developer 2. Web Application Developer 3. Mobile Application Developer

Machine Learning(I)

Course Code	22MCA32	Course type	Integrated	Credits L-T-P	4 - 0 - 1
Hours/week: L - T - P	4 - 0 - 2			Total credits	5
Total Contact Hours	L = 52 Hrs; T = 0 Hrs; P = 24 Hrs Total = 76 Hrs			CIE Marks	100
				SEE Marks	100

Course learning objectives

1.	To introduce the concept of machine Learning.
2.	To illustrate working of various machine learning algorithms like classification, clustering, neural networks and their applications.
3.	To explore the implementation of various machine learning techniques to extract hidden information from large data repository.

Required Knowledge:
   1. **Python Programming (22MCA11) (I)**
   2. **Mathematical Foundations (22MCA15)**

Unit – I	Contact Hours = 12 Hours

Introduction, Concept Learning and Data Mining

What is machine learning? Why machine learning? Applications of machine Learning Introduction, Concept Learning and Data Mining, Well-Posed Learning Problems, Perspective and Issues in Machine Learning. Concept learning task, Concept learning as Search, Find-S algorithm. Introduction, Types of Attributes, Data Mining Tasks, Data Preprocessing, Measures of Similarity and Dissimilarity.
Textbook 1 Chapter 2.3

Unit – II	Contact Hours = 10 Hours

Decision Tree Learning and alternative Techniques

Decision Tree Learning and alternative Techniques, Basics, General Approach to Solve Classification problem, Decision Tree Induction, Model Over fitting, Evaluating the Performance of Classifier, Rule-Based Classifier, Characteristics of Rule Based Classifier.
Textbook 2 Chapter 4.1,4.2,4.3,4.4,4.5 ,5.1,5.2

Unit – III	Contact Hours = 10 Hours

Clustering Techniques

Clustering Techniques, Overview, Types of Cluster Analysis Methods, K-means, Agglomerative Hierarchical Clustering, DBSCAN, Cluster Evaluation.
Textbook 2 Chapter 8.1,8.2,8.3,8.4

Unit – IV	Contact Hours = 10 Hours

Bayesian Learning and Instance Based Learning

Bayesian Learning and Instance Based Learning, Introduction, Bayes theorem, Using Bayes Theorem for Classification, Naive Bayes classifier, Bayesian Belief Networks, Introduction, Nearest Neighbor Classifiers, Algorithm, Characteristics of Nearest-Neighbor Classifier.

Textbook 2 Chapter 5.2,5.3

Unit – V	Contact Hours = 10 Hours

Artificial Neural Networks

Artificial Neural Networks, Introduction, Neural Network Representation, Appropriate Problems for Neural Network Learning, Perceptron's, Learning Perceptron Model, Multilayer Artificial Neural Networks. Design Issues in the ANN Learning, Characteristics of ANN.

Textbook 2 Chapter 5.4

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1.	1	Linear Regression.
1.	1	Measure of Similarity and Dissimilarity
1.	1	Measure of Cosine similarity
2.	1	Decision tree algorithm using ID3/C4.5
3.	1	K – Means clustering
4.	1	K – Nearest Neighbor
5.	1	Neural networks

Books	
Text Books	
1.	Tom M Mitchell, "Machine Learning", McGraw Hill, 1st Edition, 2003.
2.	Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson, LPE,2014
Reference Books	
1.	Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, 2nd Edition, 2010.
2.	Stephan Marsland, "Machine Learning - An Algorithmic Perspective", Chapman and Hall, 1st Edition, 2009.
3.	Nils Nilsson, "Introduction to Machine Learning", MIT Press, 1997.
4.	Jude Shavil, Thomas G Dietterich, "Readings in Machine Learning", Morgan Kaufmann Publishers, 1990

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project
3.	Practice session/Demonstrations in Labs	3.	Lab Test

			4.	Semester End Examination

Course Outcomes (COs)			
At the end of the course, the student will be able to		Learning Level	PO(s)
CO1	**Explain** the different types of machine learning concepts used in ANN, Naïve Based, Ripper etc., and make use of similarity and dissimilarity measures to solve real world problem.	L2	PO1,PO3
CO2	**Apply** the decision tree, rule based and Neural Networks machine learning classification algorithm in real world domains.	L3	PO4,PO5
CO3	**Make use** of different clustering techniques i.e k-Nearest Neighbor, Bayes classifier, Instance based classification etc., to make model in solving real world problems.	L3	PO4,PO5
CO4	**Analyze the problems** using machine learning algorithms for prediction and knowledge discovery from large data repository**.**	L4	PO4,PO5

Scheme of Continuous Internal Evaluation (CIE):
For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)			LAB (40 marks)		Total
IA test 1	IA test 2	Other Assessment (OBA/Seminar/Project)	Conduction	Lab test	
25 marks	25 marks	10 marks	15 marks	25 marks	100 marks
IA Test: 1. No objective part in IA question paper 2. All questions descriptive					
Conduct of Lab: 1. Conducting and execution: 5 marks 2. Viva-Voce: 5 marks 3. Lab record write-up: 5 marks					
Lab test: (Batch wise with 15 students/batch) 1. Test will be conducted at the end of the semester 2. Timetable, Batch details and examiners will be declared by Exam section 3. Write Up: 5 marks 4. Conduction, Calculations, results and graphs (if applicable): 10 marks 5. Viva voce: 10 marks					

Minimum Marks to Score for CIE is 50% of the maximum marks of CIE.
  1. 50% and above (30 marks and above) in theory component
  2. 50% and above (20 marks and above) in lab component
  3. Lab test is COMPULSORY
  4. Not eligible in any one of the two components will make the student Not Eligible for SEE					

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass: 40% of the maximum marks i.e 40 out of 100.** **In aggregate the students have to secure 50% total marks of the course (CIE + SEE).**

Rubrics:

Levels	Target
1 (Low)	Low (L): If 60% of marks are scored by less than 50% of the students.
2 (Medium)	Medium (M): If 60% of marks are scored by 50% to 70% of the students.
3 (High)	High (H): If 60% of marks are scored by 70% of the students.

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
1	✓		✓									
2				✓	✓							
3				✓	✓							
4				✓	✓							

Tick mark the CO and PO mapping

S.No	Skill & Competence enhanced after undergoing the course	Applicable Sectors & domains	Job roles students can takeup after undergoing the course
1.	Programming languages Data engineering, Exploratory data analysis, Models, Services and Deploying are the skill sets enhanced after completion of the course	Widely used by various e-commerce and entertainment companies such as Amazon, Netflix, etc., for product recommendation to the user.	Data Scientist. Data Engineer.

Big Data Paradigm (I)

Course Code	22MCA33	Course type	Integrated	Credits L-T-P	4 - 0 - 1
Hours/week: L - T- P	4 – 0 – 2			Total credits	5
Total Contact Hours	L = 52 Hrs; T = 0 Hrs; P = 24 Hrs Total = 76 Hrs			CIE Marks	100
				SEE Marks	100

Course learning objectives

1.	To emphasize on big data dimensions, Technologies and its applications with case studies.
2.	To explore Hadoop framework and architecture
3.	To emphasize the importance of Map Reduce framework
4.	To explore big data tools and technologies: Hive and Spark
5.	To introduce visualization techniques on data to analyze and provide business insights using tableau.

Required Knowledge: Programming using Java and J2EE (I) (22MCA23)

Unit – I	Contact Hours = 10 Hours
Overview of Big data	

Overview of Big data

What is Big data? Structuring Big data, Elements of Big data, Advantages of Big data, Use of Big Data in Social Networking, Use of Big Data in Preventing Fraudulent Activities; Use of Big Data in Retail Industry, Technologies for handling Big data.

Textbook 1: Chapter 1, 2 and 3

Unit – II	Contact Hours = 11 Hours

Hadoop Ecosystem

Understanding Hadoop Ecosystem, Hadoop Distributed File System: HDFS Architecture, Concept of Blocks in HDFS Architecture, NameNodes and Data Nodes, The Command-Line Interface, Using HDFS Files, Hadoop-Specific File System Types, HDFS Commands, The org.apache.hadoop.io package, HDFS High availability, Features of HDFS.

Textbook 1: Chapter 4

Unit – III	Contact Hours = 10 Hours

Understanding Map Reduce and YARN

The Map Reduce Framework: Exploring the Features of Map Reduce, Working of Map Reduce, Exploring Map and Reduce Functions, Uses of Map Reduce.

YARN Architecture: Background; Advantages of YARN

Textbook 1: Chapter 5 and 11

Unit – IV	Contact Hours = 11 Hours

Hive and Analysing Data with Spark

Getting started with Hive, Hive Services, Data types in Hive, Built-in Functions in Hive. Hive DDL.

Introduction to Apache Spark

Launching Spark's Consoles, Spark's Basic Architecture, Spark Applications, Starting with Spark with example, A Tour of Spark's Toolset: Datasets: Type-Safe Structured APIs, Spark's Ecosystem and Packages.

Textbook 1: Chapter 12

Textbook 2: Chapter 1 and 2

Unit – V	Contact Hours = 10 Hours

Data Visualization

Introduction, Techniques used for visual Data Representation, Types of Data Visualization, Applications of Data Visualization, Visualizing Big Data Tools used, Visualization, Tableau Products

Data Visualization with Tableau: Introduction to Tableau software, Tableau Workspace, Data Analytics in Tableau Public, Using visual controls in Tableau Public.

Textbook 1: Chapter 26 & 27

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
2	3	1. Hadoop environment setup 2. Hadoop file management tasks 3. HDFS Commands
3	2	4. & 5. Map Reduce process implementation programs (2 Experiments)
4	4	6. Hive process implementation 7. HIVE built-in function implementation. 8. Hive DDL statements 9. Analysis of data using Spark
5	1	10. Visualization in Tableau Public

Books	
Text Books	
1	DT Editorial Services Big Data – Black Book Dreamtech Press, Edition – 2015, ISBN -978-93-5119-931-1.
2	A Gentle Introduction to Spark, Databricks
Reference Books	
3	Paul C. Zikopoulos, Chris Eaton, Dirk deRoos, Thomas Deutsch, George Lapis, Understanding Big Data – Analytics for Enterprise Class Hadoop and Streaming Data, McGraw Hill, 2012
4	Tom White, Hadoop: The Definitive Guide, Third Edition, O'Reilly, 2012
5	Robert D. Schneider and Jeff Karmiol , Spark For Dummies, 2nd IBM Limited Edition, John Wiley & Sons, Inc
E-resouses (NPTEL/SWAYAM. Any Other)- mention links	

1	https://www.digimat.in/nptel/courses/video/106104189/L01.html
2	https://databricks-prod-cloudfront.cloud.databricks.com/public/4027ec902e239c93eaaa8714f173bcfc/346304/2168141618055043/484361/latest.html

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/Project/Seminar
3.	Practice session/Demonstrations in Labs	3.	Lab Test
		4.	Semester End Examination

Course Outcomes (COs)			
At the end of the course, the student will be able to		Learning Level	PO(s)
CO1	**Illustrate** the importance of Big Data, its characteristics and use of Big Data technologies in different fields or sectors.	L2	PO1, PO5
CO2	**Identify and Utilize** the components of ecosystem of Hadoop and HDFS architecture.	L3	PO1, PO5
CO3	**Apply** map reduce framework in analysing the data and relate to YARN	L3	PO1,PO4,PO5
CO4	**Examine** the tools in analysing, managing and visualizing Big Data with Hive, Spark and Tableau.	L4	PO1,PO4,PO5

Scheme of Continuous Internal Evaluation (CIE):
For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)			LAB (40 marks)		
IA test 1	IA test 2	Other Assessment (OBA/Seminar/Project)	Conduction	Lab test	Total
25 marks	25 marks	10 marks	15 marks	25 marks	100 marks
IA Test: 1. No objective part in IA question paper 2. All questions descriptive					
Conduct of Lab: 1. Conducting and execution: 5 marks 2. Viva-Voce: 5 marks 3. Lab record write-up: 5 marks					
Lab test: (Batch wise with 15 students/batch) 1. Test will be conducted at the end of the semester 2. Timetable, Batch details and examiners will be declared by Exam section 3. Write Up: 5 marks 4. Conduction, Calculations, results and graphs (if applicable): 10 marks					

5. Viva voce: 10 marks

Eligibility for SEE:

1. 50% and above (30 marks and above) in theory component

2. 50% and above (20 marks and above) in lab component

3. **Lab test is COMPULSORY**

4. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass: 40% of the maximum marks i.e 40 out of 100.** **In aggregate the students have to secure 50% total marks of the course (CIE + SEE).**

Rubrics:

Levels	Target
1 (Low)	Low (L): If 60% of marks are scored by less than 50% of the students.
2 (Medium)	Medium (M): If 60% of marks are scored by 50% to 70% of the students.
3 (High)	High (H): If 60% of marks are scored by 70% of the students.

Course Articulation Matrix												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
1	✓				✓							
2	✓				✓							
3	✓			✓	✓							
4	✓			✓	✓							
Tick mark the CO and PO mapping												

S.No	Skill & Competence enhanced after undergoing the course	Applicable Sectors & domains	Job roles students can takeup after undergoing the course
1	Programming languages, quantitative analysis, data mining, data visualization, problem-solving, databases, cloud computing, machine learning, and continuous learning	Banking and Securities. Communications, Media and Entertainment, Healthcare Providers, Education, Manufacturing and Natural Resources, Government, Insurance, Retail and Wholesale trade and the list goes on, all of them are adopting Big Data as a decisive contributor in their growth.	Big Data Architect, Big Data Engineer, Data Analyst, Database Administrator, Data Scientist, Data Architect, Database Manager, etc.,

BlockChain Technology

Course Code	22MCA341	Course type	Theory	Credits L-T-P	4 – 0 - 0
Hours/week: L - T- P	4 – 0 – 0			Total credits	4
Total Contact Hours	L = 52 Hrs.; T = 0 Hrs; P = 0 Hrs Total = 52 Hrs.			CIE Marks	100
				SEE Marks	100

Course learning objectives	
1.	To provide the knowledge of emerging abstract models for Blockchain Technology and to familiarize with the functional/operational aspects of cryptocurrency eco-system.
2.	To explore several implementations types of Blockchain Technology such as bitcoin, Ethereum.
3.	To explore the various aspects Hyperledger.

Required Knowledge: NA

Unit – I	Contact Hours = 10 Hours

Introduction to Blockchain Technology

Blockchain defined, Updateable via Consensus, Generic elements of a Blockchain, How Blockchain works, Tiers of Blockchain Technology, Features of Blockchain, Types of Blockchain, Consensus mechanism and types, Consensus in Blockchain, CAP theorem and Blockchain, Benefits of Blockchain.

Textbook 1: Chapter 1

Unit – II	Contact Hours = 10 Hours

Decentralization and Dapp Ecosystem

What is a Decentralized Application, Preliminaries: What is Bitcoin, Features of Decentralized Applications, The History of Decentralized Applications, Defining the Terms? Decentralized data, Decentralized wealth, Decentralized identity, and Decentralized markets for Decentralized Assets. Building your first Dapp, Centralized Architecture, and Decentralized Architecture: Introduction to IPFS. What are we Building, Dapp Economics.

Textbook 2: Chapter 1,2

Unit – III	Contact Hours = 11 Hours

Cryptography and Public Key Cryptography

Cryptographic primitives, Symmetric Cryptography - stream ciphers, Block ciphers, Asymmetric cryptography, public and private keys, RSA, Encryption and Decryption using RSA, Elliptic Curve Cryptography, RSA using OpenSSL, Encryption and Decryption, ECC using OpenSSL, Hash Functions, list of secure hash algorithms, Applications of Hash Functions- Merkle Trees, Patricia Trees, Distributed Hash Table. Symmetric Cipher Model, Substitution Techniques, Transportation Techniques.

Textbook 1: Chapter 3,4
Textbook 3: Chapter 2.1,2.2,2.3,3.1,3.2

Unit – IV	Contact Hours = 10 Hours

BitCoin

Introduction, Transactions, Structure, Transactions types, The structure of a block, The genesis block, The bitcoin Wallets and its types, Bitcoin payments, Bitcoin investment and buying and selling bitcoins.
Textbook 1: Chapter 5

Unit – V	Contact Hours = 11 Hours

Ethereum and Hyperledger

Ethereum Bird's Eye view, The Ethereum Network, Components of Ethereum ecosystem, Types of Accounts, Transactions and messages, contract creation transaction, Message call transaction, Messages, Calls, Transaction validation and execution, The Transaction sub state, State storage in the Ethereum, Ether cryptocurrency and token. Introduction to Hyperledger and Composer.
Textbook 1: Chapter 10
Textbook 4: Chapter 2

Unit No.	Self-Study Topics
4	Bitcoin security and Regulations.
5	Ethereum dApps.

Books	
Text Books	
1.	Bashir, Mastering: Distributed ledger technology, decentralization, and smart contracts explained, 2nd Edition, 2nd Revised edition edition. Birmingham: Packt Publishing, 2018.
2.	A. M. Antonopoulos, Mastering bitcoin, First edition. Sebastopol CA: O'Reilly,2015
3	Cryptography and Network Security: Principles and Practice, Sixth Edition by William Stallings, Pearson publications.
Reference Books	
4	SirajRaval, Decentralized Applications: Harnessing Bitcoin's Technology, O'Reilly Media, Inc., 2016
5.	Nakul Shah, Blockchain for Business with Hyperledger Fabric: A Complete Guide to enterprise blockchain implementation using Hyperledger Fabric, BPB publications, first edition, 2019.
E-resources (NPTEL/SWAYAM. Any Other)- mention links	
1.	https://www.ibm.com/topics/blockchain
2.	https://en.wikipedia.org/wiki/Blockchain

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes
		3.	Open Book Assignments (OBA)/Project/Seminar
		4.	Semester End Examination

Course Outcomes (COs)			
At the end of the course, the student will be able to		Learning Level	PO(s)
CO1	**Explain** the basic concepts and technology used for the Blockchain.	L2	PO1,PO9
CO2	**Identify** the relationship of decentralization with Dapp ecosystem in the context of Blockchain Technology.	L3	PO1,PO9, PO7
CO3	**Identify** the various types algorithms related to cryptography with respect to Blockchain Technology.	L3	PO1,PO9, PO7
CO4	Contrast the types of Crypto wallets in Blockchain and Analyze their working Environment.	L4	PO1,PO9

Scheme of Continuous Internal Evaluation (CIE)

Theory 100 marks					Total
IA Test 1	IA Test 2	Other Assessment (OBA/Seminar/Project)	Quiz 1	Quiz 2	
25	25	20	15	15	100

Eligibility for SEE:
1. 50% and above (50 marks and above) in theory component

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration
2.	**Minimum marks required in SEE to pass: 40% of the maximum marks i.e. 40 out of 100. In aggregate the students have to secure 50% total marks of the course (CIE + SEE).**

Rubrics:Levels	Target
1 (Low)	Low (L): If 60% of marks are scored by less than 50% of the students.
2 (Medium)	Medium (M): If 60% of marks are scored by 50% to 70% of the students.
3 (High)	High (H): If 60% of marks are scored by 70% of the students.

CourseArticulationMatrix												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
1	✓								✓			
2	✓						✓		✓			
3	✓						✓		✓			
4	✓								✓			
Tick mark the CO and PO mapping												

S.No	Skill & Competence enhanced after undergoing the course	Applicable Sectors& domains	Job role students can take up after undergoing the course
1	General skills that are needed to understand and enhance the various Blockchain entities and the knowledge of performing various transactions.	1. Financial services: 2. Supply Chain Management: 3. Healthcare: 4. Government and Public Services:	1. Blockchain Developer: 2. Blockchain Architect: Cryptocurrency Analyst: 3. Blockchain Quality Assurance (QA) Engineer: 4. Security Expert: 5. Data Analyst: 6. Smart Contract Auditor:

Management and Entrepreneurship for IT Industry

Course Code	22MCA342	Course type	Theory	Credits L-T-P	4 - 0 - 0
Hours/week: L - T- P	4- 0 - 0			**Total credits**	4
Total Contact Hours	L = 52 Hrs; T = 0 Hrs; P = 0 Hrs Total = 52 Hrs			**CIE Marks**	100
				SEE Marks	100

Course learning objectives

1.	To introduce the principles of Management, Organization and Entrepreneurship
2.	To provide knowledge about Planning, Staffing, Directing and Entrepreneurship
3.	To explore the needs and objectives of Small Scale Industries and related Institutional Support
4.	To provide the exposure to industry practices and professionals, bridge the gap between theory and application, and develop critical skills while preparing them for future careers in the IT sector.

Required Knowledge: NA

Unit – I	Contact Hours = 11 Hours
Foundations of Management and Planning	

Nature and Functions of Management: Importance of Management, Definition of Management, Management functions or the process of Management, Roles of a Manager, Levels of Management, Managerial Skills, Management and Administration, Management- A Science or an Art, Management- A Profession, Professional Management vs, Family Management. Development of Management Thought: Early Classical Approaches, Neo-Classical Approaches Modern Approaches. Planning: Nature of Planning, Importance of Planning, Forms of Planning, Types of Plans, steps in Planning, Limitations of Planning, Making planning effective.
Textbook 1 Chapter 1, 2, 3

Unit – II	Contact Hours = 11 Hours
Organizing, Staffing, and Directing in Management	

Organizing: Nature of organization, Purpose of an Organization, Principles of Organization, Types of Organization, Departmentation, Committees, Decentralization vs Decentralization, Organization levels and span of control, Management by objectives, Management by exception. Staffing: Nature and importance of staffing, Selection, Recruitment. Directing: Meaning and nature of directing, Leadership, Leadership styles, Motivation, Communication, Coordination.
Textbook 2 Chapter 4, 5, 6

Unit – III	Contact Hours = 10 Hours

Entrepreneurship and Small Scale Industry Development

Entrepreneurship: Entrepreneur, Functions of an entrepreneur, Types of entrepreneur, Intrapreneur, Entrepreneurship, Evolution of entrepreneurship, Development of entrepreneurship, Stages in entrepreneurial process, Role of entrepreneur in economic development, Entrepreneurship in India, Barriers of entrepreneurship, Women entrepreneurs. Small scale Industry: Definition, Characteristics of SSIs, Need and rationale of SSIs, Objectives of SSIs, Scope of SSIs, Role of SSI in economic development, Advantages of SSIs, steps to start a SSI.

Textbook 2 Chapter 12, 13

Unit – IV	Contact Hours = 10 Hours

Institutional Support and Project Preparation for Small Scale Industry Development

Institutional support: Institutions to assist State Small Scale Development Corporation, Small Scale Industries Board, District Industries Centers, Technical Consultancy Organizations, Small Industries Service Institutes, Industrial Credit and Investment Corporation of India Ltd., National Small Industries Corporation, SIDO, IDBI, SIDBI, SFCS, IFCI. Preparation of project: Meaning of project, Project identification, Project selection, Project report- need and significance, Contents of project report, Project formulation, Specimen of a project report, Guidelines by planning commission for project report, Network analysis, Errors of project report, Project appraisal, Identification of business opportunities, Market feasibility study, Technical feasibility study, Financial feasibility study, Social feasibility study.

Textbook 2 Chapter 14, 15

Unit – V	Contact Hours = 10 Hours

Industrial Ownership and Case Studies in Business Ownership

Industrial Ownership: Sole proprietorship, Definition and meaning of partnership, Joint Stock Companies, Types of Companies, Holding and Subsidiary companies, Domestic and Foreign companies, Differences between a public and Private Ltd. Company, Corporative societies. Case study: Microsoft, Captain G R Gopinath, N R Narayana Murthy & Infosys

Textbook 2 Chapter 16

Unit No.	Self-Study Topics
3	Supporting agencies of Government for Small Scale Industries
5	Methods of raising capital

Books
Text Books
1.	P. C. Tripathi and P. N. Reddy, "Principles of Management", Fourth Edition, The McGraw – Hill Companies
2.	N. V. R. Naidu and T. Krishna Rao, "Management and Entrepreneurship", Reprint 2016, I. K. International Publishing House Pvt. Ltd.
Reference Books

1.	Poornima M. Charantimath, "Entrepreneurship Development Small Business Enterprises", Pearson Education
2.	Vasant Desai, "Dynamics of Entrepreneural Development and Management", Himalaya Publishing House
E-resources (NPTEL/SWAYAM.. Any Other)- mention links	
1.	NPTEL Course: Entrepreneurship https://onlinecourses.nptel.ac.in/noc23_mg74/preview
2.	NPTEL Course: Principles of Management https://nptel.ac.in/courses/110107150

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Quiz
		3.	OBA/Course Project/Course Seminar
		4.	Semester End Examination

Course Outcomes (COs)			
At the end of the course, the student will be able to		**Learning Level**	**PO(s)**
CO1	**Explain** fundamental concepts in management, organization, entrepreneurship, small-scale industries, government support, and capital raising within the IT industry.	L2	PO 1, PO 7
CO2	**Apply** management, entrepreneurship, and relevant factors to assess Small Scale Industries.	L3	PO 1, PO 7
CO3	**Apply** management and entrepreneurial principles to analyze real-world IT industry scenarios and develop organizational plans.	L3	PO 1, PO 7
CO4	**Examine** and compare industrial ownership forms within the IT industry, assessing their pros, cons, applicability, and potential challenges, supported by practical examples and insights.	L4	PO 1, PO 7

Scheme of Continuous Internal Evaluation (CIE)

Theory 100 marks					Total
IA Test 1	**IA Test 2**	**Other Assessment (OBA/Seminar/Project)**	**Quiz 1**	**Quiz 2**	
25	25	20	15	15	100

Eligibility for SEE:
1. 50% and above (50 marks and above) in theory component

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration
2.	**Minimum marks required in SEE to pass: 40% of the maximum marks i.e 40 out of 100.** **In aggregate the students have to secure 50% total marks of the course (CIE + SEE).**

Rubrics: Levels	Target
1 (Low)	Low (L): If 60% of marks are scored by less than 50% of the students.
2 (Medium)	Medium (M): If 60% of marks are scored by 50% to 70% of the students.
3 (High)	High (H): If 60% of marks are scored by 70% of the students.

Course Articulation Matrix												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
1	✓						✓					
2	✓						✓					
3	✓						✓					
4	✓						✓					
Tick mark the CO and PO mapping												

S.No	Skill & Competence enhanced after undergoing the course	Applicable Sectors & domains	Job roles students can take up after undergoing the course
1	• Management Skills • Entrepreneurial Competence • Analytical and Critical Thinking • Communication and Interpersonal Skills • Strategic Planning and Execution • Understanding of Small Scale Industries	• IT Industry • Start-up eco system • Govt. and Public Sector	• Project Manager • IT Consultant • Entrepreneur

Full Stack Development**

Course Code	22MCA343	Course type	Theory	Credits L-T-P	4 – 0 - 0
Hours/week: L - T- P	4 – 0 – 0			**Total credits**	4
Total Contact Hours	L = 52 Hrs; T = 0 Hrs; P = 0 Hrs Total = 52 Hrs			**CIE Marks**	100
				SEE Marks	100

Course learning objectives	
1.	To introduce MERN and its components
2.	To impart the knowledge of creating and integrating API using Express
3.	To provide the basics of creating and performing CRUD operations on MongoDB
4.	To explore the concept of routing, or handling multiple pages
5.	To handle different form inputs in React.

Required Knowledge: Web Design and Development (I) 22MCA21

Unit – I	Contact Hours = 10 Hours
Exploring the ES6 Variables and Scoping, Destructuring, Parameter Handling, Arrow functions, Maps and sets. Textbook: 1 Chapter 10, 11, 12, 14, 19.	

Unit – II	Contact Hours = 12 Hours
Introduction to MongoDB Getting Started, Creating, Updating and deleting documents, Querying. Textbook:3 Chapter 2, 3, 4	

Unit – III	Contact Hours = 10 Hours
Introduction to ExpressJS and NodeJS What is Express? The basics of Node.js, Foundations of Express, Middleware, Routing. Textbook:4 Chapter 1,2,3,4,5	

Unit – IV	Contact Hours = 10 Hours
Introduction to ReactJS Hello, World! The philosophy of react. JSX, All about Components Textbook: 2 Chapter 1, 2, 3.	

Unit – V	Contact Hours = 10 Hours
Basics of UI Designing, Hooks and Routing Events, Forms, Styling React, Introducing Hooks, Routing. Textbook: 2 Chapter 4, 7, 8, 11, 12	

Unit No.	Self-Study Topics
3	React Data Flow

Books	
Text Books	
1.	Dr. Axel Rauschmayer, Exploring ES6: Upgrade to the next version of JavaScript, Leanpub.
2.	Chris Minnick, Beginning ReactJS Foundations: Building user Inferfaces with ReactJS, Wrox Programmer to Programmer, John Wiley & Sons
3.	Kristina Chodorow, MongoDB: The Definitive Guide, O'Reilly Second Edition
4.	Evan M. Hahn, Express in Action
Reference Books	
1	Vasan Subramanian, Pro MERN Stack, APress
E-resources (NPTEL/SWAYAM.. Any Other)- mention links	
1.	https://legacy.reactjs.org/tutorial/tutorial.html
2.	https://www.youtube.com/watch?v=QFaFIcGhPoM&list=PLC3y8-rFHvwgg3vaYJgHGnModB54rxOk3

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Project
3.	Hands On lab sessions	3.	Semester End Examination

Course Outcome (COs)			
At the end of the course, the student will be able to		Learning Level	PO(s)
CO1	**Demonstrate** the use of MERN components in designing UI, doing CRUD operations on MongoDB.	L2	PO1, PO3, PO7
CO2	**Make use o**f React Forms, React Hooks and Routers for handling user data and navigations in a website.	L3	PO3
CO3	**Utilize** MongoDB to store data and perform CRUD operations as per the requirements of the software.	L3	PO3, PO5
CO4	**Dissect** the given problem statement to identify the type of React components, React Hooks and routing needed for the application along with defining the MongoDB collections and documents, Expressjs endpoints to perform the necessary CRUD operations.	L4	PO3, PO5

Scheme of Continuous Internal Evaluation (CIE)

THEORY (40 marks)		PROJECT (60 marks)			Total
IA test (Theory)	IA test (Lab)	Project Phase 1	Project Phase 2	Project report	
25 marks	15 marks	25 marks	25 marks	10 marks	100 marks
Theory IA test should be of one-hour duration. Lab IA test should be of two/three-hour duration. Project batch will ideally consist of 2 students (maximum of 3). Project Phase 1 presentation will be conducted after 6 weeks and Project Phase 2 presentation will be conducted after 13 weeks from the start of the semester. Submitting Project report is compulsory.					
Eligibility for SEE: 1. 50% and above (20 marks and above) in theory component 2. 50% and above (30 marks and above) in project component 3. Not eligible in any one of the two components will make the student **Not Eligible** for SEE					

Eligibility for SEE: 1. 50% and above (50 marks and above) in theory component

Scheme of Semester End Examination (SEE):		
Project Viva-Voce:		
1.	Identifying the objectives of the given problem statement	15	
	Data Analysis based on the objectives and designing the MongoDB Collection and Documents with appropriate data constraints	20	100
	User interface Designing with appropriate styles and validations	20	
	Viva	10	
	Implementation of middleware with ExpressJS, axios and performing CRUD operations from UI	20	
	Modifications	15	
2.	It will be conducted for 100 marks having **5** hours duration.		
3.	**Minimum marks required in SEE to pass: 40% of the maximum marks i.e 40 out of 100.** **In aggregate the students have to secure 50% total marks of the course (CIE + SEE).**		

Rubrics: Levels	Target
1 (Low)	Low (L): If 60% of marks are scored by less than 50% of the students.
2 (Medium)	Medium (M): If 60% of marks are scored by 50% to 70% of the students.
3 (High)	High (H): If 60% of marks are scored by 70% of the students.

Course Articulation Matrix												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12

1	✓		✓			✓					
2			✓								
3			✓		✓						
4			✓		✓						
Tick mark the CO and PO mapping											

S.No	Skill & Competence enhanced afterundergoing the course	Applicable Sectors & domains	Job roles students can takeup after undergoing the course
1	Web designing and development using the latest technology (MERN full stack).	Software companies, Cloud based organizations	Web Designer Web Developer API Developer No-SQL Designer and developer.

Internet of Things**

Course Code	22MCA344	Course type	Theory	Credits L-T-P	3 – 0 – 1
Hours/week: L - T- P	3 – 0 – 2			Total credits	4
Total Contact Hours	L = 52 Hrs; T = 0 Hrs; P = 0 Hrs Total = 52 Hrs			CIE Marks	100
				SEE Marks	100

Course learning objectives

1.	To understand the fundamentals of Internet of Things (IoT) and its building blocks along with their characteristics.
2.	To gain insights about the current trends in IoT technologies.
3.	To impart necessary and practical knowledge of components of Internet of Things and develop skills required to build real-life IoT based projects.
4.	To identify sensor technologies for sensing real world entities
5.	To understand the role of IoT in various domains of Industry.

Required Knowledge:
Computer Networks and Communication(I) 22MCA13   Basics of ProgrammingLanguages

Unit – I	**Contact Hours = 10 Hours**
Emergence of IoT: Introduction, Evolution of IoT, IoT verses M2M, IT versus CPS, IoT versus WoT, Enabling IoT and the Complex Interdependence of Technologies, IoT Networking Components, Addressing Strategies in IoT, Address management classes, Addressing during node mobility. **Textbook 1: Chapter 4.1-4.5**	

Unit – II	**Contact Hours = 10 Hours**
IoT sensing and Actuation: Introduction, Sensors, Sensor Characteristics, Sensorial Deviations, Sensing Types; Scalar sensing Multimedia Sensing Hybrid sensing, Virtual sensing, Sensing Considerations, Actuators Actuator Types: Hybrid actuators, Pneumatic actuators, Electric actuators, Thermal or magnetic actuators mechanical actuators, Soft actuators, Shape memory polymers Actuators Characteristics. Elements of IoT: Hardware Components- Computing (Arduino, Raspberry Pi) **Textbook 1: Chapter 5.1-5.9**	

Unit – III	Contact Hours = 10 Hours

Beginning IoT Hardware Projects:

Introduction to Arduino Boards, Arduino Vs Raspberry Pi: Choosing a Board, Arduino Installation and setup, setting up Arduino IDE for NodeMCU, Writing an Arduino Sketch, Hands-on Experiment with Arduino. Printing on the serial console, LED interface with Arduino, DHT Sensor interface with NodeMCU, MQ-2 Gas sensor interface with NodeMCU, Ultrasonic sensor interface with NodeMCU, Obstacle detection using NodeMCU, Servo motor interface with NodeMCU,Relay interface with NodeMCU, Data transmission between NodeMCU and remote server, Pulse sensor interface with NodeMCU

Textbook 1: Chapter 16.1 - 16.3

Unit – IV	Contact Hours = 10 Hours

Introduction to Raspberry Pi Boards:

Installation, Remotely accessing the Raspberry Pi, Introduction to Python basics , Accessing GPIO Pins, Configuring WiFi on Raspberry Pi, Hands-on Experiments with Raspberry Pi. Printing on console/terminal, LED Interface, PiCamera Interface, DHT sensor interface, Client-server socket programming, Serially reading data from Arduino.

Textbook 1: Chapter 16.4 – 16.5

Unit – V	Contact Hours = 12 Hours

IoT Case Studies and future trends:

Introduction; Components of an agriculture IoT, Advantages of IoT in agriculture Case Study; Smart irrigation management system. Vehicular IoT; Introduction; Components of Vehicular IoT, Advantages of IoT in Vehicular IoT, Crime assistance in a smart IoT Transportation system. Healthcare IoT ; Introduction; Components of Healthcare IoT, Advantages and risks in Healthcare IoT, AmbuSens system Domain Specific IoT ; Home Automation, Cities , Environment, Energy, Retail , Logistics , Industry , IoT Case Studies: IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation

Textbook 1: Chapter 12,13,14
Textbook 2: Chapter 2

Unit No.	Self-Study Topics
1.	IoT Communication Technologies.
2.	Predecessors of IoT.
3.	IoT Connectivity Technologies.

Books	
Text Books	
1.	S. Misra, C. Roy, A. Mukherjee, "Introduction to Industrial Internet of Things and Industry 4.0" ,CRC Press. 2020.
2.	Arshdeep Bahga , Vijay Madisetti "Internet of Things A hands on Approach", Publisher : Orient Black swan Private Limited - New Delhi, ISBN-10, 8173719543, 2015
Reference Books	
1.	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,"IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1st Edition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978-9386873743),2017
2.	Srinivasa K G, "Internet of Things", CENGAGE Leaning India, 2017.
3.	Charles Crowell, "IoT-Internet of Things for Beginners: An Easy-to-Understand Introduction to IoT",ISBN-13 : 979-8613100194, 2020
4.	Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)",1st Edition, VPT, 2014.
E-resources (NPTEL/SWAYAM.. Any Other)- mention links	
1.	https://nptel.ac.in/courses/106/105/106105166/ Introduction to Python programming, Introduction to Raspberry Pi, Implementation of IoT with Raspberry Pi (Week 6)

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Project
3.	Practice session/Demonstrations in Labs	3.	Lab Test
		4.	Semester End Examination

Course Outcomes (COs)			
At the end of the course, the student will be able to		**Learning Level**	**PO(s)**
CO1	**Illustrate** the fundamentals of Networking and Network security for the Internet of Things.	L2	PO1
CO2	**Identify** the various types of IoT sensors and hardware components along with their limitations.	L3	PO1,PO5
CO3	**Make use of** different IoT boards to check the working nature of sensors and its applications.	L3	PO1,PO5
CO4	**Examine and solve** engineering problems related to various industry by using IoT.	L4	PO1,PO5,PO7 PO10

Scheme of Continuous Internal Evaluation (CIE)

THEORY (40 marks)		PROJECT (60 marks)			Total
IA test (Theory)	IA test (Lab)	Project Phase 1	Project Phase 2	Project report	
25 marks	15 marks	25 marks	25 marks	10 marks	100 marks
Theory IA test should be of one-hour duration. Lab IA test should be of two/three-hour duration. Project batch will ideally consist of 2 students (maximum of 3). Project Phase 1 presentation will be conducted after 6 weeks and Project Phase 2 presentation will be conducted after 13 weeks from the start of the semester. Submitting Project report is compulsory.					
Eligibility for SEE: 1. 50% and above (20 marks and above) in theory component 2. 50% and above (30 marks and above) in project component 3. Not eligible in any one of the two components will make the student **Not Eligible** for SEE					

Scheme of Semester End Examination (SEE):			
1.	It will be conducted for 100 marks having 5 hours duration.		
2.	Project Definition and Objectives	15 marks	
	Circuit and Pin configurations diagram	20 marks	
	Implementation	20 marks	100 marks
	Hardware connections	10 marks	
	Project Demonstration and Viva	20 marks	
	Code Quality and Best Practices	15 marks	
3.	**Minimum marks required in SEE to pass:** Score should be $\geq$ 40%, however overall score of CIE + SEE should be $\geq$ 50%.		
4.	SEE will be conducted in project batches by **Internal & External examiners** together.		

Rubrics:

Levels	Target
1 (Low)	Low (L): If 60% of marks are scored by less than 50% of the students.
2 (Medium)	Medium (M): If 60% of marks are scored by 50% to 70% of the students.
3 (High)	High (H): If 60% of marks are scored by 70% of the students.

Course Articulation Matrix												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
1	✓											
2	✓				✓							
3	✓				✓							
4	✓				✓		✓			✓		
Tick mark the CO and PO mapping												

S. No	Skill & Competence enhanced after undergoing the course	Applicable Sectors & domains	Job roles students can takeup after undergoing the course
1.	AI and Machine learning, Circuit Design, cloud Computing, data security and Microcontroller are the skills enhanced after undergoing the course.	Wearables, Smart Home Applications, Health Care, Smart cities and domains where IoT is applicable.	IoT Developer IoT Creator IoT Infrastructure Architect IoT System Administrator

Advanced Database Management System

Course Code	22MCA345	Course type	Theory	Credits L-T-P	4 – 0 - 0
Hours/week: L - T- P	4 - 0 - 0			Total credits	4
Total Contact Hours	L = 52 Hrs; T = 0 Hrs; P = 0 Hrs; Total = 52 Hrs			CIE Marks	100
				SEE Marks	100

	Course learning objectives
1.	To provide a clear understanding of the architectural and algorithmic aspects of Database Management System (DBMS)
2.	To emphasize about advanced database with the concepts of storage, indexing, structure, relational operators and query optimization.
3.	To emphasize on knowledge about evaluation of queries and query optimization.
4.	To provide knowledge about physical database design and database tuning.

Required Knowledge: Database Management System(I) (22MCA12) & Data Structures & Algorithms(I) (22MCA22)

Unit – I	Contact Hours = 11 Hours
Memory hierarchy; RAID and Distributed Database Concepts Disk space management; Buffer manager; Files of records; Page formats and record formats. Overview of Storage, Indexing, Disks and Files, Data on external storage; File organizations and Indexing; Index data structures; Comparison of file organizations; Indexes and performance tuning; Distributed Database Concepts, Data Fragmentation, Replication, and Allocation Techniques for Distributed Database Design. Textbook:1 Chapter 7 & 8 (7.1 - 7.7, 8.2 - 8.5) Textbook:2 Chapter 24 (24.1 - 24.2)	

Unit – II	Contact Hours = 10 Hours
Tree-Structured and Hash-Based Indexing Intuition for tree indexes; Indexed sequential access method; B+ trees, Search, Insert, Delete, Duplicates, B+ trees in practice Hash-Based Indexing: Static hashing, Extendible hashing, linear hashing, comparisons Textbook:1 Chapter 9 & 10 (9.1 - 9.8, 10.1 - 10.4)	

Unit – III	Contact Hours = 10 Hours

Overview of Query Evaluation and External Sorting

The system catalog, Introduction to operator evaluation; Algorithm for relational operations; Introduction to query optimization; Alternative plans; A motivating example; What a typical optimizer does. When does a DBMS sort data? A simple two-way merge sort; External merge sort

Textbook:1 Chapter 11 & 13(11.1 - 11.4, 13.1 - 13.3)

Unit – IV	Contact Hours = 11 Hours

Evaluating Relational Operators and A Typical Relational Query Optimizer

The Selection operation; General selection conditions; The Projection operation; The Join Operation; The Set operations; Aggregate operations; The impact of buffering.

Translating SQL queries in to Relational Algebra; Estimating the cost of a plan; Relational algebra equivalences; Enumeration of alternative plans

Textbook:1 Chapter 12 & 14 (12.1 - 12.8, 14.1 - 14.4)

Unit – V	Contact Hours = 10 Hours

Information retrieval and XML Data

Information retrieval and XML Data, Colliding Worlds: Databases, IR, and XML, Introduction to Information Retrieval, Indexing for Text Search, Web Search Engines, Managing Text in a DBMS, A Data Model for XML.

Textbook:1 Chapter 16 (16.1 - 16.11)

Unit No.	Self-Study Topics
4	Relational Algebra
5	Object-Database Systems

Books	
Text Books	
1.	Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, 3rd Edition, McGraw-Hill,2003.
2.	Elmasri and Navathe: Fundamentals of Database Systems,5th Edition, Pearson Education, 2007
Reference Books	
1.	Database System Concepts Abraham Silberschatz, Henry F. Korth, S. Sudarshan McGraw Hill 6th Edition, 2010
E-resourses (NPTEL/SWAYAM.. Any Other)- mention links	
1.	https://archive.nptel.ac.in/courses/106/105/106105175/
2.	https://nptel.ac.in/courses/106106095

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes
		3.	Open Book Assignments (OBA)/Project/Seminar
		4.	Course Seminar
		5.	Semester End Examination

Course Outcome (COs)			
At the end of the course, the student will be able to		Learning Level	PO(s)
CO1	**Summarize** the fundamental of storage, indexing concepts and Distributed Databases.	L2	PO1
CO2	**Identify** and Solve the different indexing structures.	L3	PO1
CO3	**Apply** the concepts of query evaluation and external sorting of data and **Identify** the relational operators and query plans.	L3	PO1, PO4,PO7
CO4	**Analyze** the operations of Information retrieval and XML data in DBMS	L4	PO1,PO7

Scheme of Continuous Internal Evaluation (CIE)

Theory 100 marks					Total
IA Test 1	IA Test 2	Other Assessment (OBA/Seminar/Project)	Quiz 1	Quiz 2	
25	25	20	15	15	100

Eligibility for SEE:
1. 50% and above (50 marks and above) in theory component

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration
2.	**Minimum marks required in SEE to pass: 40% of the maximum marks i.e 40 out of 100.** **In aggregate the students have to secure 50% total marks of the course (CIE + SEE).**

Rubrics: Levels	Target
1 (Low)	Low (L): If 60% of marks are scored by less than 50% of the students.
2 (Medium)	Medium (M): If 60% of marks are scored by 50% to 70% of the students.
3 (High)	High (H): If 60% of marks are scored by 70% of the students.

Course Articulation Matrix												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
1	✓											
2	✓											
3				✓			✓					
4	✓						✓					
Tick mark the CO and PO mapping												

S.No	Skill & Competence enhanced after undergoing the course	Applicable Sectors & domains	Job roles students can take up after undergoing the course
1	➢ Data analysis is the process of methodically applying statistical and logical approaches to comprehend data and draw inferences from it. ➢ An in-depth understanding of database design concepts can help professionals succeed in building a career in this domain. ➢ Data integrity is a fundamental part of the design, implementation and use of any system that stores, processes or retrieves data	➢ Relational DBMS (RDBMS) ➢ Object-oriented DBMS (OODBMS) ➢ Network DBMS (NDBMS) ➢ NoSQL DBMS	➢ Data Administrator ➢ Database designer ➢ Data Engineer ➢ Database Programmers

Django Framework**

Course Code	22MCA351	Course type	Theory	Credits L-T-P	3 – 0 - 1
Hours/week: L - T- P	3 – 0 – 2			Total credits	4
Total Contact Hours	L = 52Hrs; T = 0 Hrs; P = 0 Hrs Total = 52Hrs			CIE Marks	100
				SEE Marks	100

Course learning objectives	
1.	To understand Django Fundamentals and the MVC architecture
2.	To Build Dynamic Web Applications with Django
3.	To Implement User Authentication and Database Management
4.	To Develop Project-Based Learning and Deployment Skills

Required Knowledge: Python programming (I) 22MCA11

Unit – I	Contact Hours = 11 Hours

Foundations of Django and Web Technologies

Introduction to Django and Web Frameworks: The Evolution of Web Development, Role and Importance of Web Frameworks, An Overview of Django and its Features; MVC Architecture and Django's Design Pattern: Understanding the Model-View-Controller (MVC) Pattern, Applying the Model-View-Template (MVT) Pattern in Django; Coding Style and Best Practices in Django: Writing Readable and Maintainable Code, Adhering to PEP 8 Guidelines, Django-Specific Coding Style Considerations; Project Structuring and App Creation: Organizing Django Projects and Apps, Creating Custom Apps for Modularity and Reusability; Navigating with URLs and View Mapping: URL Configuration in Django, Mapping Views to URLs for Navigation
Textbook:1 Chapter 1, 2

Unit – II	Contact Hours = 11 Hours

Django Models, Views, and Basic Operations

Working with Databases and Models: Supported Database Systems in Django, Defining Models to Represent Data Entities, CRUD Operations on Models: Create, Retrieve, Update, Delete; Advanced Querying and Relationships: Utilizing Advanced Querying Techniques, Establishing Relationships: Foreign Keys and Many-to-Many; Views: Creating Dynamic Content: Creating Dynamic Web Pages with Django Views, Utilizing Templates for Dynamic Content Rendering; Dynamic URLs and Routing: Handling Dynamic URLs with Patterns and Parameters, Customizing Views Based on URL Input
Textbook:1 Chapter 2, 4

Unit – III	Contact Hours = 10 Hours
Django Admin, Database Management	
Efficient Use of Django Admin Interface: Introduction to Django Admin Panel, Customizing Admin Dashboard and Functionality; Database Management and Migrations: Managing Database Schema Changes with Migrations, Switching Between Different Database Engines Textbook:1 Chapter 5, 21	

Unit – IV	Contact Hours = 10 Hours
Django Templates, Forms, and Intermediate Topics	
Django Templates: Design and Basics: Introduction to Django Template System, Design Principles for Effective Templates; Advanced Template Techniques: Including Templates for Reusability, Custom Template Tags and Filters; Handling User Input with Django Forms: Creating and Validating Forms in Django, Processing Form Data and Displaying Validation Errors Textbook:1 Chapter 3, 6	

Unit – V	Contact Hours = 10 Hours
Advanced Templates, Forms, and Project-Based Learning	
Advanced Template Strategies and Context Management: Leveraging Advanced Template Features, Context Processors for Global Template Data; Enhancing User Interaction with Forms: Customizing Form Layouts and Styling, Implementing Form sets for Managing Multiple Forms; Guided Project: Building Dynamic Web Applications: Progressive Projects Ranging from Beginner to Intermediate Level, Applying Concepts Learned Throughout the Course, Software Installation, Project Setup, and Deployment Considerations Textbook:1 Chapter 6, 8, 13	

Unit No.	Self-Study Topics
3	Create a Simple Form-Based Web Page
4	Add User Authentication to a Django Project

Books	
Text Book	
1.	Nigel George, Mastering Django:Core, Packt Publishing Ltd., 2016, ISBN 978-1-78728-114-1 .
Reference Book	
1	Daniel Roy Greenfield and Audrey Roy Greenfield, Two Scoops of Django 1.11, Two Scoops Press, Fourth Edition, 2017.
E-resourses (NPTEL/SWAYAM.. Any Other)- mention links	
1	Django Official Documentation - https://docs.djangoproject.com/en/3.0/
2	https://www.youtube.com/watch?v=F5mRW0jo-U4
3	https://www.youtube.com/watch?v=OTmQOjsl0eg

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes
		3.	OBA/Course Project/Course Seminar
		4.	Semester End Examination

Course Outcomes (COs)			
At the end of the course, the student will be able to		Learning Level	PO(s)
CO1	**Explain** the historical development of Django, best practices and the Concepts associated with building web applications using Django framework	L2	PO1, PO5
CO2	**Identify** the key features of models, views and basic operations with advanced querying and relationships using models and creation of dynamic web pages using Django views.	L3	PO1, PO5
CO3	**Apply** Django's admin, forms, templates and database operations to build Django based applications	L3	PO1, PO5, PO7, PO10
CO4	**Analyze** Django's templates and forms and Experiment with advanced features of Django to build dynamic web applications.	L4	PO1, PO5, PO7, PO8, PO10

Scheme of Continuous Internal Evaluation (CIE)

THEORY (40 marks)		PROJECT (60 marks)			
IA test (Theory)	IA test (Lab)	Project Phase 1	Project Phase 2	Project report	Total
25 marks	15 marks	25 marks	25 marks	10 marks	100 marks
Theory IA test should be of one-hour duration. Lab IA test should be of two/three-hour duration. Project batch will ideally consist of 2 students (maximum of 3). Project Phase 1 presentation will be conducted after 6 weeks and Project Phase 2 presentation will be conducted after 13 weeks from the start of the semester. Submitting Project report is compulsory.					
Eligibility for SEE: 1. 50% and above (20 marks and above) in theory component 2. 50% and above (30 marks and above) in project component 3. Not eligible in any one of the two components will make the student **Not Eligible** for SEE					

Scheme of Semester End Examination (SEE):		
1.	It will be conducted for 100 marks having 5 hours duration.		
2.	Project Definition and Objectives	15 marks	
	Data Modeling and Database Design	20 marks	
	Django's MVC/MVT architectural pattern Implementation	20 marks	100 marks
	UI Design and Usability of the web application	10 marks	
	Project Demonstration and Viva	20 marks	
	Code Quality and Best Practices	15 marks	
3.	**Minimum marks required in SEE to pass:** Score should be $\geq$ 40%, however overall score of CIE + SEE should be $\geq$ 50%.		
4.	SEE will be conducted in project batches by **Internal & External examiners** together.		

Rubrics: Levels	Target
1 (Low)	Low (L): If 60% of marks are scored by less than 50% of the students.
2 (Medium)	Medium (M): If 60% of marks are scored by 50% to 70% of the students.
3 (High)	High (H): If 60% of marks are scored by 70% of the students.

Course Articulation Matrix												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
1	✓				✓							
2	✓				✓							
3	✓				✓		✓			✓		
4	✓				✓		✓	✓		✓		
Tick mark the CO and PO mapping												

S.No	Skill & Competence enhanced after undergoing the course	Applicable Sectors& domains	Job roles students can take up after undergoing the course
1	Knowledge of the Django framework and its features, Skill in creating and managing Django projects and apps, Ability to create and use Django models, views, and templates, Skill in using the Django admin interface, Knowledge of Django's form handling capabilities	Any sector that uses web applications, such as e-commerce, social media, and enterprise software, Any domain that requires the development of complex and scalable web applications	Django developer Web developer Full-stack developer Data analyst

DevOps

Course Code	22MCA352	Course type	Theory	Credits L-T-P	4 – 0 - 0
Hours/week: L - T- P	4 – 0 – 0			Total credits	4
Total Contact Hours	L = 52Hrs; T = 0 Hrs; P = 0 Hrs Total = 52Hrs			CIE Marks	100
				SEE Marks	100

Course learning objectives	
1.	To provide the fundamental knowledge Software Development process and cloud computing.
2.	To introduce DevOps concepts and architecture of DevOps.
3.	To analyze various types of building and deployment techniques for the code in Devops Culture.

Required Knowledge of:NA

Unit – I	Contact Hours = 10 Hours
Overview of Agile Software Development and Linux Environment Software Process models, waterfall model, Incremental model, reuse oriented software engineering. Agile Software Development, Agile methods, plan-driven agile methods, extreme programming and agile project management. Overview of Linux: Basic Linux commands, Components of Linux Operating System, Linux distributions, importance of Linux in DevOps. Textbook 1: Chapter 2,3 Textbook 5: Chapter 4,8	

Unit – II	Contact Hours = 10 Hours
Overview **of Cloud Computing platforms and DevOps Eco System** Introduction to Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model, Computing Platforms and Technologies, Amazon Web Services (AWS), Google AppEngine, Microsoft Azure, Hadoop, Force.com and Salesforce.com, Manjrasoft Aneka. What is DevOps? Understanding the Business Need for DevOps. Seeing how DevOps works, History of DevOps. DevOps Culture and Practices: Implementing CI/CD and continuous deployment, Understanding IaC practices an overview. Textbook 2: Chapter 1,9 Textbook 3: Chapter 1	

Unit – III	Contact Hours = 10 Hours
Provisioning Cloud Infrastructure with Terraform Overview of Infrastructure tools available. Terraform: Technical requirements, Installing Terraform, Configuring Terraform for Azure and AWS, writing a Terraform script to deploy Azure and AWS Infrastructure, Deploying the infrastructure with Terraform, Terraform command lines and life cycle. Textbook 3: Chapter 2	

Unit – IV	Contact Hours = 12 Hours

Role of Jenkins in CI/CD Pipeline and Build the code with Maven

DevOps CI/CD Pipelines: Principles, CI and CD. Jenkins, Role of Jenkins, benefits of Jenkins, Jenkins as CI tool. Overview of building the tools in DevOps environment. Introducing Apache Maven, Maven. . . What is it? Convention Over Configuration, A Common Interface, Universal Reuse through Maven Plugins Conceptual Model of a "Project", Is Maven an alternative to XYZ? Comparing Maven with Ant and Gradle. Installing Maven, installing Maven on Microsoft Windows, Testing a Maven Installation The Project Object Model: Introduction, The POM and its types. Build Cycle.

Textbook 4: Chapter 1,2,3,4

Textbook 3: Chapter 7

Unit – V	Contact Hours = 10 Hours

Micro services with Docker and kubernetes

What is Docker, Components of Docker, Docker Lifecycle, Ecosystem, Technical requirements, Installing and creating Docker files. Managing Containers Effectively with Kubernetes: Introduction, features, Benefits. Kubernetes components, installing Kubernetes, architecture overview, an example of Kubernetes.

Textbook 3: Chapter 9,10

UnitNo.	Self-StudyTopics
4	Working with different types of CI/CD implementation techniques.

Books	
Text Books	
1.	Software Engineering, Ninth Edition, Ian Sommerville, Pearson publication.
2.	Mastering Cloud Computing, Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, ISBN: 978-0-12-411454 Publication MK.
3.	Learning DevOps, By Mikael Kriefby Jenkins, Kubernetes, Terraform and Azure DevOps, 2019 Packt Publisher.
4.	Maven, The Complete reference, Tim O'Brien, Mafred Moser First edition, Sonatype, Inc. 2010.
5.	Linux for Beginners, Jason Canon, Second Edition, CreateSpace Independent Publishing Platform
Reference Books	
1.	Engineering DevOps, Mark Hornbeek, Second Edition
2.	The DevOps Hand Book, Gene Kim, Jez Humble, Patric Debois& John Wills, First Edition
E-resourses (NPTEL/SWAYAM. Any Other)- mention links	
1.	https://docs.oracle.com/en-us/iaas/Content/devops/using/home.htm
2.	https://opensource.com/article/21/3/devops-documentation

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes
		3.	Open Book Assignments (OBA)/Project/Seminar
		4.	Semester End Examination

Course Outcomes (COs)			
At the end of the course, the student will be able to		**Learning Level**	**PO(s)**
CO1	**Summarize** the fundamentals of various SDLC and cloud computing concepts**.**	L2	PO1,PO7
CO2	**Identify** various tools and practices of cloud Infrastructure used in DevOps.	L3	PO1, PO5
CO1	**Build** the code by making use of various applications/Software in DevOps environment.	L3	PO1, PO5,PO7
CO4	**Analyze** the different containers in DevOps.	L4	PO1,PO5,PO8

Scheme of Continuous Internal Evaluation (CIE)

Theory 100 marks					Total
IA Test 1	**IA Test 2**	**Other Assessment (OBA/Seminar/Project)**	**Quiz 1**	**Quiz 2**	
25	**25**	**20**	**15**	**15**	**100**

Eligibility for SEE:
1. 50% and above (50 marks and above) in theory component

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration
2.	**Minimum marks required in SEE to pass: 40% of the maximum marks i.e 40 out of 100.** **In aggregate the students have to secure 50% total marks of the course (CIE + SEE).**

Rubrics:Levels	Target
1 (Low)	Low (L): If 60% of marks are scored by less than 50% of the students.
2 (Medium)	Medium (M): If 60% of marks are scored by 50% to 70% of the students.
3 (High)	High (H): If 60% of marks are scored by 70% of the students.

CourseArticulationMatrix												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
1	✓				✓							
2	✓				✓							
3	✓				✓			✓				
4	✓				✓			✓				
TickmarktheCOandPOmapping												

S.No	Skill & Competence enhanced after undergoing the course	Applicable Sectors& domains	Job role students can take up after undergoing the course
1.	Automation Skills Continuous. Integration/Continuous Delivery (CI/CD) Cloud Security manager	1. Software Development. 2. IT Operations (ITOps). 3. Finance and Banking.	1. DevOps Engineer. 2. Automation Engineer. 3. Cloud Engineer. 4. Security Engineer (DevSecOps). 5. Infrastructure as Code (IaC) Engineer.

Artificial Intelligence

Course Code	22MCA353	Course type	Theory	Credits L-T-P	4 - 0 - 0
Hours/week: L - T- P	4 - 0 - 0			Total credits	4
Total Contact Hours	L = 52 Hrs; T = 0 Hrs; P = 0 Hrs Total = 52 Hrs			CIE Marks	100
				SEE Marks	100

Course learning objectives

1.	To emphasis the basic principles of Artificial Intelligence in various applications.
2.	To explore different methods of solving problems using Artificial Intelligence.
3.	To capture the knowledge of human experts to support decision-making.
4.	To provide knowledge of AI systems and its variants.

Required Knowledge: Basics of programming (I) 22MCA16

Unit – I	Contact Hours = 10 Hours
Introduction to AI: AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation. Textbook 1: Chapter 1, 2.	

Unit – II	Contact Hours = 11 Hours
Uninformed Search Strategies: Formulation of real world problems, Breadth First Search, Depth First Search, Depth Limited Search, Iterative Deepening Depth First Search, Bidirectional Search, Comparison of Uninformed Search Strategies, Searching with partial information, Sensor-less problems, Contingency problems Textbook 1: Chapter 3	

Unit – III	Contact Hours = 11 Hours
Informed Search Strategies Generate& test, Hill Climbing, Best First Search, A* and AO* Algorithm, Constraint satisfaction, Game playing: Minimax Search, Alpha-Beta Cutoffs, Waiting for Quiescence. Textbook 1: Chapter 4	

Unit – IV	Contact Hours = 10 Hours

Knowledge and Reasoning: Knowledge based agents, Wumpus world. Propositional Logic: Representation, Inference, Reasoning Patterns, Resolution, Forward and Backward Chaining. First order Logic: Representation, Inference, Reasoning Patterns, Resolution, Forward and Backward Chaining
Textbook 1 : Chapter 7

Unit – V	Contact Hours = 10 Hours

Planning

Planning- Planning problems, Simple planning agent, Planning languages, Blocks world, Goal stack planning, Mean Ends Analysis, Non-linear Planning, Conditional planning, Reactive planning: Implementation of toy problems, Implementation and Analysis of DFS and BFS for an application.
Textbook 1: Chapter 11

Unit No.	Self-Study Topics
3	Applications and case studies on Knowledge and Reasoning concepts.
5	Python implementation of the planning examples.

Books	
Text Books	
1.	Stuart J. Russell, Peter Norwig, Artificial Intelligence –A Modern approach, 3rd Edition, Pearson Education, 2016.
Reference Books	
1.	Parag Kulkarni, Prachi Joshi, Artificial Intelligence –Building Intelligent Systems, 1st ed., PHI learning,2015.
2.	Denis Rothman, Artificial Intelligence by Example, Packt, 2018
E-resources (NPTEL/SWAYAM. Any Other)- mention links	
1.	NPTEL Course: https://nptel.ac.in/courses/106105077

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/Project/Seminar
		3.	Quiz
		4.	Semester End Examination

Course Outcomes (COs)			
At the end of the course, the student will be able to		Learning Level	PO(s)
CO1	**Explain** the basics of the theory and practice of Artificial Intelligence.	L2	PO1
CO2	**Apply** different search algorithms, Logic & reasoning and planning to the well formulated problem.	L3	PO2, PO7
CO3	**Make use of** appropriate search strategies, Logic & reasoning and planning for to solve the given problem.	L3	PO 1, PO 2, PO7
CO4	**Examine** and solve given problem using Propositional and First order logic and **Apply** AI techniques to real-world problems to develop intelligent systems	L4	PO 5, PO 12

Scheme of Continuous Internal Evaluation (CIE)

Theory 100 marks					Total
IA Test 1	IA Test 2	Other Assessment (OBA/Seminar/Project)	Quiz 1	Quiz 2	
25	25	20	15	15	100

Eligibility for SEE:
1. 50% and above (50 marks and above) in theory component

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration
2.	**Minimum marks required in SEE to pass: 40% of the maximum marks i.e 40 out of 100. In aggregate the students have to secure 50% total marks of the course (CIE + SEE).**

Rubrics: Levels	Target
1 (Low)	Low (L): If 60% of marks are scored by less than 50% of the students.
2 (Medium)	Medium (M): If 60% of marks are scored by 50% to 70% of the students.
3 (High)	High (H): If 60% of marks are scored by 70% of the students.

Course Articulation Matrix												
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	✓											
2	✓											
3	✓	✓										
4					✓							✓
Tick mark the CO and PO mapping												

S.No	Skill & Competence enhanced after undergoing the course	Applicable Sectors & domains	Job roles students can takeup after undergoing the course
1	Knowledge to develop context-aware systems. Research and innovation mind set with an aim to maximize automation of the complete knowledge lifecycle and achieve semantic interoperability between Web resources and services.	IT Industry, Start-up eco system, Govt. and Public Sector.	Job roles related to Expert System Development, ML Projects, Machine Interface.

S.No	Skill & Competence enhanced after undergoing the course	Applicable Sectors & domains	Job roles students can takeup after undergoing the course

Software Project Management

Course Code	22MCA354	Course type	Theory	Credits L-T-P	4 - 0 - 0
Hours/week: L - T- P	4 - 0 - 0			Total credits	4
Total Contact Hours	L = 52 Hrs; T = 0 Hrs; P = 0 Hrs Total = 52 Hrs			CIE Marks	100
				SEE Marks	100

Course learning objectives

1.	To introduce an overview of Software Project Management, Project Planning and Evaluation and to identify the different industry preferred project management tools.
2.	To impart the knowledge of using critical path and precedence networks, activity on arrow networks to model ideal activity plan.
3.	To introduce the notion of Risk Management and Resource Allocation and to explore the requirements for the continual monitoring of projects and contract management.
4.	To impart the factors that influence people's behavior in a project environment and to provide the knowledge of different types of team structures and styles of leadership needed in different situations

Required Knowledge: Not Applicable

Unit – I	Contact Hours = 10 Hours

Software Project Management, Evaluation techniques and Management
Introduction to software project management, project evaluation and programme management, an overview of project planning. A case Study: List the different industry preferred project management tools.
Textbook 1: Chapter 1, 2, 3

Unit – II	Contact Hours = 11 Hours

Activity Planning
The objectives of activity planning, when to plan, project schedules, projects and activities, sequencing and scheduling activities, network planning models, formulating a network model, adding the time dimension, the forward pass, the backward pass, identifying the critical path, activity float, shortening the project duration, identifying critical activities, activity on arrow networks. A Case study on: Introduction to project management tools like JIRA and SUCCESS FACTOR software.
Textbook 1: Chapter 6

Unit – III	Contact Hours = 11 Hours

Risk Management
Risks, categories of risks, a framework for dealing with risks, risk identification, risk assessment, risk planning, risk management, evaluating risks to the schedule, applying the pert technique. Resource

Allocation- The nature of resources, identifying resource requirements, scheduling resources, creating critical paths, counting the cost, being specific, publishing the resource schedule, cost schedule, scheduling sequence.

Textbook 1: Chapter 7, 8

Unit – IV	Contact Hours = 10 Hours

Monitoring And Control

Creating The Framework, collecting the data, review, project termination review, visualizing progress, cost monitoring, earned value analysis, prioritizing monitoring, getting the project back to target. Managing contracts- types of contracts, stages in contract placement, and typical terms of a contract, contract management, and acceptance.

Textbook 1: Chapter 9, 10

Unit – V	Contact Hours = 10 Hours

Managing People in Software Environments

Understanding behavior, organizational behavior-a background, selecting the right person for the job, instruction in the best methods, motivation, the Oldham-hackman job characteristics model, stress, health, and safety. Working In Teams- becoming a team, decision making, organization and team structures, coordination dependencies, dispersed and virtual teams, communication genres, communication plans, leadership.

Textbook 1: Chapter 11,12

Unit No	Self-StudyTopics
2	Categories of risks
4	Managing contracts
5	Understanding behavior, Working In Teams

Books	
Text Books	
1.	Bob Hughes, Mike Cotterell, Rajib Mall, Software Project Management, McGraw HillEducation, 5th Edition.
Reference Books	
1.	Richard H. Thayer, Edward Yourdon, Software Engineering Project Management- Wiley student Edition.
E-resource's (NPTEL/SWAYAM. Any Other)- mention links	
1.	https://onlinecourses.nptel.ac.in/noc19_cs70/preview
2.	https://archive.nptel.ac.in/courses/106/105/106105218/

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes
		3.	OBA/ Course Project/ Course Seminar
		4.	Semester End Examination

Course Outcome (COs)			
At the end of the course, the student will be able to		**Learning Level**	**PO(s)**
CO1	**Illustrate** the basic concepts of Software Project Management, Project Planning and Evaluation, Activity Planning, Risk Management	L2	PO1,PO8
CO2	**Build** activity on node and activity on Arrow networks. **Make use of** various techniques to Monitor and control project.	L3	PO1,PO7,PO8
CO3	**Outline** the factors related to Identifying the resources required for a project and **Build** work plan and resource schedule.	L3	PO1,PO7,PO8
CO4	**Analyze** the solutions to problems using modular programming constructs. **Survey** various ways in managing People in Software Environments.	L4	PO1,PO7,PO8

Scheme of Continuous Internal Evaluation (CIE):

THEORY 100 Marks					
IA test 1	**IA test 2**	**Other Assessment (OBA/Seminar/Project)**	**Quiz-1**	**Quiz-2**	**Total**
25	**25**	**20**	**15**	**15**	**100**
Eligibility for SEE: 1. 50% and above (50 marks and above) in CIE component.					

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass: 40% of the maximum marks i.e., 40 out of 100.** **In aggregate the students have to secure 50% total marks of the course (CIE + SEE).**

Rubrics:

Levels	Target
1 (Low)	Low (L): If 60% of marks are scored by less than 50% of the students.
2 (Medium)	Medium (M): If 60% of marks are scored by 50% to 70% of the students.
3 (High)	High (H): If 60% of marks are scored by 70% of the students.

Course Articulation Matrix												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
1	✓							✓				
2	✓						✓	✓				
3	✓						✓	✓				
4	✓						✓	✓				
Tick mark the CO and PO mapping												

Sl.no	Skill & Competence enhanced after undergoing the course	Applicable Sectors & domains	Job roles students can take up after undergoing the course
1 2 3 4 5 6 7 8	Leadership Skills Communication Risk Management, Time Management, Client Management Documentation Financial Management. Problem-Solving. Quality Assurance	1. Information Technology (IT) and Software Development. 2. Construction, Healthcare, Manufacturing, Engineering, Government and Public Sector.	1. Project Manager. 2. Product Owner. 3. Quality Assurance Manager. 4. Consultant. 5. Entrepreneur or Startup Founder. 6. IT director or Chief Information Officer (CIO).

Ethical Hacking**

Course Code	22MCA355	Course type	Theory	Credits L-T-P	3 – 0 - 1
Hours/week: L - T- P	3 – 0 – 2			Total credits	4
Total Contact Hours	L = 52 Hrs; T = 0 Hrs; P = 0 Hrs Total = 52 Hrs			CIE Marks	100
				SEE Marks	100

	Course learning objectives
1.	To develop a comprehensive understanding of ethical hacking principles, methodologies, and tools, and recognize the significance of ethical and legal considerations in conducting security assessments.
2.	To acquire hands-on proficiency in executing penetration tests, vulnerability assessments, and ethical hacking techniques across various system components, networks, and applications.
3.	To demonstrate the ability to identify, assess, and prioritize vulnerabilities in diverse computing environments using both manual and automated methods, and effectively communicate these findings to stakeholders.
4.	To develop a strategic mindset towards cybersecurity by acquiring knowledge of common attack vectors, learning to simulate real-world attacks, and implementing preventive measures to secure systems, networks, and web applications.

Required Knowledge: Cyber Security and Cyber Laws (22MCA253)

Unit – I	Contact Hours =10 Hours
Introduction to Ethical Hacking	
Introduction to ethical hacking and its importance, Legal and ethical considerations in ethical hacking, Differentiating between black hat, white hat, and grey hat hacking, Basic cybersecurity concepts and terminology, Overview of penetration testing methodologies Textbook:1 Chapter 1 Textbook:2 Chapter 1, 2	

Unit – II	Contact Hours = 10 Hours
Footprinting and Information Gathering	
Passive and active information gathering techniques, Whois lookup, DNS enumeration, and social engineering, Tools and methodologies for footprinting, Google hacking and OSINT (Open Source Intelligence) techniques Textbook:1 Chapter 3	

Unit – III	Contact Hours = 10 Hours
Scanning and Enumeration: Port scanning techniques: SYN, TCP, UDP scans; Service enumeration and version detection; NetBIOS, SNMP, and SMTP enumeration; Vulnerability scanning and assessment Textbook:1 Chapter 3,4, 5	

Unit – IV	Contact Hours = 10 Hours
System Hacking and Exploitation Password cracking techniques and tools; Privilege escalation and maintaining access; Malware types and countermeasures; Exploiting common vulnerabilities (e.g., buffer overflow, SQL injection) Textbook:1 Chapter 7, 9, 10	

Unit – V	Contact Hours = 12 Hours
Web Application and Network Security Common web vulnerabilities: SQL injection, XSS, CSRF; Web application penetration testing methodology; Network sniffing and spoofing; Intrusion Detection Systems (IDS) and Intrusion Prevention Systems (IPS) Textbook:1 Chapter 6, 12 Textbook:1 Chapter 1	

Unit No.	Self-Study Topics
1	Research and summarize a recent ethical hacking case study, highlighting the lessons learned
3	Research and explain the differences between TCP and UDP scanning.
4	Set up a virtual lab to practice password cracking using popular tools.

Books	
Text Books	
1	Rafay Baloch, Ethical Hacking and Penetration Testing Guide, CRC Press, 2015,ISBN 978-1-4822-3161-8 (Paperback)
2	Harper Allen, Gray Hat Hacking: The Ethical Hackers HandBook, 3rd Edition, McGraw Hill, 2011.
3	Jay Beale, Andrew R. Baker, Joel Esler, Snort Intrusion Detection and Prevention Toolkit,Syngress Publishing, Inc, 2007, ISBN-13: 978-1-59749-099-3
Reference Books	
1	William Stallings, Network Security Essentials: Applications and Standards, Pearson Education Limited 2017, ISBN 13: 978-1-292-15485-5
2	Patrick Engebretson, The Basics of Hacking and Penetration Testing, SyngressPublishing, 2013, ISBN 978-0-12-411644-3
E-resources (NPTEL/SWAYAM.. Any Other)- mention links	
1.	Nmap - Official Documentation: https://nmap.org/book/
2.	National Vulnerability Database (NVD): https://nvd.nist.gov/

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes
		3.	OBA/Course Project/Course Seminar
		4.	Semester End Examination

Course Outcomes (COs)			
At the end of the course, the student will be able to		Learning Level	PO(s)
CO1	**Explain** the core concepts, principles and legal considerations of ethical hacking.	L2	PO1, PO6, PO10
CO2	**Make us of** differenttools and techniques for information gathering, scanning and enumeration	L3	PO1, PO5,PO6, PO10
CO3	**Apply** tools and techniques for exploiting vulnerabilities, Network sniffing, web application hacking, system hacking, escalating privileges, etc.	L3	PO1, PO5, PO6, PO7, PO10
CO4	**Analyze** the results of IDS/IPS, ethical hacking and penetration testing tasks	L4	PO1, PO5, PO6, PO7, PO10

Scheme of Continuous Internal Evaluation (CIE)

THEORY (40 marks)		PROJECT (60 marks)			
IA test (Theory)	IA test (Lab)	Project Phase 1	Project Phase 2	Project report	Total
25 marks	15 marks	25 marks	25 marks	10 marks	100 marks
Theory IA test should be of one-hour duration. Lab IA test should be of two/three-hour duration. Project batch will ideally consist of 2 students (maximum of 3). Project Phase 1 presentation will be conducted after 6 weeks and Project Phase 2 presentation will be conducted after 13 weeks from the start of the semester. Submitting Project report is compulsory.					
Eligibility for SEE: 1. 50% and above (20 marks and above) in theory component 2. 50% and above (30 marks and above) in project component 3. Not eligible in any one of the two components will make the student **Not Eligible** for SEE					

Scheme of Semester End Examination (SEE):

1.	It will be conducted for 100 marks having 5 hours duration.		
2.	Project Definition based on Ethical Hacking Principles and Objectives	15 marks	100 marks
	Demonstration of the Practical Application of Ethical Hacking Techniques for the assigned task	20 marks	
	Analyzing and Visualizing Hacking Scenarios for the assigned problem	20 marks	
	Presentation of Ethical Hacking Findings	10 marks	
	Enhancements to Hacking Techniques and Viva	20 marks	
	Comprehensive Documentation of Ethical Hacking Project	15 marks	
3.	**Minimum marks required in SEE to pass:** Score should be $\geq$ 40%, however overall score of CIE + SEE should be $\geq$ 50%.		
4.	SEE will be conducted in project batches by **Internal & External examiners** together.		

Rubrics:Levels	Target
1 (Low)	Low (L): If 60% of marks are scored by less than 50% of the students.
2 (Medium)	Medium (M): If 60% of marks are scored by 50% to 70% of the students.
3 (High)	High (H): If 60% of marks are scored by 70% of the students.

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
1	✓					✓				✓		
2	✓				✓	✓				✓		
3	✓				✓	✓	✓			✓		
4	✓				✓	✓	✓			✓		
Tick mark the CO and PO mapping												

S.No	Skill & Competence enhanced after undergoing the course	Applicable Sectors& domains	Job roles students can take up after undergoing the course
1	Knowledge of ethical hacking concepts and terminology Ability to perform footprinting and information gathering techniques Ability to scan and enumerate networks and systems Ability to exploit common vulnerabilities	Any sector that uses information technology, such as finance, healthcare, and government Any domain that requires the protection of sensitive data, such as	Ethical hacker Penetration tester Security analyst Security engineer Security consultant Incident responder

	Ability to defend against common attacks	credit card information and medical records	
	Knowledge of web application and network security		
	Ethical hacking mindset and adherence to legal and ethical considerations		

OPEN ELECTIVES

Python Programming (I)

Course Code	22MCA361	Course type	Open Elective	Credits L-T-P	3 – 0 - 0
Hours/week: L - T- P	3 - 0 - 2			Total credits	3
Total Contact Hours	L = 35 Hrs; T = 0 Hrs; P = 10 Hrs; Total = 45 Hrs			CIE Marks	100
				SEE Marks	100

	Course learning objectives
1.	To create the ability to design and build applications for problem solving using core of python programming
2.	To introduce file handling mechanism and usage with Python Programming

Required Knowledge: NA

Unit – I	Contact Hours = 9 Hours

Basics of Python Programming: Features of python, writing and executing first python program, Literal constants Numbers and Strings, variables and identifiers, data types, Assigning or Initialization values to variables, Multiple Assignment. **Data Structures:** Lists, Tuple, Sets, Dictionaries.
Textbook Chapter 3.1, 3.4 - 3.7,8.1, 8.2.1 – 8.2.6, 8.2.9 – 8.2.10, 8.3, 8.4 – 8.6

Unit – II	Contact Hours = 9 Hours

Input Output Operations in Python: Input operation, Output Operations, comments, reserved words, indentation, operators and expressions, operations on strings. Decision control statements.
Textbook Chapter: 3.8.4, 3.14, 4

Unit – III	Contact Hours = 9 Hours

Functions: Introduction, Function Definition, Function Call, Variable scope and lifetime, the return statement, more on defining functions. Lambda functions.
Textbook Chapter : 5.1 – 5.7, 5.10

Unit – IV	Contact Hours = 9 Hours

Modules: The from…import statement, Name of Module, Making your own Modules, The dir() function. **Regular Expressions:** The match() function, The search() function, The sub() function, The findall(), finditer() functions, Metacharacters in regular expressions, groups.
Textbook:5.11,6

Unit – V	Contact Hours = 9 Hours

File Handling: Introduction, File Path, Types Of Files, Opening And Closing Files, Reading And Writing Files, File Positions, Renaming And Deleting Files, Directory Methods,
Textbook Chapter 7.1 – 7.8.

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1.	2	Program Using If Else Statement.
2.	2	Program Using Loops.
3.	2	Function, Lambda Function.
4.	1	Regular Expression.
5.	1	File Handling .

Unit No.	Self-Study Topics
4	Simple Calculator
6	Mail merge Program

Books :	
Text Books	
1.	Reema Thareja, "Python Programming using problem solving approach", Oxford University Press, 2017
Reference Books	
1.	Paul Gries, Jennifer Campbell, Jason, Practical Programming, An introduction to Computer Science using Python 3.6, 3rd Edition, Pragmetic Bookshelf.
E-resources (NPTEL/SWAYAM.. Any Other)- mention links	
1.	The joy of computing using python https://onlinecourses.nptel.ac.in/noc21_cs32/preview
2.	Programming in python https://onlinecourses.swayam2.ac.in/cec22_cs20/preview

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	OBA/Course Project /Course Seminar
3.		3.	Semester End Examination

Course Outcome (COs)			
At the end of the course, the student will be able to		**Learning Level**	**PO(s)**
CO1	**Explain** core elements of Python Programming and key features.	L2	PO1
CO2	**Build** applications for problem solving using core concepts of python programming.	L3	PO1, PO3, PO5
CO3	**Build** GUI applications.	L3	PO3, PO5
	Analyze the problem to determine the operations		

CO4	and constraints and choose the right data structure & other programming elements that best meets these requirements for implementation.	L4	PO3, PO5

Scheme of Continuous Internal Evaluation (CIE)

THEORY (60 marks)			LAB (40 marks)		Total
IA test 1	IA test 2	Other Assessment (OBA/Seminar/Project)	Conduction	Lab test	
25 marks	25 marks	10 marks	15 marks	25 marks	100 marks
IA Test: 1. No objective part in IA question paper 2. All questions descriptive					
Conduct of Lab: 1. Conducting and execution: 5 marks 2. Viva-Voce: 5 marks 3. Lab record write-up: 5 marks					
Lab test: (Batch wise with 15 students/batch) 1. Test will be conducted at the end of the semester 2. Timetable, Batch details and examiners will be declared by Exam section 3. Write Up: 5 marks 4. Conduction, Calculations, results and graphs (if applicable): 10 marks 5. Viva voce: 10 marks					
Eligibility for SEE: 1. 50% and above (30 marks and above) in theory component 2. 50% and above (20 marks and above) in lab component 3. **Lab test is COMPULSORY** 4. Not eligible in any one of the two components will make the student **Not Eligible** for SEE					

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass: 40% of the maximum marks i.e. 40 out of 100. In aggregate the students have to secure 50% total marks of the course (CIE + SEE).**

Rubrics: Levels	Target
1 (Low)	Low (L): If 60% of marks are scored by less than 50% of the students.
2 (Medium)	Medium (M): If 60% of marks are scored by 50% to 70% of the students.
3 (High)	High (H): If 60% of marks are scored by 70% of the students.

Course Articulation Matrix												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
1	✓											
2	✓											
3				✓			✓					
4	✓						✓					
Tick mark the CO and PO mapping												

S.No	Skill & Competence enhanced afterundergoing the course	Applicable Sectors & domains	Job roles students can takeup after undergoing the course
1	Solid foundation in Python syntax, data types, data structures, control structures,functions, modules. Problem-solving: Ability to analyze, design and implement solutions for a wide rangeof problems	Workflow automation Test Automation Data Analytics Gaming	Software Developer, Test Automation Engineer, Data Analyst.

Course Code	22MCA362	Course type	Open Elective	Credits L-T-P	3 – 0 - 0
Hours/week: L - T- P	3 - 0 - 0			**Total credits**	3
Total Contact Hours	L = 45 Hrs; T = 0 Hrs; P = 0 Hrs; Total = 45 Hrs			**CIE Marks**	100
				SEE Marks	100

	Course learning objectives
1.	To introduce concept of Data Mining and its applications in real world
2.	To explore the implementation of data processing techniques, visualization, predictive modeling, association analysis and clustering to extract hidden information patterns from large data repository

Required Knowledge: NA

Unit – I	Contact Hours = 12 Hours

Introduction to Data Mining
Introduction, Motivating Challenges, Data Mining Tasks, Types of Data, Data Preprocessing, Measures of similarity and dissimilarity, Data Mining Applications
Textbook:1 Chapter 1.1, 1.2, 1.4, 2.1, 2.3, 2.4

Unit – II	Contact Hours = 09 Hours

Association Analysis: Basic Concepts and Algorithms
Frequent Item set Generation, Rule Generation, Compact Representation of Frequent Item sets, FP Growth Algorithm, Evaluation of Association Patterns.
Textbook:1 Chapter 6.2- 6.7

Unit – III	Contact Hours = 07 Hours

Classification Technique
Basics, General approach to solve classification problem, Decision Trees, Rule Based Classifiers.
Textbook:1 Chapter 4.2, 4.3, 5.1

Unit – IV	Contact Hours = 08 Hours

Bayesian Learning and Instance Based Learning
Introduction, Bayesian Classifiers, Nearest Neighbor Classifiers., Estimating Predictive accuracy of classification methods, Improving accuracy of clarification methods, Evaluation criteria for classification methods, Multiclass Problem.
Textbook:1 Chapter 5.2, 5.3, 5.8
Textbook:3 Chapter 4.10, 4.11, 4.12

Unit – V	Contact Hours = 09 Hours

Clustering Techniques
Overview, features of cluster analysis, Types of Data and Computing Distance, Types of Cluster Analysis Methods, Partitional Methods, Hierarchical Methods, Density Based Methods, Quality and Validity of Cluster Analysis.

Textbook:2 Chapter 7.2, 7.4, 7.5, 7.6

Unit No.	Self-Study Topics
2	Alternative methods for generating Frequent Item sets
5	Outlier Analysis, Web mining

Text Books	
1.	Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Addison-Wesley, 2005
2.	Jiawei Han and Micheline Kamber: Data Mining - Concepts and Techniques, 2nd Edition, Morgan Kaufmann Publisher, 2006
3.	G. K. Gupta: Introduction to Data Mining with Case Studies, 3rd Edition, PHI, New Delhi, 2009
Reference Books	
1.	Arun K Pujari: Data Mining Techniques University Press, 2nd Edition, 2009.
E-resouses (NPTEL/SWAYAM.. Any Other)- mention links	
1.	https://www.geeksforgeeks.org/introduction-to-data-mining/
2.	https://www.javatpoint.com/data-mining

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes
		3.	Open Book Assignments (OBA)/Project/Seminar
		4.	Semester End Examination

Course Outcome (COs)			
At the end of the course, the student will be able to		**Learning Level**	**PO(s)**
CO1	**Explain** different data mining concepts used in association analysis, classification technique etc. and make use of similarity and dissimilarity measures to solve real world problem.	L2	PO1, PO3
CO2	**Identify** the concept of association rules and demonstrate FP-growth algorithm for discovering frequent item sets in real world domains.	L3	PO3, PO4
CO3	**Apply** decision tree, rule based, instance based classification, clustering techniques i.e., k-nearest neighbor, Bayesian classifier etc. to make model in solving real world problems.	L3	PO4, PO5
CO4	**Analyze** the problems using machine learning algorithms for prediction and knowledge discovery from large data repository.	L4	PO4, PO5

Scheme of Continuous Internal Evaluation (CIE)

Theory 100 marks					Total
IA Test 1	IA Test 2	Other Assessment (OBA/Seminar/Project)	Quiz 1	Quiz 2	
25	25	20	15	15	100

Eligibility for SEE:
1. 50% and above (50 marks and above) in theory component

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration
2.	**Minimum marks required in SEE to pass: 40% of the maximum marks i.e 40 out of 100. In aggregate the students have to secure 50% total marks of the course (CIE + SEE).**

Rubrics: Levels	Target
1 (Low)	Low (L): If 60% of marks are scored by less than 50% of the students.
2 (Medium)	Medium (M): If 60% of marks are scored by 50% to 70% of the students.
3 (High)	High (H): If 60% of marks are scored by 70% of the students.

Course Articulation Matrix												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
1	✓		✓									
2			✓	✓								
3				✓	✓							
4				✓	✓							
Tick mark the CO and PO mapping												

S.No	Skill & Competence enhanced after undergoing the course	Applicable Sectors & domains	Job roles students can take up after undergoing the course
1	➢ Programming languages, Data engineering, exploratory data analysis, models, Services and Deploying are the skill sets enhanced after completion of the course.	➢ Widely used by various E-commerce and entertainment companies such as Amazon, Netflix, etc., for product recommendation to the user.	➢ Data Scientist. ➢ Data Engineer.

Data Analysis using R

Course Code	22MCA363	Course type	Open Elective	Credits L-T-P	2 – 0 - 2
Hours/week: L - T- P	2 - 0 - 2			Total credits	3
Total Contact Hours	L = 35 Hrs; T = 0 Hrs; P = 10 Hrs; Total = 45 Hrs			CIE Marks	100
				SEE Marks	100

	Course learning objectives
1.	To emphasize to learn R Programming language.
2.	To explore Graphics, modelling, write functions and use R in an efficient way.
3.	To fit some basic types of statistical models and use R in their own research work.
4.	To perform data analytics, data visualisation using R.
5.	To emphasize students to become data analyst.

Required Knowledge:
Basics of Mathematics and Statistics
Basics of Programming

Unit – I	Contact Hours = 08 Hours

Introduction
Introduction, How to run R, R Sessions and Functions, Basic Math, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes.
Textbook 2 Chapter 1 (1.1 to 2.2, 4.1-5.4)

Unit – II	Contact Hours = 06 Hours

R Programming Structures
R Programming Structures, Control Statements, Loops, - Looping Over Non vector Sets-If-Else, Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objective, No Pointers in R, Recursion, A Quick sort Implementation.
Textbook 1 Chapter 7 (7.1 to 7.9)

Unit – III	Contact Hours = 07 Hours

Doing Math and Simulation in R
Doing Math and Simulation in R, Math Function, Extended Example Calculating Probability-Cumulative Sums and Products-Minima and Maxima- Calculus, Sorting, Linear Algebra Operation on Vectors and Matrices, Extended Example: Vector cross Product, Set Operation, Input /Output, Accessing the Keyboard and Monitor, Reading and writer Files.
Textbook 1 Chapter 8 (8.1 to 10.2)

Unit – IV	Contact Hours = 07 Hours
Graphics and working with databases in R	

Graphics, Creating Graphs, The Workhorse of R Base Graphics, the plot () Function – Customizing Graphs, Saving Graphs to Files, Connecting with database in R– Connecting MySQL with R, create tables, insert into tables, updating a tables in R.
Textbook 1 Chapter 12 (12.1. to 12.3)

Unit – V	Contact Hours = 07 Hours
Basics of Statistics and Introduction to Machine Learning in R	

Basic Statistics, Correlation and Covariance, Linear Models, Simple Linear Regression, -Multiple Regression Generalized Linear Models, Logistic Regression, - other Generalized Linear Models- Survival Analysis, Nonlinear Models, Decision- Random Forests
Textbook 2 Chapter 17 (17.1 to 23.67)

Unit No.	Self-Study Topics
2	Extended Example: A Binary Search Tree
4	Dropping tables in R

Books	
Text Books	
1.	The Art of R Programming, Norman Matloff, Cengage Learning / No starch press, 2011
2.	Jared P Lander, R for Everyone: advanced analytics and graphics, Pearson Education, 2013
Reference Books	
1.	R Cookbook, Paul Teetor, Oreilly, 2011.
E-resources (NPTEL/SWAYAM.. Any Other)- mention links	
1.	https://www.geeksforgeeks.org/working-with-databases-in-r-programming/

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes
		3.	Open Book Assignments (OBA)/Project/Seminar
		4.	Semester End Examination

Course Outcome (COs)			
At the end of the course, the student will be able to		**Learning Level**	**PO(s)**
CO1	**Illustrate** the basic structures of R Programming, built-in functions for math, visualisation, probability distributions and database connectivity.	L2	PO1
CO2	**Experiment with** basic structures, advanced data structures in R, built-in functions for math, statistical distributions and database connectivity for solving given problem.	L3	PO3
CO3	**Make use of** basic structures of R, built-in functions for math, basic types of statistical distributions, and	L3	PO3

	data visualization in R, database connectivity for performing effective data analytics.			
CO4	**Examine** and apply the suitable and useful R programming constructs to solve the engineering problems.	L4		PO3, PO5

Lab Experiments:
1. Implementation of Quick Sort
2. Implementation of Probability
3. Graphical analysis of a dataset
4. Database connectivity & basic operations
5. Developing decision tree model

Scheme of Continuous Internal Evaluation (CIE)

Theory 100 marks					Total
IA Test 1	IA Test 2	Other Assessment (Lab Journal)	Quiz 1	Quiz 2	
25	25	20	15	15	100

Eligibility for SEE:
1. 50% and above (50 marks and above) in theory component

Scheme of Semester End Examination (SEE):			
1.	Write-up	10	
2.	Data Analysis based on the objectives	20	
3.	Plotting and Visualization	20	100 marks
4.	Viva	20	
5.	Presentation of Project	20	
6.	Project Dissertation	10	
Minimum score for passing this course : 40%			

1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass: 40% of the maximum marks i.e 40 out of 100. In aggregate the students have to secure 50% total marks of the course (CIE + SEE).**

Rubrics: Levels	Target
1 (Low)	Low (L): If 60% of marks are scored by less than 50% of the students.
2 (Medium)	Medium (M): If 60% of marks are scored by 50% to 70% of the students.
3 (High)	High (H): If 60% of marks are scored by 70% of the students.

Course Articulation Matrix												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
1	✓											
2			✓									
3			✓									
4			✓		✓							
Tick mark the CO and PO mapping												

S.No	Skill & Competence enhanced after undergoing the course	Applicable Sectors & domains	Job roles students can take up after undergoing the course
1.	➢ General skills that have basic statistical and mathematical knowledge and reporting tools.	➢ Healthcare ➢ Academics ➢ Consulting ➢ Finance ➢ Media	➢ Data Scientist ➢ Data Analyst ➢ R programmer ➢ Data Visualization Analyst

Software Testing

Course Code	22MCA364	Course type	Theory	Credits L-T-P	3 – 0 - 0
Hours/week: L - T- P	3 - 0 – 0			Total credits	3
Total Contact Hours	L = 45 Hrs; T = 0 Hrs; P = 0 Hrs; Total = 45 Hrs			CIE Marks	100
				SEE Marks	100

Course learning objectives	
1.	To provide basics of software testing and various types testing and concepts for testers.
2.	To explore the concepts of boundary value, equivalence class and decision table based testing
3.	To explore path testing, data flow testing and decision table based testing methodologies.

Required Knowledge: NA

Unit – I	Contact Hours = 9 Hours

Introduction to Software Testing
Introduction Evolution of Software Testing Software Testing—Myths and Facts Goals of Software Testing Psychology for Software Testing Software Testing Definitions Model for Software Testing Effective Software Testing Vs Exhaustive Software Testing
Effective Testing is Hard Software Testing as a Process Schools of Software Testing Software Failure Case Studies.
Software Testing Terminology and Methodology:
Software Testing Terminology Software Testing Life Cycle (STLC) Software Testing Methodology.
Textbook:1 Chapter1,2

Unit – II	Contact Hours = 9 Hours

Verification and Validation
Verification and Validation (V&V) Activities Verification, Verification of Requirements Verification of High-level Design Verification of Low-level Design How to Verify Code? Validation.
Dynamic Testing: Black-Box Testing Techniques
Boundary Value Analysis (BVA) Equivalence Class Testing State Table-Based Testing Decision Table-Based Testing Cause-Effect Graphing Based Testing Error Guessing**.**
Textbook:1 Chapter 3,4

Unit – III	Contact Hours = 9 Hours

Path Testing
Program Graphs, DD Paths, Basis path testing; Data flow testing: Define/Use Testing, Slice-Based Testing, program slicing tools; Life Cycle–Based Testing: Traditional Waterfall Testing, Testing in Iterative Life Cycles, Agile Testing.
Textbook:2 Chapter 4

Unit – IV	Contact Hours = 9 Hours

Managing the Testing Process
Test Management, Test Organization, Structure of Testing Group, Test Planning, Detailed Test Design and Test Specifications
Testing Metrics for Monitoring and Controlling the Testing Process:
Measurement Objectives for Testing, Attributes and Corresponding Metrics in Software Testing, Attributes, Estimation Models for Estimating 'Testing Efforts, Architectural Design Metric Used for Testing, Information Flow Metrics Used for Testing, Cyclomatic Complexity Measures for Testing, Function Point Metrics for Testing, Test Point Analysis (TPA) Some Testing Metrics
Textbook:1 Chapter 9,11

Unit – V	Contact Hours = 9 Hours

Software Quality Management
Software Quality, Broadening the Concept of Quality, Quality Cost, Benefits of Investment on Quality, Quality Control and Quality Assurance. Quality Management (QM) QM and Project Management, Quality Factors, Methods of Quality Management, Software Quality Metrics, SQA Models.
Test Automation
Automation and Testing Tools, need for Automation, Categorization of Testing Tools, Selection of Testing Tools, Costs Incurred in Testing Tools, Guidelines for Automated Testing, Overview of Some Commercial
Textbook:1 Chapter 13,15

Unit No.	Self-Study Topics
4	Analyze the various testing tools preferred by the industry for Quality Management Process.

Books
Text Books

1.	Software Testing Principles and Practices - By Naresh Chauhan, Oxford university Press.
2.	Software Testing, A Craftsman's Approach, Paul C. Jorgensen, 4th Edition, First Indian Reprint, 2014, Auerbach Publications, ISBN-13:9781466560680

Reference Books

1.	Adithya P.Mathur " Foundations of Software Testing – Fundamental Algorithms and Techniques", Pearson Education India, 2011
2	Software Testing principles and practices- By Srinivasan Desikan, Gopalaswamy Ramesh, Pearson Ed.

E-resourses (NPTEL/SWAYAM.. Any Other)- mention links

1.	https://www.ibm.com/topics/software-testing

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes
		3.	Open Book Assignments (OBA)/Project/Seminar
		4.	Course Seminar
		5.	Semester End Examination

Course Outcome (COs)		
At the end of the course, the student will be able to	Learning Level	PO(s)
CO1 Demonstrate the fundamentals concepts of software testing.	2	1
CO2 Apply the testing concepts using various testing tools/techniques.	3	4,5
CO3 Develop the skill of maintaining and updating test cases as the software evolves.	3	5
CO4 Analyze effective test cases and test the data to identify bugs in the software	4	5,10

Scheme of Continuous Internal Evaluation (CIE)

Theory 100 marks					Total
IA Test 1	IA Test 2	Other Assessment (OBA/Seminar/Project)	Quiz 1	Quiz 2	
25	25	20	15	15	100

Eligibility for SEE:
1. 50% and above (50 marks and above) in theory component

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration
2.	**Minimum marks required in SEE to pass: 40% of the maximum marks i.e 40 out of 100. In aggregate the students have to secure 50% total marks of the course (CIE + SEE).**

Rubrics: Levels	Target
1 (Low)	Low (L): If 60% of marks are scored by less than 50% of the students.
2 (Medium)	Medium (M): If 60% of marks are scored by 50% to 70% of the students.
3 (High)	High (H): If 60% of marks are scored by 70% of the students.

Course Articulation Matrix												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
1	✓											
2				✓	✓							
3					✓							
4					✓				✓			
Tick mark the CO and PO mapping												

S.No	Skill & Competence enhanced after undergoing the course	Applicable Sectors & domains	Job roles students can takeup after undergoing the course
	Students will be able to understand, • Test Planning and Management concepts • Various types of testing available. • Importance of Testing in delivering the products	• IT industry. • Telecommunications. • Automation Industry • Healthcare. • Defence.	• Software Tester/QA Analyst • Automation Tester • Test Engineer • Quality Assurance (QA) Lead/Manager • Performance Tester

SOCIETAL PROJECT

Course Code	22MCA36	Course type	Project	Credits L-T-P	0 - 0 - 3
Hours/week: L - T- P	0 - 0 - 3			Total credits	2
Total Contact Hours	L = 00 Hrs; T = 0 Hrs; P = 30 Hrs Total = 30 Hrs			CIE Marks	100
				SEE Marks	NA

Course learning objectives

1.	Learn to identify and define societal problems.
2.	Understand how to balance technical innovation with social responsibility.
3.	Generate innovative and creative solutions to address complex societal challenges.
4.	Improve oral and written communication skills to effectively convey project goals, progress, and results to both technical and non-technical audiences.

Required Knowledge: Software Development Tools & Technologies and Programming Languages

Guidelines

1. Students in consultation with the internal guide as well as with external guide (much preferable) shall involve in applying technology to workout/proposing viable solutions for societal problems.
2. The team should consist of 2 to 3 members and identify and implement a project that addresses any societal issue with the help of technology.

Project Report format

The following format needs to be followed for preparing the report:
Title Page: • Title of the Project • Name of the Institution • Department • Name of the Supervisor/Guide • Name(s) and USN of the Student(s) Abstract • A brief summary of the project, including its objectives, methods, key findings, and conclusions. It should provide a concise overview of the entire report. Table of Contents • List of sections and subsections with their corresponding page numbers. List of Figures/Tables • If applicable, list the figures and tables used in the report with their corresponding page numbers.

1. Introduction
- Background and context of the project.
- Problem statement and objectives.
- Scope and significance of the project.
- Brief overview of the methodology/approach.

2. Literature Review
- Review of relevant literature, research, and existing solutions related to the project's problem domain.
- Discussion of similar projects and their outcomes.

3. Methodology
- Detailed explanation of the methods, tools, and technologies used in the project.
- Description of the project's architecture/design.
- Explanation of algorithms, data structures, or other technical aspects.

4. System Design
- Detailed design of the project's components/modules.
- Flowcharts, diagrams, and schematics if applicable.
- Database schema and design if the project involves a database.

5. Implementation
- Description of the actual coding and development process.
- Challenges faced during implementation and how they were overcome.
- Code snippets or pseudocode for critical algorithms if necessary.

6. Testing and Evaluation
- Description of testing methodologies used to validate the project.
- Testing results, including any bugs encountered and how they were fixed.
- Performance evaluation metrics if applicable.

7. Results and Discussion
- Presentation of the project's outcomes.
- Data analysis and interpretation if applicable.
- Comparison of the project's results with the initial objectives.

8. Conclusion
- Summary of the entire project, highlighting the achieved outcomes.
- Discussion of the significance of the project in the larger context.
- Lessons learned and potential future work.

9. References
- List of all sources referenced throughout the report, including books, research papers, online resources, and any other materials used.

Course Outcome (COs)			
At the end of the course, the student will be able to		**Learning Level**	**PO(s)**
CO1	**Explain** the social issues and also summarize the ethical issues in their project	L2	PO1, PO2
CO2	**Identify** solutions for societal problems and **develop** a strong sense of ethical responsibility in their project work, considering the potential impact of their actions on society.	L3	PO3, PO5, PO8, PO10, PO11
CO3	**Develop** the ability to communicate complex ideas effectively, both in written and through oral presentations.	L3	PO9, PO11
CO4	**Analyze** information, and draw conclusions which includes understanding the different methodologies and techniques.	L4	PO4, PO5

Scheme of Continuous Internal Evaluation (CIE):
The CIE will be conducted in 2 phases.

CIE 100 Marks		
Phase 1	Phase 2	Total
50 marks	50 marks	100 marks

EVALUATION for Phase-1

Sl. No	Evaluation parameter	Marks
1.	**Problem Definition and Objectives**	**15**
2.	**Literature Review**	**15**
3.	**Requirement Analysis and Feasibility**	**20**
	Total	**50**

EVALUATION for Phase-2

Sl. No	Evaluation parameter	Marks
1.	**System Design**	**15**
2.	**Proposed Viable Solution**	**15**
3.	**Demonstration/Viva Voce**	**10**
4.	**Report**	**10**
	Total	**50**

Rubrics:

Levels	Target
1 (Low)	Low (L): If 60% of marks are scored by less than 50% of the students.
2 (Medium)	Medium (M): If 60% of marks are scored by 50% to 70% of the students.
3 (High)	High (H): If 60% of marks are scored by 70% of the students.

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
1	✓	✓										
2					✓			✓			✓	✓
3								✓			✓	
4				✓	✓							

Tick mark the CO and PO mapping

S.No	Skill & Competence enhanced after undergoing the course	Applicable Sectors & domains	Job roles students can takeup after undergoing the course
1.	Collaboration, Teamwork Communication, Leadership, Critical thinking.	Healthcare, Sports, Public Safety, Farming etc.	Intern in any IT company

Professional Practice

Course Code	22MCA41	Course type	PC	Credits L-T-P	5
Hours/week: L -T- P	--			Total credits	5
Total Contact Hours	--			CIE Marks	100
				SEE Marks	100

Course learning objectives

1 To provide introductory practical experience under close supervision of a Professional in the IT Industry
2 To explore work culture and impart knowledge to acquire communication, interpersonal and other critical skills.

Guidelines for Internship

1. The student shall undergo Internship for minimum 6 weeks during vacations and or last semester.
2. The internship can be carried out in any reputed Public/Private Industry/ R & D organization/ Research Institute/ Educational Institute of repute.
3. Two guides will supervise the internship work, one from the department and another one from the workplace where internship is being carried out.
4. The students shall report the progress of the Internship to the guide at regular intervals and seek his/her advice.
5. After the completion of internship, the students shall submit a report with completion certificate from the respective industry/organization/industry.
6. Internship may be carried in any Technology/Tool that may be used in project work or it can be a feasibility study of the undertaken work or it can be existing system study.
7. After completion of Internship students have to give presentation and submit report.

Report and presentation should consist of following information.

CONTENTS OF THE REPORT

1	**Cover Page**
2	**College Certificate**
3	**Certificate from the industry/Organization**
4	**Declaration by the student**
5	**Acknowledgement**
6	**A Brief Executive Summary of the Internship** A one page summary of the company/institution and a short account of the major activities carried out during the internship period.
7	**Table of Contents** Contents of the report with page numbers, list of tables, and list of figures.
8	**Chapter 1. Description of the company/institution** This section should answer the following questions: • What is the full title of the company/institution? Give a brief history of the company, full mailing address and relevant web links. • What is the type of ownership of the company/institution? State the main shareholders and their shares. • What is the sector that the company/institution operates in? Specify the products and services produced and offered to its customers.

	• Who are regarded as the customers of your internship company/institution (consider the end users, retailers, other manufacturers, employees, etc.)? • Provide an organization chart of the company, along with information on the number of employees. • Provide a list of functions performed by the engineers in the internship organization. • Provide information, in brief, about the department in which internship was undertaken.
9	**Chapter 2. Internship activities** This is the main body of your report. You should present the activities performed during the internship period. All the activities / assignments carried need to be explained in detail as shown below. Week wise activities to be described in the report in detail as shown below • Week number • Activity Title • Activity description • Implementation with necessary code snippets • Screenshots of Execution
10	**Chapter 3. Internship Outcomes** This section shall address the following: • Skills and qualifications you think that you have gained from the internship. • Kind of responsibilities you have undertaken during the internship period. • How do you think the internship will influence your future career plans? • How do you think the internship activities that you carried out are correlated with your classroom knowledge?
11	**Chapter 4. Conclusions of the report** This section should include: • Conclusions derived from the internship experience. • Suggestions for improvement in the industry/organization

RULES FOR WRITING THE INTERNSHIP REPORT:

- Do not write theoretical excerpts from textbooks. Describe what you exactly did there and what experiences you have gained throughout your training.
- The internship report should be minimum 20-25 pages.
- Paper- A4 size, executive bond.
- Line spacing -1.5, Margin- 3cm on the left and 2.5 cm on all the other sides
- Font type - Times new Roman, Font size: Chapter Title -14 point (Bold), Main headings- 12 point (Bold) and sub-headings and body – 12 point, normal.
- You can include graphs, pictures, data, drawings and design calculations in your report; however they should not cover more than 1/3 of the page. They should be properly numbered and should have the caption.
- Larger graphs, pictures, data, drawings, design calculations, codes and program should be given as an Appendix.
- Number of copies: **TWO** (Student copy, Department library copy)

Annexure 1

INTERNSHIP REPORT

A report submitted in partial fulfilment of the requirements for the award of degree of

Master of Computer Applications

[Title of the report]

By

[Student's Full Name]
[USN]

Under Supervision of

External Guide
[Name]
[Designation]
[Company name]
[Company Address]

Internal Guide
[Name]
[Designation]

KLS GOGTE INSTITUTE OF TECHNOLOGY
Udyambag Belagavi 590008
(An Autonomous Institute under VTU, Belagavi)
(Approved by AICTE New Delhi)
DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS

202X-2X

Annexure 2

KLS GOGTE INSTITUTE OF TECHNOLOGY
Udyambag, Belagavi 590008
(An Autonomous Institute under VTU, Belagavi)
(Approved by AICTE New Delhi)
DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS

CERTIFICATE

This is to certify that the Internship Report entitled **[Title of the report]** submitted to the department of Master of Computer Applications, KLS Gogte Institute of Technology, is a record of bonafide work carried out by **[Name] [USN:]** in partial fulfilment for the award of degree of Master of Computer Applications of the Visvesvaraya Technological University, Belagavi during the year **202X-2X**. It is entitled that all suggestions / corrections indicated for internal assessment have been incorporated in the report. The internship report has been approved as it satisfies the academic requirements prescribed for the said degree.

Signature of Internal Guide   **Signature of External Guide**

Signature of HoD   **Signature of Principal**

Sl no.	Name of the Examiner	Date of Viva voce	Signature
1.			
2.			

Course Outcomes

1. **Build** analytical skills, including the ability to understand information, interpret data and solve industry problems.   L3

2. **Analyze** applicability of appropriate tools and or technologies and use them for conducting internship activities.   L4

3. **Select** thoughts and ideas clearly and effectively in written and oral forms as required for particular workplace settings.   L3

4. **Function** with good professionalism and as per industry standards.   L4

	Program Outcome of this course (POs)	**PO No.**
1.	Apply the knowledge of mathematics and computing fundamentals to abstract and conceptualize models from defined problems and requirements.	PO1
2.	Ability to identify, formulate and conduct literature review to solve complex computing problems for obtaining optimal inference.	PO2
3.	Apply research-based knowledge and methods to design experiments, analyze and interpret data with synthesis of information to provide valid conclusions.	PO4
4.	Ability to create, select, adapt and apply appropriate techniques using modern computing tools with an understanding of the limitations.	PO5
5.	Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practices.	PO6
6.	Ability to engage in independent and lifelong learning in the context of technological advancements for continual development as a computing professional.	PO7
7.	Demonstrate knowledge and understanding of the computing and management principles as a member and leader in a team, to manage projects in multidisciplinary environments.	PO8
8.	Ability to communicate effectively on complex computing activities with computing community and the society at large.	PO9
9.	Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.	PO11

Mapping through Direct Assessment:

Rubrics:

Levels	Target
1	Low (L): If 60% of marks are scored by less than 50% of the students.
2	Medium (M): If 60% of marks are scored by 50% to 70% of the students.
3	High (H): If 60% of marks are scored by 70% of the students.

CO-PO Mapping (planned)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	✔	✔		✔							✔	
CO2					✔		✔					
CO3						✔			✔			
CO4						✔	✔	✔	✔		✔	

Scheme of Continuous Internal Evaluation (CIE)

Internship Continuous Evaluation to be done by external / industry guide as per the criteria mentioned below at the end of the internship program.

Internship Evaluation Criteria for External Guides (100 marks)

Criteria	Marks	CO	PO
Professional Attitude, Responsiveness towards instructions and Punctuality	20	1,4	PO1, PO2, PO4, PO6,PO7, PO11
Ability to take Initiative	20	1,2,4	PO1, PO7, PO11
Ability to Learn New Technology	20	1,2	PO5
Quality of Work	20	1,2	PO1, PO2, PO4, PO5, PO8
Oral/Written Communication	20	3	PO8, PO9, PO11
Total	**100**		

Eligibility for SEE:
1. 50% and above (50 marks and above).

Scheme of SEE Evaluation

Internship presentation Evaluation by Examiners (Out of 100 Marks)

Criteria	Marks	CO	PO
Work carried	30	1,2,4	PO1, PO2, PO4, PO5,
Outcome	20	1,2,4	PO1, PO2, PO6, PO7,PO11
Presentation	20	1,3	PO7, PO9
Internship Report Evaluation	20	1,3	PO6, PO7, PO9
Viva	10	3	PO7,PO9
Total	**100**		

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks.
2.	**Minimum marks required in SEE to pass: 40% of the maximum marks i.e 40 out of 100.** **In aggregate the students have to secure 50% total marks of the course (CIE + SEE).**

Sl no.	Skill & Competence enhanced after undergoing the course	Applicable sectors & domains	Job roles students can take up after undergoing the course
1	Professionalism, Technical Advancements,	IT industry in general	Various Job Roles in IT industry

Project Work

Course Code	22MCA42	Credits	12
Course type	PC	CIE Marks	100
Hours/week:	--	SEE Marks	100
Total Hours	---	SEE Duration	3 Hours for 100 Marks

Course learning objectives

1. To explore the industry environment and get acquainted with the tools and technologies used
2. To emphasize the importance of literature survey, identification of problem and framing the problem definition
3. To incorporate various design techniques
4. To utilize industry standard procedures and tools for implementation
5. To explore the validation of software/ application using various testing methodologies
6. To emphasize on oral and written communication through presentations

Pre-requisite: NA

Guidelines

1. Students are required to take up individual project in companies or research work in the Colleges other than the mini project standards already taken up during previous semesters.
2. Project should be real time work, for total of 4 months" duration
3. Project work may be application oriented or research oriented as per student and guide"s interest. Therefore, the project reports will vary depending on whether it is application oriented project or research based project
4. Students should submit project offer letter to their respective guides before starting of theproject.
5. Seminars / presentation should be given on Synopsis, Software Requirement Specifications, Design and Project Completion levels. Advancement in project development must be presented in front of a panel during phases.
6. If project report is not as per the format and not a real-time project, external examiners willhave every right to reject the project.
7. Students are encouraged and appreciated to demonstrate the project / run time behaviour(video) along with power point slides during their viva-voce exams
8. The outcome of the project should be encouraged to present/publish in reviewed Conferences/Journals as papers.
9. The problem statement, literature survey and synopsis of the project must be submitted to the project committee with approval of the internal guide within three weeks from the commencement of 4th semester.
10. Submission and certification of project report is compulsory to qualify for SEE.
11. Failing to meet the above process by candidate may lead to disqualification of the candidate"s project work (22MCA42) course and eventually award of the degree.

Guidelines for the Preparation of Project Reports

1. Printing Area: The margins should be: **Left:** 1.25", **Right**: 1.00", **Top and Bottom**-1.00". The text should be justified to occupy the full line width, so that the right margin is not ragged, with words hyphenated as appropriate. Please fill pages so that the length of the text runs to the right margin.

2. The report must be printed on one side only. Please use a high-resolution printer, preferably a laser printer with at least 300 dpi. Project reports must be printed neatly on one side of the paper on a A4

size bond paper. The reports submitted to the department/guide(s) must be hard bounded with drytone Xerox.

3. Abstract: The abstract should summarize the contents of the report and should contain at least 150 and at most 350 words. It should be set in 12-point font size. There should be two blank (10-point) lines before and after the title **ABSTRACT**.

4. Layout, Typeface, Font Sizes, and Numbering: For the main text, please use 12-point type and 1.5-line spacing. We recommend using **Times New Roman** fonts. Italic type may be used to emphasize words in running text. Bold type and underlining should be avoided.

5. Headings.
The chapter headings should be in capitals and must be separated from the other text by 24point line space. Headings should be in the form where each word is capitalized (i.e., nouns, verbs, and all other words except articles, prepositions, and conjunctions should be set with an initial capital) and should, with the exception of the title, be aligned to the left. The font sizes
are given in Table 1.
Here are some examples of headings: "Criteria to Disprove Context-Freeness of Collage Languages", "On Correcting the Intrusion of Tracing Non-Deterministic Programs by Software", "A User-Friendly and Extendable Data Distribution System", "Multi-flip Networks: Parallelizing GenSAT", "Self-determinations of Man".
Table 1 Font sizes of headings. Table captions should always be positioned above the tables. The final sentence of a tablecaption should end without a period

Heading	Example	Font Size and Style
Title	Chapter 1Introduction	16 Point Bold
First Level Heading	1.1. Preamble	14 Point Bold
Second Level Heading	2.3.1. Mandatory or Regulatory Signs	12 Point Bold
Third Level Heading	Stop and Giveaway signs	12 Point Bold
Fourth Level	Heading *Creation of database*	12 Point Bold Italicized

Figures and Photographs
Check that in line drawings, lines are not interrupted and have constant width. Grids and   details within the figures must be clearly readable and may not be written one on top of the other. The lettering in figures should have a height of 2 mm (10-point type). Figures should be scaled up or down accordingly.
Figures should be numbered and should have a caption which should always be positioned under the figures, in contrast to the caption belonging to a table, which should always appear above the table. Please center the captions between the margins and set them in 9-point type (Fig. 1 shows an example). The distance between text and figure should be about 12 point spacing, the   distance between figure and caption about 6 point spacing.
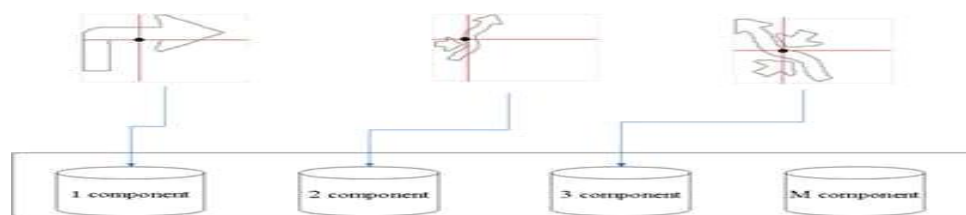

Fig 1.1. The last sentence of a figure caption should generally end without a period

6. Formulas

Displayed equations or formulas are centered and set on a separate line (with an extra line or half line space above and below). Displayed expressions should be numbered for reference. The numbers should be consecutive within each section or within the contribution, with numbers enclosed inparentheses and set on the right margin.

For example, A correlation matrix is computed using equation (5), Here, and is the feature vectors of query examples and is the dimension of feature.

7. Program Code
Program listings or program commands or algorithms in the text are normally set intypewriter font, e.g., CMTT10 or Courier.
Example of an Algorithm is
Algorithm-1: Database Creation (Mean and Standard Deviation based approach)
Fig 1.1. The last sentence of a figure caption should generally end without a period.

Input: Static images of potential traffic sign
Output: Database created.
Methodology:
For each input image do
Step1: Preprocess the image as explained in section 4.3.1
Step2: Calculate the number of components in a sign as explained in section 4.3.1.
Step3: calculate a feature vector as mentioned in section 4.3.2.1.
Step4: Store the feature vector computed in step 3 in the corresponding database,based on number of components present in the sign. For End.
Algorithm End.

8. Footnotes/ Header
Footnotes/Header should appear at the bottom of the normal text area, with a line of about 5 cm in Word set immediately below/above the text.

Header sample: (Project title is left aligned and page number is right aligned)
<<Project Title>><<Page Number>>

Sample Footer:
<College Name>   Department of MCA   2019-2020

9. The list of references is headed "References" and is assigned a number with square brackets in the decimal system of headings. The list should be set in small print and placed at the end of the dissertation, in front of the appendix, if any exists. Please do not insert a page break before the list of references if the page is not completely filled. An example is given at the end of this information sheet in the following format : <Name of Authors>,<Title of the paper>,<Conference name/Journal Name>,<Journal Series and volume (for journals)>,<page numbers>,<year of Publication>.An example for conference in journal are as follows:

> ➢ [1] J. L. Alqueres and J. C. Praca, "The Brazilian power system and the challenge of the Amazon transmission," in Proc. 1991 IEEE Power Engineering Society Transmission and Distribution Conf., pp. 315-320
> ➢ [2] J. F. Fuller, E. F. Fuchs, and K. J. Roesler, "Influence of harmonics on power distribution system protection," IEEE Trans. Power Delivery, vol. 3, pp. 549-557, Apr. 1988.

10. Any references mentioned should be referred in the content of the report by using the relevant reference number inside square bracket.
11. Page Numbering

Reports must be printed with page numbers on the top right corner.

12. The total number of reports to be prepared are three

· One copy to the concerned guide
· One copy for college
· One copy to candidate
· Two CD‟s having soft copy of Project report (for department purpose)

13. Before taking the **final printout**, the approval of the concerned guide is mandatory and suggestedcorrections, if any, must be incorporated.

14. Every copy of the report must contain (See formats towards the end of this document)
1. Outer title page (off white) with a plastic cover
2. Inner title page (White)
3. Certificate in the format enclosed, only certificate will be signed by following:
   - Principal
   - HOD
   - Internal guide and External guide (if project is carried out in company)
   - Guide and/or Co-guide (if project is carried out in college)

15. The **organization of the report** should be as follows
1. Inner title page – Annexure I
2. Certificate – Annexure II
3. Project Completion certificate from Company / College
4. Declaration (by student) – Annexure III
5. Acknowledgement – Annexure IV
6. Abstract
7. Table of Contents – Annexure V
8. List of table and figures
9. Main body of project

Care should be taken to avoid spelling and typing errors. The student should note that report (write-up) should include the important component in the overall evaluation of the project. Sample content (more suitable for Application oriented projects) is attached and number of pages may be 40-70, which can be modified as per guide‟s instructions depending on the project under development. The respective guides can decide how the content of the project report must be organized if the project is research oriented, as a specific format cannot be defined for various domains of research problems.

Note 1 :
Proper attention has to be given to the technical contents as well as to the organization of the report and clarity of the expression.

Note 2 :
All the students should submit the report for each phase to the internal guides one week before the scheduled phase dates.

KARNATAK LAW SOCIETY'S
GOGTE INSTITUTE OF TECHNOLOGY
UDYAMBAG, BELAGAVI-590008
(An Autonomous Institution under Visvesvaraya Technological University, Belagavi)
(APPROVED BY AICTE, NEW DELHI)

Department of Master of Computer Applications

Project Report on
<<Project Title>>
Submitted in partial fulfillment of the requirement for the award of the degree of
Master of Computer Applications

Submitted by
<<Student Name>>

USN : <<USN>>

Internal Guide
<<Name>>
<<Designation.>>
Department of M.C.A.,
K.L.S. Gogte Institute of Technology,
Belagavi

External Guide
<<Name of external guide>>
<<Designation>>
<<Company Name>>
<<City>>

<<(202X-202X)>>

KARNATAK LAW SOCIETY'S
GOGTE INSTITUTE OF TECHNOLOGY
UDYAMBAG, BELAGAVI-590008
(An Autonomous Institution under Visvesvaraya Technological University, Belagavi)
(APPROVED BY AICTE, NEW DELHI)

Department of Master of Computer Applications

CERTIFICATE

This is to certify that the project report entitled **<<Project Title>>**, submitted to the Department of Master of Computer Application, KLS Gogte Institute of Technology, is a record of the bonafide work carried out by Mr./Ms. **<<Name>>**, USN **<<USN>>** in partial fulfillment for the award of the degree of **Master of Computer Applications** of the Visvesvaraya Technological University, Belagavi during the academic year **<<202X – 202X>>**. It is certified that all corrections/suggestions indicated for internal assessment have been incorporated in the report. The project report has been approved as it satisfies the academic requirements prescribed for the said degree.

_____	_____	_____	_____

Internal Guide
<<Name>>
<<Designation>>,
Department of M.C.A.,
K.L.S. Gogte Institute of
Technology, Belagavi.

External Guide
<<Name>>
<<Desig.>>
<<Company>>
<<Place>>

HoD
<<Name>>
<<Designation>>,
Department of M.C.A.,
K.L.S. Gogte Institute of
Technology, Belagavi

Principal
<<Name>>
K.L.S. Gogte Institute of
Technology, Belagavi.

Date:

Final Viva-Voce

	Name of the examiners	Date of Viva -voce	Signature
1.			
2.			

DECLARATION BY THE STUDENT

I <<Name of student>> , hereby declare that the project report entitled <<Project Title>> submitted by me to K.L.S. Gogte Institute of Technology, Belagavi in the partial fulfilment of the degree of **Master of Computer Application**s is a record of the project carried out at <<Name of the company>>. This report is for the academic purpose.

I further declare that this report has not been submitted and will not be submitted, either in part or full, to any other institute or university for the award of any diploma or degree.

Name of the Student	USN	Signature

Place:

Date:

ACKNOWLEDGEMENT

Culmination of project is that stage which makes the transformation a mere theoretical idea into a visible reality. My project acknowledges guidelines, supervision and a lot of inspiration. It is time now to acknowledge my obligations to all who have extended their co-operation all along my study tenure of project work.

I am thankful to Principal <<**Name**>> for having provided us the academic environment in contributing to the success of academic project.

I am deeply grateful to <<**Name**>> our beloved Head of the Department, for having provided us the academic environment which nurtured my practical skills contributing to the success of my project.

I am thankful to <<**Name of guide**>> worthy guide, for her support, cooperation and presence provided to me during the course of the project. My diction falls short of words to gratify the faculty members of our department for being the source of inspiration.

I would like to express my heartfelt gratitude towards my external guide <<Guide's name>> who guided me during the course of the project with <<his/her>> suggestions, cooperation and periodic encouragement for completion of the project.

Lastly, with unquantifiable affection and reference I wish to express my sincere feeling to my parents and friends in the form of words which are restricted in expression and quantum.

<Student Name>

TABLE OF CONTENTS

Course Outcome (COs)		
At the end of the course, the student will be able to		Bloom's Level
1.	**Identify** the relevant information using various sources and evaluate the information to know the need and scope of solutions which can be combined into a project work.	L3
2.	**Make use of** intensive literature survey, **Apply** software development knowledge, **Categorize** various required functionalities to prepare a detailed design of the system with properly outlined modules.	L4
3.	**Choose** efficient tools for designing effective and executable project modules.	L3
4.	**Develop** the software using modern tools/ technologies/ frameworks as per industry standards	L5
5.	**Construct** the test cases for the software using modern testing techniques and validate the software.	L5
6.	**Defend** the project using good oral and written presentation skills	L5

	PROGRAM OUTCOMES(POs)	
1.	Apply the knowledge of mathematics and computing fundamentals to abstract and Conceptualize models from defined problems and requirements.	PO1
2.	Ability to identify, formulate and conduct literature review to solve complex computing problems for obtaining optimal inference.	PO2
3.	Design and develop solutions for complex computing problems, components or processes to meet the specified needs after considering public health and safety, cultural, societal, and environmental factors.	PO3
4.	Apply research-based knowledge and methods to design experiments, analyze and Interpret data with synthesis of information to provide valid conclusions.	PO4
5.	Ability to create, select, adapt and apply appropriate techniques using modern computing tools with an understanding of the limitations.	PO5
6.	Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practices.	PO6
7.	Ability to engage in independent and life long learning in the context of technological advancements for continual development as a computing professional	PO7
8.	Demonstrate knowledge and understanding of the computing and management principles as a member and leader in a team, to manage projects in Multidisciplinary environments	PO8
9.	Ability to communicate effectively on complex computing activities with computing community and the society at large.	PO9
10.	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	PO10
11.	Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments	PO11
12.	Ability to identify an opportunity and execute innovative ideas to create value and sustainable well-beings for the individual and society at large	PO12

Mapping through Direct Assessment:

Rubrics:

Levels	Target
1	Low (L): If 60% of marks are scored by less than 50% of the students.
2	Medium (M): If 60% of marks are scored by 50% to 70% of the students.
3	High (H): If 60% of marks are scored by 70% of the students.

Course Articulation Matrix												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
1	✓	✓								✓		✓
2		✓	✓	✓								
3					✓	✓	✓			✓	✓	
4			✓	✓	✓		✓	✓			✓	
5		✓				✓						
6						✓			✓			✓
Tick mark the CO and PO mapping												

Scheme of Continuous Internal Evaluation (CIE)

Theory Component:					
Components	Phase-1	Phase-2	Phase-3	Report	Total Marks
Internal Guide	20	30	30	20	100
Minimum marks required to qualify for SEE : 50 out of 100					

Scheme of Semester End Examination (SEE)

Scheme of Semester End Examination (SEE):				
Demonstration				
1.	**Criteria**	**Marks**	**CO**	**PO**
	Project Problem definition and Objective	5 marks	CO1, CO2	PO1, PO2, PO3, PO4
	Presentation of Literature review	5 marks	CO1, CO2, CO6	PO2, PO10, PO12
	UI Design and Development / Data pre-processing	10 marks	CO2, CO3, CO4	PO3, PO4, PO5, PO6, PO7
	Implementation and Testing	10 marks	CO3, CO4, CO5	PO5, PO6, PO7, PO8, PO11
	Presentation of results, discussion of results and Conclusion	10 marks	CO2, CO5, CO6	PO2, PO6, PO9
	Viva	10 marks	CO1, CO2, CO6	PO1, PO2, PO9
Dissertation Report Evaluation				

1.	Criteria	Marks	CO	PO
	Relevance of the subject in present context and Novelty	10 marks	CO1, CO2	PO1, PO2, PO3, PO4
	Critical understanding of the topic and Literature review	10 marks	CO1, CO2	PO2, PO10, PO12
	Clarity and completeness of problem formulation/ experiment design	10 marks	CO2, CO3, CO4	PO3, PO4, PO5, PO6, PO7
	Result presentation and discussion	10 marks	CO2, CO5, CO6	PO2, PO6, PO9
	Conclusion and scope of future work	5 marks	CO2, CO6	PO1, PO2, PO9
	Overall Presentation of thesis	5 marks	CO1, CO2, CO6	PO1, PO2, PO6, PO9
2.	**Minimum marks required in SEE to pass: 40% of the maximum marks i.e 40 out of 100.** **In aggregate the students have to secure 50% total marks of the course (CIE + SEE).**			

S.No	Skill & Competence enhanced after undergoing the course	Applicable Sectors& domains	Job roles students can take up after undergoing the course
1.	The course enhances skills in problem-solving, project management, communication, and technical competence.	Applicable to various sectors including IT, software development, research, and academia.	Software Engineer/Developer, Systems Analyst, Database Administrator, Data Scientist/Analyst, Network Administrator, AI/Machine Learning Engineer

Academic Writing

Course Code	22MCA43	Course type	SC	Credits L-T-P	1- 0 - 0
Hours/week: L - T- P	1- 0 - 0			Total credits	4
Total Contact Hours	NA			CIE Marks	100
				SEE Marks	NA

Course learning objectives

1.	To encourage the students to study advanced engineering developments.
2.	To develop academic technical paper writing skill.
3.	To motivate the students to use various teaching aids such as overhead projectors, power point presentation and demonstrative models.
4.	To emphasize on communication capability of the student to present a technical topic.

Guidelines

1. This course is mandatory for all students pursuing MCA degree.

2. One or (maximum) two students can be allotted a seminar topic.

3. The topics should be finalized by the students through consultation with their respective guides.

4. The topics decided for academic technical seminars are expected to be research topics so that it may lead to publications in reputed conferences / journals.

5. Before the end of 3rd Semester, the Seminar title must be finalized.

6. In Phase I, student must be submit minimum 5 literature review related to title.

7. Phase II and Phase III must be conducted with analysis and conclusion respectively. Phase III is the final phase where all the changes are expected to be incorporated as per suggestion in previous two phases.

8. A panel of examiners will evaluate each phase and the panel will have full authority to judge the quality of work.

9. Student should submit the final academic technical seminar report as per the following format: The first two pages should have cover page and certificate page respectively. The format of these two pages are provided in the Annexure-1 and Annexure-2. The content of the report should start from third page and should strictly follow the IEEE format (For IEEE format students are advised to visit https://www.coep.org.in/page_assets/491/IEEE_Template_4.pdf). The content part should consist of at least 8-10 pages.

Course Outcomes (COs)			
At the end of the course, the student will be able to		Learning Level	PO(s)
CO1	**Interpret** the material in organized manner.	L2	PO7
CO2	**Apply** the changes in the technologies relevant to the topic selected based on literature review.	L3	PO2, PO6
CO3	**Utilize** the technology and interpret the impact on the society, environment and domain.	L3	PO3, PO9, PO10
CO4	**Analyze** report of the study and present to the audience, following the ethics.	L4	PO6, PO11

Scheme of Continuous Internal Evaluation (CIE): No SEE for Academic Writing.

Topic relevance	Content	Presentation	Adherence to IEEE format	Impact factor/significance of conference / journal
10	**40**	**20**	**10**	**20 (**Distribution of this mark is given at the "Note" below this table)
Note: Minimum duration for presentation is 12 minutes + 3 minutes QA **Minimum marks required to pass : 50 out of 100**				

NOTE: For CIE (publication) component, the marks distribution is as follows:

(Guides have to maintain record for the same for the students under them)

For publication in reputed journal (like IEEE/Scopus/SCI indexed journals etc.) – **20marks.**

If presented/communicated in reputed conferences (like IEEE/Springer/ACM etc.)- **15marks**

For publication in journal/conference (peer-reviewed / refereed) - **10 marks.**

If communicated to any other journal/conference – **05 marks.**

If communicated to any other journal/conference but not published or presented in any conferences (in the discretion of guides) – **02 marks.**

Rubrics:

Levels	Target
1 (Low)	Low (L): If 60% of marks are scored by less than 50% of the students.
2 (Medium)	Medium (M): If 60% of marks are scored by 50% to 70% of the students.
3 (High)	High (H): If 60% of marks are scored by 70% of the students.

Course Articulation Matrix												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
1							✓					
2		✓				✓						
3			✓						✓	✓		
4						✓					✓	
Tick mark the CO and PO mapping												

S. No	Skill & Competence enhanced after undergoing the course	Applicable Sectors & domains	Job roles students can take up after undergoing the course
1	Enhancement in academic technical paper writing and presentation skill.	All technical domains.	NA

Technical Certification

Course Code	22MCA44X	**Course type**	Theory	**Credits L-T-P**	2 – 0 - 0
Hours/week: L - T- P	NA - 0 - 0			**Total credits**	2
Total Contact Hours	L = 30 Hrs; T = 0 Hrs; P = 0 Hrs; Total = 30 Hrs			**CIE Marks**	25
				SEE Marks	NA

Course learning objectives	
1.	To impart fundamental concepts in the area of recent trends
2.	To explore the features of recent trends paradigm.

Required Knowledge: NA

Recommended Course Platform	
1.	NPTEL, Coursera
2.	College Approved Courses
3.	College Designed Courses

Guidelines for Certification Courses:

1. The student should take up certification from the college Approved/Recommended list.
2. The certification course should be of min 30 Hrs.
3. The certification course should be assessed with Grade/Percentage/Marks.
4. The student should take up the course which is not listed in the syllabus.
5. After the course completion the student has to submit the copy of certificate to the mentor.

Course Outcome (COs)			
At the end of the course, the student will be able to		**Learning Level**	**PO(s)**
CO1	Familiarize and study the variety of courses which will add professional value to their learning	L3	PO5,PO7

Scheme of Continuous Internal Evaluation (CIE)

Certificate Grading:

Percentage - wise	100%(25)	91-99%(24-23)	81-90%(22-20)	71-80%(20-18)	61-70%(17-15)
Grade-wise	21- 25(A grade)	18 - 20(B grade)	17- 15(C Grade)	14- 13(D Grade)	12(E Grade)

Eligibility for SEE: NA

Scheme of Semester End Examination (SEE): NA

Rubrics: Levels	Target
1 (Low)	Low (L): If 60% of marks are scored by less than 50% of the students.
2 (Medium)	Medium (M): If 60% of marks are scored by 50% to 70% of the students.
3 (High)	High (H): If 60% of marks are scored by 70% of the students.

Course Articulation Matrix												
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
1					✓		✓					
Tick mark the CO and PO mapping												

S.No	Skill & Competence enhanced afterundergoing the course	Applicable Sectors & domains	Job roles students can take up after undergoing the course
1	The certification course taken up provides the respective skill and competence	Applicable to the respective courses taken up	Respective course related Jobs can be acquired.