



Estd: 1939

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: 1979



2024-25 Scheme

Department: MCA

Programme: MCA

1st to 4th Semester Scheme of Teaching and Examination

3rd and 4th 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.

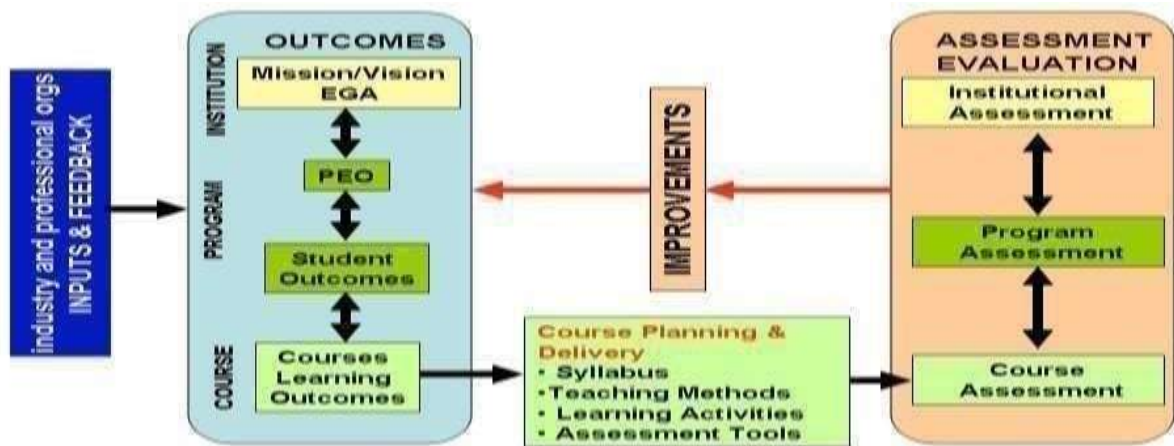
DEPARTMENT VISION

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.	(Foundation Knowledge): Apply knowledge of mathematics, programming logic and coding fundamentals for solution architecture and problem solving.
2.	(Problem Analysis): Identify, review, formulate and analyze problems primarily focusing on customer requirements using critical thinking frameworks.
3.	(Development of Solutions): Design, develop and investigate problems with as an innovative approach for solutions incorporating ESG/SDG goals.
4.	(Modern Tool Usage): Select, adapt and apply modern computational tools such as development of algorithms with an understanding of the limitations including human biases.
5.	(Individual and Teamwork): Function and communicate effectively as an individual or a team leader in diverse and multidisciplinary groups. Use methodologies such as agile.
6.	(Project Management and Finance): Use the principles of project management such as scheduling, work breakdown structure and be conversant with the principles of Finance for profitable project management.
7.	(Ethics): Commit to professional ethics in managing software projects with financial aspects. Learn to use new technologies for cyber security and insulate customers from malware
8.	(Life-long learning): Change management skills and the ability to learn, keep up with contemporary technologies and ways of working.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

1. PEO1 – Problem Solving using Emerging Technologies
Postgraduates will design and implement creative, user-centric solutions to real-world and societal problems by leveraging strong fundamentals in computer applications, mathematics and evolving Information Technologies.
2. PEO2 – Professional Excellence
Postgraduates will excel as IT professionals by integrating technical expertise with innovation and software development practices to deliver market-ready, scalable, and secure computing solutions.
3. PEO3 – Ethical Leadership and Collaboration
Postgraduates will demonstrate leadership, effective communication, and teamwork skills while upholding ethics, integrity, and social responsibility in diverse, interdisciplinary, and global work environments.
4. PEO4 – Lifelong Learning and Adaptability
Postgraduates will engage in continuous professional development, adapting to technological advancements and industry changes to remain competitive in the global IT landscape.

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 21st century. 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, written and graphic communication.
L3	Applying	Carry out or use a procedure in a given situation – using learned knowledge.
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 relate to an overall structure or task.
L5	Evaluating	Make judgments based on criteria and standards, using previously learned knowledge.
L6	Creating	Combining or reorganizing elements to form a coherent or functional whole or into a new pattern, structure or idea.

Scheme for 2024 M.C.A.

Total credits for M.C.A. Program

	Semester	Credits per Semester	Total credits
1 st year	1	22	43
	2	21	
2 nd year	3	21	37
	4	16	
	Total		80

Curriculum framework:

Sl. No.	Course		Credits
1.	Integrated Professional Core Course	IPCC	45
2.	Professional Core Course	PCC	4
3.	Professional Elective Course	PEC	12
4.	Basic Science	BSC	4
5.	Non Credit Mandatory Course	NCMC	0
6.	Ability Enhancement Course	AEC	0
7.	Project	PROJ	11
8.	Internship	MINT	3
9.	Technical Seminar	TS	1
			80

Credit definition:

Lecture (L): One Hour /week – 1 credit

Tutorial (T): Two hour /week – 1 credit

Practical (P): Two hours/week –1credit

I SEMESTER (MCA)												
Sl. No	Course Type	Course Code	Course Title	Teaching Hours per Week			Examination				Credits	
				Theory	Practical/Seminar	Tutorial/SDA	Duration in hours	CIE Marks		SEE Marks		Total Marks
								L	P			
1	IPCC	MMC101	Python Programming	4	2	0	6	60	40	100	200	5
2	IPCC	MMC102	Database Management System	4	2	0	6	60	40	100	200	5
3	IPCC	MMC103	Computer Networks and Communication	4	2	0	6	60	40	100	200	5
4	PCC	MRMI104	Research Methodology and IPR	3	0	0	3	100		100	200	3
5	BSC	MMC105	Discrete Mathematics and Statistics	3	0	2	5	100		100	200	4
6	NMC	MMC106	Basics of Programming Languages – Bridge Course	4	2	0	6	100		-	100	0
7	NMC	MMAT107	Mathematics Bridge Course	3	0	0	3	100		-	100	0
				25	8	2	35	700		500	1200	22

Note: **BSC**-Basic Science Courses, **PCC**: Professional core course. **IPCC**-Integrated Professional Core Courses, **NMC**- Non Credit Mandatory Course, **L**-Lecture, **P**-Practical, **T/SDA**-Tutorial / Skill Development Activities (Hours are for Interaction between faculty and students), **GE**: General Elective. **PEC**: Professional Elective Course.

BSC: Basic Science Courses: Courses like Mathematics/ Science are the prerequisite courses that the concerned engineering stream board of Studies will decide. **PCC: Professional Core Course:** Courses related to the stream of engineering, which will have both CIE and SEE components, students have to qualify in the course for the award of the degree. **Integrated Professional Core Course (IPCC):** Refers to a Professional Theory Core Course Integrated with practicals of the same course. The IPCC's theory part shall be evaluated by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. **Project Based Learning (PBL):** For these courses the Semester End Examination will be a project. **Project Based Evaluation (PBE):** Project Based Evaluation is a Course where the students will demonstrate the project work in the SEE. **Basics of Programming Languages - Bridge Course:** This course is mandatory for the students from UG programs of B.Com, B.Sc (Non Computer Applications). **Mathematics Bridge Course:** Students who have taken admission to MCA without studying mathematics at 10+2 or degree level are required to take up this course.

II SEMESTER (MCA)												
Sl. No	Course Type	Course Code	Course Title	Teaching Hours per Week			Examination				Credits	
				Theory	Practical/Seminar	Tutorial/SDA	Duration in hours	CIE Marks		SEE Marks		Total Marks
								L	P			
1	IPCC	MMC201	Web Design and Development	4	2	0	6	60	40	100	200	5
2	IPCC	MMC202	Data Structures and Algorithms	3	2	2	7	60	40	100	200	5
3	IPCC	MMC203	Programming using Java and J2EE	4	2	0	6	60	40	100	200	5
4	NCMC	MMC204	Professional Communication and Ethics	0	2	0	2	100	-	100	100	0
5	PEC	MMC215X	Professional Elective Course-1	3	0	0	3	100	100	200	200	3
6	PEC	MMC216X	Professional Elective Course-2	3	0	0	3	100	100	200	200	3
7	AEC	MAEC257	Employability Skill	2	0	0	2	100	-	100	100	0
				19	8	2	30	700	500	1200	1200	21

Note: **BSC**-Basic Science Courses, **PCC**: Professional core course. **IPCC**-Integrated Professional Core Courses, **NCMC**- Non-Credit Mandatory Course, **L**-Lecture, **P**-Practical, **T/SDA**-Tutorial / Skill Development Activities (Hours are for Interaction between faculty and students), **GE**: General Elective, **PEC**: Professional Elective Course.

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Certification Course: One certification is compulsory and need to be completed before start of 4th semester. Certifications must be chosen from NPTEL/Swayam/Industry/NASSCOM/VTU Online Courses. 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.

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

Professional Elective Course-1 (General Elective)

Sl. No.	Course Code	Course Title
1	MMC215A	Software Project Management
2	MMC215B	IT Infrastructure and Management
3	MMC215C	Digital Systems and Computer Organization
4	MMC215D	Introduction to Salesforce - Industry Supported Elective. PCC(PBE)

Professional Elective Course-2 (Database/Cloud/Security)

Sl. No.	Course Code	Course Title	Group
1	MMC216A	NoSQL	I
2	MMC216B	R Programming - PCC(PBE)	
3	MMC216C	Cloud Computing	II
4	MMC216D	Cryptography and Network Security	

Note: The students that choose courses from:

1. Group I from Professional Elective-2 must compulsorily choose a course from Group-III from Professional Elective-4 in the 3rd semester.
2. Group II from Professional Elective-2 must compulsorily choose a course from Group-IV from Professional Elective-4 in the 3rd semester.

III SEMESTER (MCA)												
Sl. No	Course Type	Course Code	Course Title	Teaching Hours per Week			Examination				Credits	
				Theory	Practical/Seminar	Tutorial/SDA	Duration in hours	CIE Marks		SEE Marks		Total Marks
								TH	L			
1	IPCC	MMC301	C# Programming using .NET	4	2	0	6	60	40	100	200	5
2	IPCC	MMC302	Machine Learning	4	2	0	6	60	40	100	200	5
3	IPCC	MMC303	Big Data Paradigm	4	2	0	6	60	40	100	200	5
4	PEC	MMC314X	Professional Elective Course-3	3	0	0	3	100		100	200	3
5	PEC	MMC315X	Professional Elective Course-4	3	0	0	3	100		100	200	3
				18	6	0	24	500		500	1000	21
<p>Note: BSC-Basic Science Courses, PCC: Professional core course. IPCC-Integrated Professional Core Courses, NCMC- Non Credit Mandatory Course, L-Lecture, P-Practical, T/SDA-Tutorial / Skill Development Activities(Hours are for Interaction between faculty and students), GE: General Elective, PEC: Professional Elective Course.</p>												
<p>BSC: Basic Science Courses: Courses like Mathematics/ Science are the prerequisite courses that the concerned engineering stream board of Studies will decide. PCC: Professional Core Course: Courses related to the stream of engineering, which will have both CIE and SEE components, students have to qualify in the course for the award of the degree. Integrated Professional Core Course (IPCC): Refers to a Professional Theory Core Course Integrated with practicals of the same course. The IPCC's theory part shall be evaluated by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. Project Based Learning (PBL): For these courses the Semester End Examination will be a project. Project Based Evaluation (PBE): Project Based Evaluation is a Course where the students will demonstrate the project work in the SEE.</p>												

Professional Elective Course-3 (General Elective)

Sl. No.	Course Code	Course Title
1	MMC314A	Management and Entrepreneurship for IT Industry
2	MMC314B	Blockchain Technology
3	MMC314C	Artificial Intelligence
4	MMC314D	Software Testing

Professional Elective Course-4 (Web Development/DevOps/Security)

Sl. No.	Course Code	Course Title	Group
1	MMC315A	Full Stack Development - PCC(PBL)	III
2	MMC315B	Advanced Database Management System	
3	MMC315C	Django Framework - PCC(PBE)	
4	MMC315D	Internet of Things - PCC(PBL)	IV
5	MMC315E	Cyber Security and Cyber Laws	
6	MMC315F	DevOps - PCC(PBE)	

Note: The students that choose courses from:

1. Group I from Professional Elective-2 must compulsorily choose a course from Group-III from Professional Elective-4 in the 3rd semester.
2. Group II from Professional Elective-2 must compulsorily choose a course from Group-IV from Professional Elective-4 in the 3rd semester.

IV SEMESTER										
Sl. No	Course	Course Code	Course Title	Teaching Hours /Week		Examination				Credits
				Theory	Practical/ Field work	Duration in hours	CIE Marks	SEE Marks Viva voce	Total Marks	
				L	P					
1	PCC	MMC401X	Certification (MOOC/NPTEL/Swayam /Industry/NASSCOM/VTU Online Courses)		4 weeks/ 30 hrs min	4 weeks/ 30 hrs min	100	-	100	1
1	TS	MMC452	Technical Seminar	--	--	--	100	-	100	1
3	INT	MINT483	Professional Practice (Internship)	--	4 to 6 weeks	4 to 6 weeks	100	100	100	3
4	PROJ	MPRJ484	Project work	--	22 to 25 hrs per week	22 to 25 hrs per week	100	100	200	11
							400	200	600	16

Professional Practice (Internship): The main objective of the internship is to ensure that the intern is exposed to a real-world environment and gains practical experience. Often, it may be a practical exposure to the theory that has been learned during the academic period. The industry internship helps students understand of analytical concepts and tools, hone their skills in real-life situations, and build confidence in applying the skills learned. The students who take up a one-semester Internship in the Industry have to appear SEE at the institute at the end of the semester as per the examination calendar.

Project Work: Students in consultation with the guide shall carry out literature survey/ visit industries to finalize the topic of the Project. Subsequently, the students shall collect the material required for the selected project, prepare a synopsis, and narrate the methodology to carry out the project work. Each student, under the guidance of a faculty, is required to undergo three Phases and also Present the topic on the selected project orally and/or through Power Point slides. Answer the queries and be involved in debate/discussion.

Technical Seminar: Students can present the seminar based on the new technologies in the seminar by all postgraduate students of the program shall be mandatory. The CIE marks awarded for the Seminar shall be based on the evaluation of the Report, Presentation skill, and performance in the Question and Answer session in the ratio 50:25:25. Seminar shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take up/ complete shall be declared as fail in the seminar course and have to complete the same during the subsequent semester.

Certification: Refer 2nd semester scheme for guidelines on certification courses.

C# Programming using .NET (I)

Course Code	MMC301	Course type	IPCC	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 = 20 Hrs Total = 72 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 of : 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: Value Types, Reference Types, Understanding Type Conversions, 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 DataReader 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, TreeView Control, ListView Control, and The Table Control. TabControl and Multiple Document Interface (MDI) Windows.
Textbook 1: Chapter 19, 21.

Unit – V	Contact Hours = 8 Hours
<p>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.</p>	

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	1	<ol style="list-style-type: none"> checked and unchecked exceptions try, catch, finally block throw keyword
2	5	<ol style="list-style-type: none"> Encapsulation using Properties Polymorphism using Indexer Inheritance Interfaces Operator overloading
3	1	9. Windows Application with Database Connectivity
4, 5	1	10. 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., New Delhi Dreamtech Press 2013 and onwards
Reference Books	
1.	Anne Boehm, Joel Murach, Murach's ASP.NET 4 web programming with C# 2010, Mike Murach & Associates Inc.; 4th Edition and onwards
E-resources (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) Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create			
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,PO3
CO2	Apply the object oriented concepts using C#.	L3	PO1,PO3, PO4
CO3	Develop windows application using C# by selecting appropriate database using ADO.NET technology.	L3	PO1,PO3,PO4
CO4	Analyse and Build dynamic and rich web applications with consistent look and authentic validations using ASP.NET technology.	L4	PO1,PO4

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	Conduction	Lab test	
30 marks	30 marks	10 marks	30 marks	100 marks
IA Test:				
1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).				
2. Remaining 20 marks questions in Part B & C should be descriptive.				
Conduct of Lab:				
1. Conducting the experiment and journal: 5 marks				
2. Calculations, results, graph, conclusion and Outcome: 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. Conducting the experiment and writing report: 5 marks				
4. Calculations, results, graph and conclusion: 15 marks				
5. Viva voce: 10 marks				
Eligibility for SEE:				
1. Student should score minimum 50% of 60 marks (i.e. 30 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE				
2. Student should score minimum 50% of 30 marks (i.e. 15 marks) in Lab test & should score 50% of 40 marks (i.e. 20 marks) in Lab component.				
3. Lab test is COMPULSORY				
4. Minimum score in CIE to be eligible for SEE: 50 OUT OF 100.				
5. 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: Score should be $\geq 40\%$, however overall score of CIE+SEE should be $\geq 50\%$.
3.	Question paper contains three parts A,B and C . Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.

	<p>2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks.</p> <p>3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.</p>
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CO PO mapping (planned)								
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
1.	√		√					
2.	√		√	√				
3.	√		√	√				
4.	√			√				
Tick mark the CO 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.	The student will improve their critical thinking and problem-solving skills, enabling them to develop Windows and Web applications using efficient controls, secure features, and robust technologies that support scalable, faster, and more effective deployment.	Any IT Company/Sector that uses .NET technologies in the development of the following applications: <ol style="list-style-type: none"> 1. Web Applications 2. Desktop Applications 3. Mobile Applications 	<ol style="list-style-type: none"> 1. Windows Application Developer 2. Web Application Developer.

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

Machine Learning (I)

Course Code	MMC302	Course type	IPCC	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 = 0Hrs; P = 20 Hrs Total = 72 Hrs			CIE Marks	100
				SEE Marks	100

Course learning objectives

1.	To introduce the basic theory underlying machine learning, types, and the processing techniques.
2.	To illustrate various machine learning algorithms such as 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 of:

1. Python Programming (MMC101)
2. Discrete Mathematics and Statistics (MMC105)

Unit – I

Contact Hours = 12 Hours

Introduction to Machine Learning: Need for Machine Learning, Machine Learning Explained, Machine Learning in Relation to Other Fields, Types of Machine Learning, Challenges of Machine Learning, Machine Learning Process, Machine Learning Application.

Concept learning task, Concept learning as Search, Find-S algorithm. Introduction, Data Mining Tasks, Data Preprocessing, Measures of Similarity and Dissimilarity.

Textbook 3: Chapter – 1 (1.1-1.7)

Textbook 1: Chapter – 2 (2.1-2.4)

Textbook 2: Chapter – 2 (2.1-2.4)

Unit – II

Contact Hours = 10 Hours

Decision Tree Learning: Basics, General Approach to Solve Classification problem, Decision Tree Induction, Model Over fitting, Evaluating the performance of a classifier.

Textbook 2 : Chapter – 4 (4.1- 4.5)

Unit – III

Contact Hours = 10 Hours

Clustering Techniques: Overview, Types of Cluster Analysis Methods, K-means, Agglomerative Hierarchical Clustering, DBSCAN, Cluster Evaluation.

Textbook 2 : Chapter – 8(8.1- 8.5)

Unit – IV

Contact Hours = 10 Hours

Introduction, Nearest Neighbor Classifiers, Algorithm, Characteristics of Nearest-Neighbor Classifier.

Bayesian Learning and Instance Based Learning, Introduction, Bayes theorem, Using Bayes Theorem for Classification, Naive Bayes classifier.

Textbook 2 : Chapter – 5 (5.2,5.3.3)

Unit – V	Contact Hours = 10 Hours
Artificial Neural Networks: Introduction, Biological Neurons, Artificial Neurons, Simple Model of an artificial Neuron, Artificial Neural Network Structure, Activation Functions, Perceptron and learning Theory , Types of ANN. Textbook 3: Chapter – 1 (10.1-10.4)	

Books	
Text Books:	
1.	Tom M Mitchell, "Machine Learning", McGraw Hill, 1st Edition, 2003 and onwards.
2.	Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson, LPE,2014 and onwards.
3.	S Sridhar and M Vijayalakshmi , "Machine Learning", Oxford University Press, 2021 and onwards.
Reference Books:	
1.	Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, 2nd Edition, 2010 and onwards.
2.	Stephan Marsland, "Machine Learning - An Algorithmic Perspective", Chapman and Hall, 1st Edition, 2009 and onwards.
3.	Nils Nilsson, "Introduction to Machine Learning", MIT Press, 1997 and onwards.
4.	Jude Shavil, Thomas G Dietterich, "Readings in Machine Learning", Morgan Kaufmann Publishers, 1990 and onwards.
E-resources links	
1.	Web links and Video Lectures (e-Resources): <ul style="list-style-type: none"> • https://developers.google.com/machine-learning/crash-course • https://www.drssridhar.com/?page_id=1053 • https://www.universitiespress.com/resources?id=9789393330697 • https://onlinecourses.nptel.ac.in/noc23_cs18/preview • https://www.geeksforgeeks.org/machine-learning/ • https://www.w3schools.com/python/python_ml_getting_started.asp • https://www.tutorialspoint.com/machine

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

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
I	1	1. Linear regression
I	2	2. SMC and Jaccard 3. Euclidean distance
II	1	4. Decision tree for given dataset (Diabetes)
III	1	5. k-Means clustering
IV	1	6. KNN(K-Nearest-Neighbor)
V	1	7. Neural Networks

Course Outcome (COs)			
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create			
At the end of the course, the student will be able to		Learning Level	PO(s)
CO 1	Demonstrate the types of machine learning, roles of preprocessing techniques and various similarity and dissimilarity measures.	L2	PO1,PO3, PO4
CO 2	Illustrate and Apply Decision Trees, Naive Bayes, K-Nearest Neighbors (KNN) algorithm for classification problems and Bayesian models for probabilistic learning.	L3	PO1, PO3,PO4
CO 3	Demonstrate and Build perceptron / Artificial Neural Networks to perform the classification.	L3	PO1, PO3,PO4
CO 4	Explain and Analyze the basic clustering techniques namely K-means, Agglomerative Hierarchical Clustering, DBSCAN on real world data sets.	L2, L4	PO1, PO3,PO4

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	Conduction	Lab test	
30 marks	30 marks	10 marks	30 marks	100 marks
IA Test:				
<ol style="list-style-type: none"> No objective part in IA question paper All questions descriptive 				
Conduct of Lab:				
<ol style="list-style-type: none"> Conducting the experiment and journal: 5 marks Calculations, results, graph, conclusion and Outcome: 5 marks 				
Lab test: (Batch wise with 15 students/batch)				
<ol style="list-style-type: none"> Test will be conducted at the end of the semester Timetable, Batch details and examiners will be declared by Exam section Conducting the experiment and writing report: 5 marks Calculations, results, graph and conclusion: 15 marks Viva voce: 10 marks 				
Eligibility for SEE:				
<ol style="list-style-type: none"> Student should score minimum 50% of 60 marks (i.e. 30 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE Student should score minimum 50% of 30 marks (i.e. 15 marks) in Lab test & should score 50% of 40 marks (i.e. 20 marks) in Lab component. Lab test is COMPULSORY Minimum score in CIE to be eligible for SEE: 50 OUT OF 100. 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: Score should be ≥ 40 &, however overall score of CIE+SEE should be $\geq 50\%$.
3.	Question paper contains three parts A, B and C . Students have to answer <ol style="list-style-type: none"> From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.

2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks.
3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO PO mapping (planned)

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
1.	✓		✓	✓				
2.	✓		✓	✓				
3.	✓		✓	✓				
4.	✓		✓	✓				

Tick mark the CO 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.

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

Big Data Paradigm (I)

Course Code	MMC303	Course type	IPCC	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 = 20 Hrs Total = 72 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 of: Programming using Java and J2EE (I)(MMC203)

Unit – I	Contact Hours = 10 Hours
<p>Overview of Big data</p> <p>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.</p> <p>Textbook 1: Chapter 1, 2 and 3</p>	

Unit – II	Contact Hours = 11 Hours
<p>Hadoop Ecosystem</p> <p>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.</p> <p>Textbook 1: Chapter 4</p>	

Unit – III	Contact Hours = 10 Hours
<p>Understanding Map Reduce and YARN</p> <p>The Map Reduce Framework: Exploring the Features of Map Reduce, Working of Map Reduce, Exploring Map and Reduce Functions, Uses of Map Reduce.</p> <p>YARN Architecture: Background; Advantages of YARN</p> <p>Textbook 1: Chapter 5 and 11</p>	

Unit – IV	Contact Hours = 11 Hours
<p>Hive and Analysing Data with Spark</p> <p>Getting started with Hive, Hive Services, Data types in Hive, Built-in Functions in Hive. Hive DDL.</p> <p>Introduction to Apache Spark</p> <p>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.</p> <p>Textbook 1: Chapter 12</p> <p>Textbook 2: Chapter 1, 3 and 5</p>	

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 –2016, ISBN -978-93-5119-931-1.
2	Holden Karau, Andy Konwinski, Patrick Wendell & Matei Zaharia, Learning Spark Lightning-Fast Big Data Analysis, O'Reilly, 2015
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-resources (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 Assignment (OA)/ Lab Project/ Industry assignment/Certification/ Course project
3.	Practice session/Demonstrations in Labs	3.	Lab Test
4.	Virtual Labs (if present)	4.	Semester End Examination

Course Outcome (COs)			
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create			
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, PO2, PO3
CO2	Identify and Utilize the components of ecosystem of Hadoop and HDFS architecture.	L3	PO1, PO2
CO3	Apply map reduce framework in analysing the data and relate to YARN	L3	PO1, PO3
CO4	Examine the tools in analysing, managing and visualizing Big Data with Hive, Spark and Tableau.	L4	PO1, PO3, PO4

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	Conduction	Lab test	
30 marks	30 marks	10 marks	30 marks	100 marks
IA Test:				
1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).				
2. Remaining 20 marks questions in Part B & C should be descriptive.				
Conduct of Lab:				
1. Conducting the experiment and journal: 5 marks				
2. Calculations, results, graph, conclusion and Outcome: 5 marks				
Lab test: (Batchwise 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. Conducting the experiment and writing report: 5 marks				
4. Calculations, results, graph and conclusion: 15 marks				
5. Viva voce: 10 marks				
Eligibility for SEE:				
1. Student should score minimum 50% of 60 marks (i.e. 30 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE				
2. Student should score minimum 50% of 30 marks (i.e. 15 marks) in Lab test & should score 50% of 40 marks (i.e. 20 marks) in Lab component.				
3. Lab test is COMPULSORY				
4. Minimum score in CIE to be eligible for SEE: 50 OUT OF 100.				
5. 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: Score should be $\geq 40\%$ &, however overall score of CIE+SEE should be $\geq 50\%$.
3.	Question paper contains three parts A, B and C . Students have to answer <ol style="list-style-type: none"> From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO-PO Mapping (planned)								
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
1	✓	✓	✓					
2	✓	✓						
3	✓		✓					
4	✓		✓	✓				
Tick mark the CO, 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, 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.,

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

Management and Entrepreneurship for IT Industry

Course Code	MMC314A	Course type	PEC	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 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 offer students exposure to industry practices and professionals; bridge the gap between theoretical knowledge and its practical application; and cultivate essential skills to prepare them for future careers in the IT sector.

Required Knowledge of : NA

Unit – I	Contact Hours = 9 Hours
<p>Foundations of Management and Planning</p> <p>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.</p> <p>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.</p> <p>Textbook 1 Chapter 1, 2, 3</p>	

Unit – II	Contact Hours = 9 Hours
<p>Organizing, Staffing, and Directing in Management</p> <p>Organizing: Nature of organization, Purpose of an Organization, Principles of Organization, Types of Organization, Departmentation, Committees, Decentralization vs Centralization, Organization levels and span of control, Management by objectives, Management by exception.</p> <p>Staffing: Nature and importance of staffing, Selection, Recruitment.</p> <p>Directing: Meaning and nature of directing, Leadership, Leadership styles, Motivation, Communication, Coordination.</p> <p>Textbook 2 Chapter 4, 5, 6</p>	

Unit – III	Contact Hours = 9 Hours
<p>Entrepreneurship and Small Scale Industry Development</p> <p>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.</p> <p>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.</p> <p>Textbook 2 Chapter 12, 13</p>	

Unit – IV	Contact Hours = 9 Hours
<p>Institutional Support and Project Preparation for Small Scale Industry Development</p> <p>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.</p> <p>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.</p> <p>Textbook 2 Chapter 14, 15</p>	

Unit – V	Contact Hours = 9 Hours
<p>Industrial Ownership and Case Studies in Business Ownership</p> <p>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.</p> <p>Case study: Microsoft, Captain G R Gopinath, N R Narayana Murthy & Infosys</p> <p>Textbook 2 Chapter 16</p>	

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 Entrepreneurial Development and Management", Himalaya Publishing House
	E-resource (NPTEL/SWAYAM.. Any Other)
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.	OBA/Course Project/Course Seminar
3.	Online Classes	3.	Semester End Examination

<p>Course Outcome (COs)</p> <p>Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create</p>

At the end of the course, the student will be able to		Learning Level	PO(s)
1.	Explain fundamental concepts in management, organization, entrepreneurship, small-scale industries, government support, and capital raising within the IT industry.	L2	PO6, PO7
2.	Apply management, entrepreneurship, and relevant factors to assess small scale industries.	L3	PO6, PO7
3.	Apply management and entrepreneurial principles to analyze real-world IT industry scenarios and develop organizational plans.	L3	PO6, PO7
4.	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	PO7, PO8

Scheme of Continuous Internal Evaluation (CIE)

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc.)	Course project (CP)/ Case study etc.	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100
<p>IA Test:</p> <p>1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).</p> <p>2. Remaining 20 marks questions in Part B & C should be descriptive</p> <p>-Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.</p>				
<p>Eligibility for SEE:</p> <p>-Student should score minimum 50% of 60 marks (i.e. 30 marks) in IA tests.</p> <p>-Lack of minimum score in IA test will make the student Not Eligible for SEE.</p> <p>-Minimum score in CIE to be eligible for SEE: 50 OUT OF 100.</p>				

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: Score should be $\geq 40\%$, however overall score of CIE + SEE should be $\geq 50\%$.
3.	Question paper contains three parts A,B and C . Students have to answer <ol style="list-style-type: none"> 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO-PO Mapping (Planned)												
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
1						√	√					
2						√	√					
3						√	√					
4							√	√				
Tick mark the CO, PO mapping												

S. No.	Skill & Competence Enhanced	Applicable Sectors & Domains	Job Roles Students Can Take Up After Undergoing the Course
1	Awareness of management principles relevant to IT project environments	IT Services, Software Development	Project Support Intern, IT Management Trainee
2	Understanding of organizational structure, staffing, and leadership	IT Firms, Startups, Tech Teams	Team Coordinator (Intern), Technical HR Support
3	Entrepreneurial thinking and knowledge of small-scale IT business setup	Tech Startups, MSMEs, Freelancing	Tech Startup Intern, Innovation Cell Member
4	Familiarity with project proposal writing and institutional support	Government IT Schemes, MSME Projects	Proposal Assistant, Business Research Intern
5	Exposure to business ownership types and real-world IT case studies	Software Companies, Business Analysis	Entry-level Business Analyst, Strategy & Planning Intern

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

Blockchain Technology

Course Code	MMC314B	Course type	PEC	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 understand the fundamentals of blockchain technology and consensus mechanisms.
2.	To explore classical and modern cryptographic techniques in blockchain.
3.	To examine the structure and operations of Ethereum, Bitcoin, and UTXO models.
4.	To develop and deploy smart contracts using Solidity and blockchain development tools.

Required Knowledge of : **NA**

Unit – I	Contact Hours = 9 Hours
<p>Introduction to Blockchain Technology: Blockchain defined, Peer-to-peer, Distributed ledger, Cryptographically-secure, Append-only, Updateable via consensus, Generic elements of a Blockchain, How Blockchain works, How Blockchain accumulates blocks, Benefits and limitations of Blockchain, Tiers of Blockchain technology, Features of a Blockchain, Consensus mechanism, Types of consensus mechanisms, Consensus in Blockchain, CAP theorem and Blockchain. Symmetric Key Cryptography: Problems based on Classical Ciphers - Substitution Ciphers(Caesar Cipher, Playfair Cipher , Hill Cipher), Transposition Ciphers(Columnar Transposition Cipher, Rail Fence Cipher, Route Cipher). Theoretical concepts of Modern Ciphers - Block Ciphers, Stream Ciphers.</p> <p>Textbook 1: Chapter 1.3, 1.4, 1.5, 3.3</p>	

Unit – II	Contact Hours = 9 Hours
<p>Asymmetric Key Cryptography: Encryption Algorithms (RSA, ECC), Digital Signature Algorithms (Digital Signature Algorithm, Elliptic Curve DSA, RSA (also used for signing), Key Exchange Protocols(Diffie–Hellman (DH), Elliptic Curve Diffie–Hellman). Introduction to Ethereum: Ethereum Architecture, Ether currency, Ether accounts, Ethereum Transaction.</p> <p>Textbook 1: Chapter 4.2.1, 4.2.3, 4.2.5 Textbook 2: Chapter 1.2</p>	

Unit – III	Contact Hours = 9 Hours
<p>Bitcoin: Bitcoin, Digital Keys and Addresses, Transactions, Blockchain Mining. Understanding UTXO, problems based on UTXO.</p> <p>Textbook 1: Chapter 5.1 – 5.4</p>	

Unit – IV	Contact Hours = 9 Hours
<p>Getting started with Solidity: Introduction to the Solidity Language, Solidity Data types, assigning variables and functions, Understanding Solidity Control Structures, Solidity Contracts, Types of Solidity functions.</p> <p>Textbook 2: Chapter 2.1 – 2.3</p>	

Unit – V	Contact Hours = 9 Hours
Development Tools: Learning MetaMask and Remix, Using Ganache and the Truffle Framework. Solidity Programming Projects: Development of a Basic Data Storage Smart Contract, Variable Type Usage in Solidity Smart Contracts, Development of a Decentralized Counter Application, Robust Error Handling in Financial Transactions, Patient Record Management System. Textbook 2: Chapter 4, 5.1-5.3.2	

Unit No.	Self-Study Topics
3	Unspent Transaction Outputs
5	Developing Dapps

Books	
	Text Books:
1.	Imran Bashir, Mastering Blockchain: Distributed ledger technology, decentralization, and smart contracts explained, 2nd edition, Packt Publishing, 2018.
2.	Jitendra Chittoda, Mastering Blockchain Programming with Solidity, edition -2019, Packt Publishing, 2019.
	Reference Books:
1.	SirajRaval, Decentralized Applications: Harnessing Bitcoin's Technology, O'Reilly Media, Inc., 2016
2.	Cryptography and Network Security: Principles and Practice, Sixth Edition by William Stallings, Pearson publications.
	E-resources (NPTEL/SWAYAM.. Any Other)
1.	E-resources (NPTEL/SWAYAM.. Any Other)
2.	https://www.ibm.com/topics/blockchain

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

Course Outcome (COs)			
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create			
Create At the end of the course, the student will be able to		Learning Level	PO(s)
1.	Explain blockchain fundamentals including architecture, consensus, cryptography, Ethereum, Bitcoin, and Solidity basics.	L2	PO1, PO2
2.	Apply classical and modern cryptographic techniques in blockchain use cases.	L3	PO1, PO2
3.	Develop smart contracts and execute blockchain transactions using Solidity.	L3	PO1, PO2
4.	Analyze and construct decentralized applications using Solidity and blockchain development tools.	L4	PO1, PO2

Scheme of Continuous Internal Evaluation (CIE)

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100
<p>IA Test:</p> <p>1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).</p> <p>2. Remaining 20 marks questions in Part B & C should be descriptive</p> <p>-Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.</p>				
<p>Eligibility for SEE:</p> <p>-Student should score minimum 50% of 60 marks (i.e. 30 marks) in IA tests.</p> <p>-Lack of minimum score in IA test will make the student Not Eligible for SEE.</p> <p>-Minimum score in CIE to be eligible for SEE: 50 OUT OF 100.</p>				

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: Score should be $\geq 40\%$, however overall score of CIE + SEE should be $\geq 50\%$.
3.	<p>Question paper contains three parts A,B and C. Students have to answer</p> <p>1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.</p> <p>2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks.</p> <p>3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.</p>

CO PO mapping (planned)								
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
1	√	√						
2	√	√						
3	√	√						
4	√	√						
Tick mark the CO PO mapping								

S. No.	Skill & Competence Enhanced	Applicable Sectors & Domains	Job Roles Students Can Take Up After Undergoing the Course
1	Understanding of blockchain fundamentals and consensus mechanisms	IT Services, FinTech, Cybersecurity	Blockchain Support Intern, Crypto Analyst Intern
2	Familiarity with classical and modern cryptographic techniques	Security Solutions, Banking & Finance	Cryptography Assistant, Security Research Intern
3	Knowledge of Bitcoin, Ethereum, and UTXO models	Blockchain Platforms, Digital Currency	Blockchain Analyst Trainee, Wallet Testing Assistant
4	Ability to develop and test basic smart contracts using Solidity	DApp Development, Smart Contract Testing	Solidity Intern, Smart Contract Developer (Entry-level)
5	Exposure to blockchain development tools (MetaMask, Remix, Ganache, Truffle)	Blockchain DevOps, Tech Startups	Blockchain QA Intern, DApp Testing & Deployment Assistant

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

Artificial Intelligence

Course Code	MMC314C	Course type	PEC	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 emphasize fundamental principles of Artificial Intelligence (AI) and their applications across domains.
2.	To analyze problem-solving methodologies using AI techniques, including search algorithms, logic, and planning.
3.	To design intelligent systems by integrating knowledge representation, reasoning, and decision-making strategies.
4.	To understand ethical implications and societal impacts of AI systems while fostering innovation.

Required Knowledge of : Python recommended(MMC101), Data Structures & Algorithms (MMC202)

Unit – I	Contact Hours = 9 Hours
<p>Introduction, Intelligent Agents: What Is AI?, The Foundations of Artificial Intelligence, Risks and Benefits of AI, Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents Textbook 1: Chapter 1, 2</p>	

Unit – II	Contact Hours = 9 Hours
<p>Solving Problems by Searching: Problem-Solving Agents, Search Algorithms, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions Textbook 1: Chapter 3</p>	

Unit – III	Contact Hours = 9 Hours
<p>Search in Complex Environments: Local Search and Optimization Problems, Local Search in Continuous Spaces, Search with Nondeterministic Actions, Search in Partially Observable Environments, Online Search Agents and Unknown Environments Defining Constraint Satisfaction Problems, Game Theory, Optimal Decisions in Games Textbook 1: Chapter 4, Chapter 5, Chapter 6</p>	

Unit – IV	Contact Hours = 9 Hours
<p>Logical Agents: Knowledge based agents, Wumpus world. Logic, Propositional Logic: A Very Simple Logic, Propositional Theorem Proving, First order Logic: Syntax and Semantics of First-Order Logic, Using First-Order Logic Textbook 1 : Chapter 7, Chapter 8</p>	

Unit – V	Contact Hours = 9 Hours
Planning, Philosophy, Ethics, and Safety of AI Overview, An example Domain: The blocks world, Components of a Planning System, Goal stack planning, Non-linear Planning with Constraint Posting, Hierarchical Planning The Limits of AI, Can Machines Really Think?, The Ethics of AI Textbook 2: Chapter 13, Textbook 1 : Chapter 28	

Unit No.	Self-Study Topics
3	Case studies on AI applications in healthcare and autonomous systems.
5	Python implementation of planning algorithms (e.g., Blocks World).

Books	
	Text Books:
1.	Stuart J. Russell, Peter Norwig, Artificial Intelligence –A Modern approach, 4 th Edition, Pearson Education, 2020.
2.	Elaine Rich, Kevin Knight, Shivasankar B. Nair, Artificial Intelligence, The McGrawHill publications, Third Edition, 2009.
	Reference Books:
1.	Parag Kulkarni, Prachi Joshi, Artificial Intelligence –Building Intelligent Systems, 1st ed., PHI learning, 2015.
	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.	Semester End Examination
		3.	Project/Seminar

Course Outcome (COs)			
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create			
At the end of the course, the student will be able to		Learning Level	PO(s)
1.	Explain core theories of Artificial Intelligence, including agent architectures, search strategies, and logical frameworks.	L2	PO1
2.	Apply uninformed and informed search algorithms, constraint satisfaction, and logical reasoning techniques to solve computational problems.	L3	PO1, PO2
3.	Develop AI-driven solutions for real-world applications by using knowledge representation, planning algorithms etc.	L3	PO1, PO2
4.	Analyze ethical, societal implications of AI systems through case studies and implementation of AI-driven solutions.	L4	PO1, PO7, PO8

Scheme of Continuous Internal Evaluation (CIE)

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100
<p>IA Test:</p> <p>1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).</p> <p>2. Remaining 20 marks questions in Part B & C should be descriptive</p> <p>-Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.</p>				
<p>Eligibility for SEE:</p> <p>-Student should score minimum 50% of 60 marks (i.e. 30 marks) in IA tests.</p> <p>-Lack of minimum score in IA test will make the student Not Eligible for SEE.</p> <p>-Minimum score in CIE to be eligible for SEE: 50 OUT OF 100.</p>				

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: Score should be $\geq 40\%$, however overall score of CIE + SEE should be $\geq 50\%$.
3.	<p>Question paper contains three parts A, B and C. Students have to answer</p> <p>1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.</p> <p>2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks.</p> <p>3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.</p>

CO-PO Mapping (Planned)								
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
1	✓							
2	✓	✓						
3	✓	✓						
4	✓						✓	✓
Tick mark the CO, PO mapping								

Sl No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	Ability to select, adapt, and implement search algorithms (BFS, DFS, A*) and logical reasoning techniques.	IT Industry, Start-up eco system, Govt. and Public Sector.	AI Engineer, Data Scientist, Robotics Engineer, Machine Learning Developer
2	Integrate knowledge representation, reasoning, and planning to design AI-driven solutions.		

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

Software Testing

Course Code	MMC314D	Course type	PEC	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.	Acquire knowledge of basic principles and knowledge of software testing and debugging and test cases.
2.	To explore the concepts of boundary value, equivalence class and decision table based testing.
3.	To study the various types of testing, concepts of integration testing and system testing.
4.	Analyze the performance of fault based testing, planning and Monitoring the process, Documentation testing.

Required Knowledge of : NA

Unit – I	Contact Hours = 9 Hours
Basics of Software Testing Basic Definitions, Test Cases, preparing a Test Plan, Insights from a Venn Diagram, Identifying Test Cases, Fault Taxonomies, Levels of Testing; Examples: The Triangle Problem, The NextDate Function, The Commission Problem; Graph Theory for Testers: Graphs, Directed graph, graphs for testing. Textbook 1: Chapter 1, 2.2, 2.3, 2.4, 4.1, 4.2, 4.3.	

Unit – II	Contact Hours = 9 Hours
Boundary value testing Normal, Robust Boundary value testing, Examples, Random testing; Equivalence class testing, Traditional and Improved Equivalence class testing, Equivalence class test cases examples- triangle problem, Next Date function; Decision table based Testing: Decision Table Techniques, Decision Table Test cases for triangle problem. Textbook 1: Chapter 5.1, 5.2, 5.5, 5.6, 6.1, 6.2, 6.3, 6.4, 6.5, 7.1, 7.2, 7.3.	

Unit – III	Contact Hours = 8 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 1: Chapter 8.1, 8.2, 8.4, 9.1, 9.2, 9.3, 11, 11.1, 11.2, 11.3.	

Unit – IV	Contact Hours = 9 Hours
Integration Testing Decomposition-Based Integration, Path-Based Integration, Example: integration NextDate; System Testing: Threads, Basis Concepts for Requirements Specification, Model-Based Threads, Use Case–Based Threads, Non-functional System Testing. Textbook 1: Chapter 13., 13.1, 13.3, 13.4. 14. 14.1, 14.2, 14.3, 14.4, 14.9.	

Unit – V	Contact Hours = 10 Hours
Fault Based Testing, Planning and Monitoring the Process, Documenting Analysis and Test Assumptions in fault-based testing, Mutation Analysis, Fault-based Adequacy Criteria; Variations on mutation Analysis; From Test case specification to Test Cases, Scaffolding, Generic vs. specific Scaffolding, Test Oracles, Self-checks as oracles, Capture and Replay. Quality and Process, Test and Analysis strategies and plans, Risk	

Planning, Monitoring the Process, Improving the process, the quality team, Organizing documents, Test strategy document, Analysis and test plan, Test design specifications documents, Test and analysis reports.
Textbook 2: Chapter 16, 16.2, 16.3, 16.4, 16.5, 17.2, 17.3, 17.4, 17.6, 17.7, 20.2, 20.3, 20.4, 20.5, 20.6, 20.7, 20.8, 24.2, 24.3, 24.4, 24.5, 24.6.

Books	
	Text Books:
1.	Paul C Jorgensen, "Software Testing A Craftsman's Approach", Auerbach publications, 4th edition.
2.	Mauro Pezze, Michael Young, Software testing and Analysis- Process, Principles and Techniques, Wiley India, 2012
	Reference Books:
1.	Aditya P.Mathur " Foundations of Software Testing – Fundamental Algorithms and Techniques", Pearson Education India, 2011
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://onlinecourses.nptel.ac.in/noc25_cs66/preview
2.	https://onlinecourses.nptel.ac.in/noc22_cs61/preview

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Assignment (OA)/ Industry/ Certification.
		3.	Course Project
		4.	Semester End Examination

Course Outcome (COs)			
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create			
At the end of the course, the student will be able to		Learning Level	PO(s)
1.	Demonstrate the fundamentals of software testing.	L2	PO1
2.	Apply the concepts of black box testing techniques in different testing scenarios	L3	PO1,PO4
3.	Identify the concepts of integration and system testing technique	L3	PO1,PO4
4.	Analyze the fault based testing, planning and Monitoring the process, Documentation testing.	L4	PO1, PO2, PO6

Scheme of Continuous Internal Evaluation (CIE)

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study etc.	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100
IA Test: 1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks). 2. Remaining 20 marks questions in Part B & C should be descriptive -Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.				
Eligibility for SEE: -Student should score minimum 50% of 60 marks (i.e. 30 marks) in IA tests. -Lack of minimum score in IA test will make the student Not Eligible for SEE. -Minimum score in CIE to be eligible for SEE: 50 OUT OF 100.				

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: Score should be $\geq 40\%$, however overall score of CIE + SEE should be $\geq 50\%$.
3.	Question paper contains three parts A, B and C . Students have to answer <ol style="list-style-type: none"> 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO PO mapping (planned)								
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
1	√							
2	√			√				
3	√			√				
4	√	√				√		
Tick mark the CO PO mapping								

Name & Signature of Faculty members
involved in designing the syllabus

Name & Signature of Faculty members
verifying/approving the syllabus

Full Stack Development

Course Code	MMC315A	Course type	PBL	Credits L-T-P	2-0-1
Hours/week: L - T - P	2-0-2			Total credits	3
Total Contact Hours	L = 24 Hrs; T = 0 Hrs; P = 21 Hrs Total = 45 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 using React and NextJS
5.	To handle different form inputs in React.

Required Knowledge of: Web Design and Development (I) (MMC201)

Unit – I	Contact Hours = 9 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 = 9 Hours
Introduction to MongoDB Getting Started, Creating, Updating and deleting documents, Querying. Textbook:3 Chapter 2, 3, 4	

Unit – III	Contact Hours = 9 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 = 9 Hours
Introduction to ReactJS Hello, World! The philosophy of react. JSX, All about Components. Basics of UI Designing, Hooks and Routing Events, Forms, Styling React, Introducing Hooks, Routing, React Redux Textbook: 2 Chapter 1, 2, 3, 4, 7, 8, 11, 12.	

Unit – V	Contact Hours = 9 Hours
Introduction to Typescript Understanding TypeScript, Your first TypeScript application, Using the TypeScript compiler, Understanding static types, Using arrays, tuples, and enums, Working with classes and interfaces, Creating a stand-alone web app, Creating a React app.	

Unit No.	Self-Study Topics
5	Deployment using Vercel

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 Interfaces 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
5.	Adam Freeman, Essential TypeScript 5, Manning, Third Edition
	Reference Books:
1.	Vasan Subramanian, Pro MERN Stack, APress
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://nextjs.org/
2.	https://legacy.reactjs.org/tutorial/tutorial.html
3.	https://www.youtube.com/watch?v=ZjAqaclC_3c&list=PLC3y8-rFHvwjOKd6gdf4QtV1uYNiQnrul

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

Course Outcome (COs)			
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create			
At the end of the course, the student will be able to		Learning Level	PO(s)
1.	Demonstrate the features of ES6 and Typescript and interact with MongoDB (create, update, delete, and query documents).	L2	PO1, PO4
2.	Make use of the foundations of Node.js, ExpressJS to design middleware, routing, and create backend services.	L3	PO1, PO3, PO4
3.	Design and Develop dynamic ReactJS applications by managing state and event handling with hooks and build functional, interactive user interfaces.	L3	PO1, PO3, PO4
4.	Analyze the architecture and data flow of MERN stack applications by examining the interaction between MongoDB, Express.js, React, and Node.js, and distinguishing client-side and server-side responsibilities to design efficient full-stack web solutions.	L4	PO1, PO3, PO4, PO8

Scheme of Continuous Internal Evaluation (CIE)

THEORY (40 marks)		PROJECT (60 marks)			Total
IA test Total (Theory)	IA test (Lab)	Project Phase 1	Project Phase 2	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	100
	Data Analysis based on the objectives and designing the MongoDB Collection and Documents with appropriate data constraints	20	
	User interface Designing with appropriate styles and validations	20	
	Implementation of middleware with ExpressJS, axios and performing CRUD operations from UI	20	
	Modifications	15	
	Viva	10	
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).		

CO-PO Mapping (Planned)								
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
1	√			√				
2	√		√	√				
3	√		√	√				
4	√		√	√				√
Tick mark the CO, 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	Proficiency in Full-Stack JavaScript Development (Frontend + Backend)	IT Services, Startups, E-commerce, SaaS	Full-Stack Developer, Web Application Developer
2	Ability to Build Scalable Web Applications Using React and Node.js	FinTech, EdTech, HealthTech, Enterprise Software	Frontend Developer, Backend Developer
3	Hands-on Experience with NoSQL Databases (MongoDB) and RESTful APIs	Cloud Solutions, CRM Systems, Data Analytics Platforms	Backend Developer, API Developer
4	Understanding of MVC Architecture & Application Deployment (e.g., using Heroku, Vercel)	Product Development, DevOps, Cloud Hosting	DevOps Engineer (Entry Level), Deployment Specialist

Name & Signature of Faculty members
involved in designing the syllabus

Name & Signature of Faculty members
verifying/approving the syllabus

Advanced Database Management System

Course Code	MMC315B	Course type	PEC	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 impart a comprehensive understanding of advanced database architectures, storage mechanisms, and indexing techniques.
2.	To enable students to apply indexing structures (e.g., B+ trees, hashing) and query optimization strategies for efficient database design.
3.	To equip learners with the ability to implement physical database tuning and query evaluation methods in real-world scenarios.
4.	To foster analytical skills for evaluating trade-offs in database design, performance tuning, and optimization strategies.

Required Knowledge of : Database Management System (MMC102) & Data Structures & Algorithms (MMC202)

Unit – I	Contact Hours = 9 Hours
Overview of Storage and Indexing Data on external storage; File organizations and Indexing; Index data structures; Comparison of file organizations; Indexes and performance tuning; The Memory Hierarchy; Redundant Arrays of Independent Disks; Disk space management; Buffer manager. Textbook:1 Chapter 8 (8.1 - 8.5), Chapter 9 (9.1-9.4)	

Unit – II	Contact Hours = 9 Hours
Tree-Structured and Hash-Based Indexing Intuition for tree indexes; Indexed sequential access method; B+ trees, Search, Insert, Delete, B+ trees in practice Hash-Based Indexing: Static hashing, Extendible hashing, linear hashing, comparisons Textbook:1 Chapter 10 (10.1 - 10.8, 11.1 - 11.4)	

Unit – III	Contact Hours = 9Hours
Overview of Query Evaluation and External Sorting The system catalog, Introduction to operator evaluation; Algorithm for relational operations; Introduction to query optimization; What a typical optimizer does. When does a DBMS sort data? A simple two-way merge sort; External merge sort Textbook:1 Chapter 12 & 13(12.1 - 12.4, 12.6, 13.1 - 13.3)	

Unit – IV	Contact Hours = 9 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. Translating SQL queries in to Relational Algebra; Estimating the cost of a plan; Relational algebra equivalences; Enumeration of alternative plans	

Textbook:1 Chapter 14 & 15 (14.1 - 14.6, 15.1 - 15.4)

Unit – V	Contact Hours = 9 Hours
Physical Database Design and Tuning Introduction to physical database design; Guidelines for index selection, Basic examples of index selection; Clustering and indexing; Indexes that enable index-only plans, Tools to assist in index selection; Overview of database tuning; Choices in tuning the conceptual schema; Choices in tuning queries and views. Textbook:1 Chapter 20 (20.1 – 20.9)	

Unit No.	Self-Study Topics
1,5	Distributed Database Systems
2	Handling Duplicates in B+ Trees

Books	
	Text Books:
1.	Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, 3rd Edition, McGraw-Hill, 2003.
	Reference Books:
1.	Elmasri and Navathe: Fundamentals of Database Systems, 5th Edition, Pearson Education, 2007
2.	Database System Concepts Abraham Silberschatz, Henry F. Korth, S. Sudarshan McGraw Hill 6 th Edition, 2010
	E-resources (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.	Semester End Examination
		3.	Seminar/Project
		4.	Assignment

Course Outcome (COs)			
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create			
At the end of the course, the student will be able to		Learning Level	PO(s)
1.	Understand the principles of database storage architectures, indexing mechanisms, query evaluation plans, external sorting algorithms, database tuning, query evaluation and optimization frameworks.	L2	PO1
2.	Apply tree-based and hash-based indexing structures (e.g., B+ trees, extendible hashing) to design physical databases and optimize database operations.	L3	PO1
3.	Develop various data storage architectures, query evaluation plans, external sorting algorithms, evaluation of relational operators, relational query optimizer and tuning strategies for performance enhancement.	L3	PO1, PO8
4.	Analyze the efficiency of relational operators, indexing methods, database tuning, query plans, external sorting algorithms, evaluation of	L4	PO1, PO8

	relational operators, relational query optimizer to propose context-specific improvements.		
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Scheme of Continuous Internal Evaluation (CIE)

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100
<p>IA Test:</p> <p>1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).</p> <p>2. Remaining 20 marks questions in Part B & C should be descriptive</p> <p>-Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.</p>				
<p>Eligibility for SEE:</p> <p>-Student should score minimum 50% of 60 marks (i.e. 30 marks) in IA tests.</p> <p>-Lack of minimum score in IA test will make the student Not Eligible for SEE.</p> <p>-Minimum score in CIE to be eligible for SEE: 50 OUT OF 100.</p>				

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: Score should be $\geq 40\%$, however overall score of CIE + SEE should be $\geq 50\%$.
3.	<p>Question paper contains three parts A,B and C. Students have to answer</p> <p>1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.</p> <p>2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks.</p> <p>3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.</p>

CO-PO Mapping (Planned)								
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
1	✓							
2	✓							
3	✓							✓
4	✓							✓
Tick mark the CO, 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	<ul style="list-style-type: none"> ➤ 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 	<ul style="list-style-type: none"> ➤ Relational DBMS (RDBMS) ➤ Object-oriented DBMS (OODBMS) ➤ Network DBMS (NDBMS) ➤ NoSQL DBMS 	<ul style="list-style-type: none"> ➤ Data Administrator ➤ Database designer ➤ Data Engineer ➤ Database Programmers

Name & Signature of Faculty members
involved in designing the syllabus

Name & Signature of Faculty members
verifying/approving the syllabus

Django Framework

Course Code	MMC315C	Course type	PBE	Credits L-T-P	2 – 0 - 1
Hours/week: L - T- P	2 – 0 – 2			Total credits	3
Total Contact Hours	L = 24Hrs; T = 0 Hrs; P = 21 Hrs Total = 45 Hrs			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) MMC101

Unit – I	Contact Hours = 05 Hours
<p>Foundations of Django and Web Technologies</p> <p>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</p> <p>Textbook:1 Chapter 1, 2</p>	

Unit – II	Contact Hours = 05 Hours
<p>Django Models, Views, and Basic Operations</p> <p>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</p> <p>Textbook:1 Chapter 2, 4</p>	

Unit – III	Contact Hours = 04 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 = 05 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 = 05 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.	No. of Experiments	Topic(s) related to Experiment
I	1	Creation of Custom Apps, Navigating with URLs and View mapping
II	1	Django Models and basic operations
III	1	Django Admin Interface
IV	2	Django Templates
V	2	Django Forms

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-resources (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)			
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create			
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, P O 2 , PO5
CO3	Apply Django's admin, forms, templates and database operations to build Django based applications	L3	PO1, PO5, PO7
CO4	Analyze Django's templates and forms and Experiment with advanced features of Django to build dynamic web applications.	L4	PO1, PO5, PO7,PO8

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 3 hours duration.		
2.	1 Lab program/problem/experiment Write-up & execution - (10 marks write-up + 20 marks Database and Data modeling design + 20 marks MVC/MVT architectural pattern implementation)	50 marks	100 marks
	Project evaluation	10 marks	
	a. Project definition stating the objectives, methodology and the outcome b. Project demonstration & Viva voce c. UI design & usability of the web application	20 marks 20 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.		

CO PO mapping (planned)												
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

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

Internet of Things

Course Code	MMC315D	Course type	PBL	Credits L-T-P	2 – 0 – 1
Hours/week: L - T- P	2 – 0 – 2			Total credits	3
Total Contact Hours	L = 24 Hrs; T = 0 Hrs; P = 21 Hrs Total = 45 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) MMC103

Basics of Programming Languages MMC106

Unit – I	Contact Hours = 9 Hours
<p>Emergence of IoT: Introduction, Evolution of IoT, IoT versus 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</p>	

Unit – II	Contact Hours = 9 Hours
<p>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) Textbook 1: Chapter 5.1-5.9</p>	

Unit – III	Contact Hours = 9 Hours
<p>Beginning IoT Hardware Projects:</p> <p>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</p> <p>Textbook 1: Chapter 16.1 - 16.3</p>	

Unit – IV	Contact Hours = 9 Hours
<p>Esp32 and Interfacing Cloud to Arduino</p> <p>Introducing ESP32, ESP32 with Arduino IDE, ESP32 Weather Station.</p> <p>Cloud Computing: Introduction, Virtualization, Cloud Models, Service-Level Agreement in Cloud Computing, Cloud Implementation, Sensor-Cloud : Sensor-as-service.</p> <p>Arduino IoT Cloud : Getting Started with Arduino IoT Cloud, Thingspeak, Overview, Getting started with Thingspeak, IoT Plant Monitor</p> <p>E – resource : 1</p> <p>Textbook 1: Chapter 10</p> <p>Textbook 3 :Chapter 12, 13, 14, 15</p>	

Unit – V	Contact Hours = 9 Hours
<p>IoT Case Studies and future trends:</p> <p>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</p> <p>Textbook 1: Chapter 12,13,14</p> <p>Textbook 2: Chapter 2</p>	

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 Madiseti "Internet of Things A hands on Approach", Publisher : Orient Black swan Private Limited – New Delhi, ISBN-10, 8173719543, 2015
3.	Charles Bell, "MicroPython for the Internet of Things A Beginner's Guide to Programming with Python on Microcontrollers", Second Edition, Apress, 2024
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", 1 st Edition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978-9386873743), 2017
2.	Srinivasa K G, "Internet of Things", CENGAGE Learning 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 Madiseti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1 st Edition, VPT, 2014.
E-resources (NPTEL/SWAYAM.. Any Other)- mention links	
1.	https://randomnerdtutorials.com/projects-esp32/ ESP32 Projects, Tutorials and Guides with Arduino IDE
2.	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)			
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create			
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 usage of various IoT sensors and implement their usage.	L3	PO1, PO2, PO4
CO3	Make use of different IoT sensors and programming logic to implement IoT model for the given problem as per the requirements.	L3	PO1, PO2, PO3, PO4
CO4	Examine and solve engineering problems related to various industry by using IoT.	L4	PO1, PO2, PO3, PO4

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.	Setting up IDE environment and Hardware Connections	15	100 marks
	Circuit diagram and writeup	20	
	Implementation	20	
	Data Analysis	20	
	Modification	15	
	Viva	10	
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.		

CO PO mapping (planned)								
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
1	✓							
2	✓	✓		✓				
3	✓	✓	✓	✓				
4	✓	✓	✓	✓				
Tick mark the CO 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.	Arduino IDE implementation, Sensors configuration and basics for IoT implementations	Wearable devices, Smart Home Applications, Health Care, Smart cities and domains where IoT is applicable.	IoT Developer IoT Infrastructure Architect IoT Solution Architect

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

Cyber Security and Cyber Laws

Course Code	MMC315E	Course type	PEC	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 the concept of cybercrime and cyber offenses.
2.	To emphasize on security challenges of mobile devices and organizational measures to handle such threats.
3.	To explore the tools and methods used in cybercrime.
4.	To elaborate on the legal perspectives of cybercrimes in India.
5.	To introduce the concept of Computer forensics

Required Knowledge of: Computer Networks & Communications (MMC103)

Unit – I	Contact Hours = 09 Hours
<p>Introduction to Cybercrime, Cyber offenses: Definition and Origins of the Word Cybercrime, Cybercrime and Information Security, who are Cybercriminals? Classifications of Cybercrimes; Cybercrime - The Legal Perspectives, Cybercrimes – An Indian Perspective, Cybercrime and the Indian ITA2000, A Global Perspective on Cybercrimes, How Criminals Plan the Attacks, Social Engineering, Cyberstalking, Attack Vector, Cloud Computing. Textbook: Chapter 1.1-1.9, 2.1-2.4, 2.7-2.8</p>	

Unit – II	Contact Hours = 09 Hours
<p>Cybercrime in case of Mobile and Wireless devices, Phishing and Identity Theft: Proliferation of Mobile and Wireless Devices, Trends in Mobility, Security challenges posed by mobile devices, Registry settings for mobile devices, Authentication Service Security, Attacks on Mobile/Cellphones, Mobile Devices- Security implications for organizations, Organizational measures for handling mobile devices-related security issues, Organizational security policies and measures in mobile computing era. Phishing; Identity theft. Textbook: Chapter 3.1-3.11, 5.1-5.3</p>	

Unit – III	Contact Hours = 09 Hours
<p>Tools and Methods Used in Cybercrime: Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection. Textbook: Chapter 4.1-4.10</p>	

Unit – IV	Contact Hours = 09 Hours
<p>The Legal Perspectives: Cybercrime and the Legal Landscape around the World, Why Do We Need Cyber laws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Digital Signatures and the Indian IT Act. Textbook: Chapter 6.1-6.7</p>	

Unit – V	Contact Hours = 09 Hours
Computer Forensics: Digital Forensics Science, The Need for Computer Forensics, Cyber forensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, approaching a Computer Forensics Investigation, Computer Forensics and Steganography, Special Tools and Techniques, Forensics Auditing. Textbook:Chapter7.1–7.10,7.12,7.17-7.18	

Unit No.	Self-Study Topics
1	Botnets-The Fuel for Cybercrime,
2	Biometric Authentication: Strengths and Vulnerabilities on Mobile Devices
3	<ul style="list-style-type: none"> • Command and Control (C2) Infrastructures in Cybercrime. • Advanced Steganography Techniques and Tools
5	Settingupofacomputerforensicslaboratory:Understandingtherequirements

Books	
	Text Books:
1.	Sunit Belapure and Nina Godbole, “Cyber Security: Understanding Cyber Crimes, ComputerForensicsandLegalPerspectives”,WileyIndiaPvtLtd,ISBN:978-81-265-21791,2011,FirstEdition(Reprinted2018)
	Reference Books:
1.	Computer Forensics and Cyber Crime An Introduction by Marjie T.Britz,Pearsonpublication,2 nd edition.
	E-resources (NPTEL/SWAYAM. Any Other)- mention links
1.	https://in.coursera.org/specializations/intro-cyber-security
2.	https://in.coursera.org/learn/cybersecurity-for-everyone

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Assignment (OA)/ Industry/Certification
		3.	Course Project/Seminar
		4.	Semester End Examination

Course Outcome (COs)			
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create			
At the end of the course, the student will be able to		Learning Level	PO(s)
1.	Outline cyber offenses along with the concepts of computer forensics, phishing, identity theft, and cybercrimes related to mobile and wireless devices.	L2	PO1
2.	Make use of tools and methods used in cybercrime and Computer forensics.	L3	PO1,PO4,PO7
3.	Apply the legal perspectives of cybercrimes	L3	PO1,PO7
4.	Categorize the different cybercrime techniques, inspect organizational security policy components, and analyze cyber forensics methodologies.	L4	PO1,PO7,PO8

Scheme of Continuous Internal Evaluation (CIE)

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project(CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100
<p>IA Test:</p> <p>1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).</p> <p>2. Remaining 20 marks questions in Part B & C should be descriptive</p> <p>-Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.</p>				
<p>Eligibility for SEE:</p> <p>-Student should score minimum 50% of 60 marks (i.e. 30 marks) in IA tests.</p> <p>-Lack of minimum score in IA test will make the student Not Eligible for SEE.</p> <p>-Minimum score in CIE to be eligible for SEE: 50 OUT OF 100.</p>				

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: Score should be $\geq 40\%$, however overall score of CIE + SEE should be $\geq 50\%$.
3.	<p>Question paper contains three parts A, B and C. Students have to answer</p> <p>1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.</p> <p>2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks.</p> <p>3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.</p>

CO PO mapping (planned)								
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
1	√							
2	√			√			√	
3	√						√	
4	√						√	√
Tick mark the CO, 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 2. Ability to perform foot printing and information gathering techniques 3. Ability to scan and enumerate networks and systems 4. 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	1. Ethical hacker 2. Penetration tester 3. Security analyst 4. Security engineer 5. Security consultant 6. Incident responder

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

DevOps

Course Code	MMC315F	Course type	PBE	Credits L-T-P	2-0-1
Hours/week: L - T- P	2-0-2			Total credits	3
Total Contact Hours	L = 24 Hrs; T = 0 Hrs; P = 21 Hrs Total =45 Hrs			CIE Marks	100
				SEE Marks	100

Course learning objectives	
1.	To understand modern software development methodologies and operating environments that support agile and DevOps practices.
2.	To explore cloud computing concepts, platforms, and tools used for effective software development and project management.
3.	To gain knowledge of DevOps principles, focusing on automation, continuous integration, and continuous delivery practices.
4.	To develop the ability to provision and manage infrastructure using declarative tools in cloud environments.
5.	To familiarize students with containerization and orchestration technologies used for building and deploying scalable applications.

Required Knowledge of :Cloud Computing (MMC216C)

Unit – I	Contact Hours = 04Hours
<p>Overview of Agile Software Development and Linux Environment Software Process models, waterfall model, Incremental model, and 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 2: Chapter 2,3 Textbook 5: Chapter 4,8</p>	

Unit – II	Contact Hours = 05 Hours
<p>An Overview of Cloud Services, Project Management with JIRA, and Fundamentals of Version Control Systems: Introduction to Cloud Computing at a Glance, exploring cloud computing applications (SAAS, PAAS and IAAS) using various platforms like Amazon Web Services (AWS), Google cloud platform and Microsoft Azure platforms. Project Setup in JIRA software and understanding Issue types and Workflows. Exploring various features and applications of Version Control Systems (VCS) using GitHub. Textbook 3: Chapter 1,7</p>	

Unit – III	Contact Hours = 05 Hours
<p>DevOps Eco System:What is DevOps? DevOps Culture and Practices: Implementing CI/CD and continuous Deployment, Understanding IaC practices an overview. CI/CD Pipeline using Jenkins and GitHub Actions: Introduction to DevOps CI/CD Principles, CI/CD implementation using Jenkins and GitHub actions. Build the code with Maven: Introducing Apache Maven, Installing Maven, installing Maven on Microsoft Windows, Testing a Maven Installation. The Project Object Model: Introduction, The POM and its types. Build applications using Maven. Textbook 3: Chapter 1 Textbook 4: Chapter 1,2,3,4</p>	

Unit – IV	Contact Hours = 05 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 1: Chapter 2	

Unit – V	Contact Hours = 05 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 1: Chapter 9,10	

UnitNo.	No.of Experiments	Topic(s)relatedtoExperiment
I	2	Basic Linux Command-Line Operations Project Setup in JIRA
II	2	Cloud Platform Familiarization Version Control with Git and GitHub
III	2	CI/CD with GitHub Actions Build Java App using Maven
IV	1	Provision VM using Terraform
V	2	Containerize App with Docker Full DevOps Pipeline

Unit No.	Self-Study Topics
5	Container orchestration, MLSecOps

Books	
	Text Books:
1.	Mikael Krief ,Learning DevOps by Jenkins, Packt Publisher for Kubernetes, Terraform and Azure DevOps, 2019
2.	Ian Sommerville, Software Engineering, Pearson publication, Ninth Edition, Pearson publication.
3.	Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi ,Mastering Cloud Computing, Publication MK, ISBN: 978-0-12-411454
4.	Tim O'Brien, Mafred Moser ,Maven-The Complete reference, First edition, Sonatype, Inc. 2010
5.	Jason Canon, Linux for Beginners, Second Edition, Create Space Independent Publishing Platform
	Reference Books:
1.	Gene Kim, Jez Humble, Patric Debois& John Wills ,The DevOps Hand Book , First Edition
2.	Mark Horn beek ,Engineering DevOps, Second Edition
	E-resources (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.	OBA/Course Project/Course Seminar
		3.	Semester End Examination

Course Outcome (COs)			
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create			
At the end of the course, the student will be able to		Learning Level	PO(s)
1.	Summarize the fundamentals of various SDLC and utilize foundational tools and environments—for effective DevOps practices.	L2	PO1,PO6
2.	Identify various tools and practices of cloud Infrastructure used in DevOps.	L3	PO1,PO3
3.	Build and manage CI/CD pipelines using Jenkins and GitHub Actions, and Make use of various Infrastructures as Code (IaC) tools.	L3	PO1,PO3,PO4
4.	Analyse the different micro services using containers in real-world DevOps scenarios.	L4	PO1,PO3,PO4

Scheme of Continuous Internal Evaluation(CIE)

THEORY(40 marks)		PROJECT(60marks)			Total
IAtest (Theory)	IAtest (Lab)	ProjectPhase1	ProjectPhase2	Projectreport	
25 marks	15 marks	25 marks	25 marks	10 marks	100 marks
<p>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 Phase1 presentation will be conducted after 6 weeks and Project Phase2 presentation will be conducted after 13 weeks from the start of the semester. Submitting Project report is compulsory.</p>					
<p>Eligibility for SEE:</p> <ol style="list-style-type: none"> 50% and above (20 marks and above) in theory component 50% and above (30marksandabove) in project component 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 3 hours duration.		
2.	1 Lab program/problem/experiment Write-up & execution - (10marks write-up+20marks Tool Setup & Configuration / System Design+20marks Implementation of DevOps Workflow (Process/Automation))	50 marks	100marks
	Project evaluation a. Problem Definition, Objectives, and Methodology b. Project Implementation: DevOps Tools Integration c. Project Demonstration & Viva Voce	10 marks 20 marks 20 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 examiner together.		

CO PO mapping (planned)								
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
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
	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

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

Certification
(MOOC/NPTEL/Swayam/Industry/NASSCOM/VTU Online Courses)

Course Code	MMC401X	Course type	PCC	Credits L-T-P	---
Hours/week: L - T- P	NA - 0 - 0			Total credits	1
Total Contact Hours	L = 30 Hrs; T = 0 Hrs; P = 0 Hrs; Total = 30 Hrs			CIE Marks	100
				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.	MOOC/NPTEL/Swayam/Industry/NASSCOM/VTU Online Courses
2.	College Approved Courses
3.	College Designed Courses

Guidelines for Certification Courses:

1. The student should take up certification from the college Approved/Recommended Course Platform.
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	At the end of the course students will be able to explain the concepts of related subjects.	L3	PO8
CO2	At the end of the course students will be able to write any exam related with subject.	L3	PO1

Scheme of Continuous Internal Evaluation (CIE)

Certificate Grading:

Score Range %	≥90	<90- ≥ 80	<80- ≥ 70	<70- ≥ 60	<60- ≥ 50	<50
Grade obtained	Higher grade- O	Higher grade- A+, A	Average grade- B+	Average grade- B	Lower grade- C	F
Marks to be awarded	100% of total marks		90%-80% of total marks	80%- 70% of total marks	70%- 60% of total marks	0

Minimum marks required to pass CIE: 50% (50 marks out of 100)
Eligibility for SEE: NA

Scheme of Semester End Examination (SEE): NA

Rubrics: Levels	Target
1 (Low)	60% of the students score Less than 50 % of the total marks.
2 (Medium)	60% of the students score 50 – 70 % of the total marks.
3 (High)	60% of the students score More than 70 % of the total marks.

Course Articulation Matrix								
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
1								✓
2	✓							

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	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.

A. N. Nazare
**Name and Signature of the
 who prepared the syllabus**

H. S. Mogare
**Name and signature of faculty
 the reviewer**

Technical Seminar

Course Code	MMC452	Course type	TS	Credits L-T-P	--
Hours/week: L - T- P	--			Total credits	1
Total Contact Hours	L = 0 Hrs; T = 0 Hrs; P = 0 Hrs Total = 0 Hrs			CIE Marks	100
				SEE Marks	--

Course learning objectives	
1.	To inculcate self-learning, present the seminar topic confidently, enhance communication skill, involve in group discussion for exchange of ideas.
2.	To encourage the students to study new technologies in engineering developments.
3.	To develop academic technical paper writing skill.
4.	To motivate the students to use various teaching aids such as overhead projectors, power point presentation and demonstrative models.
5.	To emphasize on communication capability of the student to present a technical topic.

Required Knowledge of : Nil

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. The technical seminar titles must be discussed and finalized at the commencement of the 3rd Semester.
6. Submission of literature review must be conducted at the commencement of the 4th semester.
7. Technical seminar, analysis and conclusion must be conducted in Phase-II and Phase-III.
8. Phase III is the final phase where all the changes are expected to be incorporated as per suggestion in previous two phases.
9. A panel of examiners will evaluate each phase and the panel will have full authority to judge the quality of work.
10. 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**. 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**.
11. The CIE marks awarded for the technical seminar shall be based on the evaluation of the Report, Presentation skill, and performance in the Question and Answer session in the ratio 50:25:25.
12. Technical seminar shall be considered as a head of passing and shall be considered for the award of degree.
13. Students, who do not take up/complete shall be declared as fail in the technical seminar course and have to complete the same during the subsequent semester.

At the end of the course, the student will be able to		Learning Level	PO(s)
CO1	Interpret the recent technological advancements relevant to a selected topic through literature review.	L5	PO1,PO2,PO5,PO7
CO2	Discuss the impact of emerging technologies on society, the environment, and specific domains.	L6	PO1,PO3,PO4,PO5
CO3	Design and organize information gathered in a structured and a coherent format.	L6	PO1,PO5
CO4	Compile a comprehensive technical report adhering to professional standards.	L6	PO1,PO5,PO7,PO8

Scheme of Continuous Internal Evaluation (CIE):

No SEE for Technical seminar.

Topic Relevance	Content (Literature survey- Depth of research, critical thinking, and ability to analyze and interpret data or findings related to the topic etc.)	Presentation (Present the seminar topic orally and/or through PowerPoint slides- Clarity of speech, confidence, body language, ability to engage the audience and overall presentation style)	Adherence to IEEE format [Quality of submitted report (in their own words) with a list of references, without using ChatGPT]	Impact factor/significance of conference / journal
10	40	20	20	10 (Distribution of this mark is given at the „Note“ below this table)
Note: Minimum duration for presentation is 12 minutes + 3 minutes QA The CIE marks for Technical Seminar is 100 and the minimum marks to pass is 50.				

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 Journals (like **Scopus**/IEEE/Springer/ACM etc.)- **10 marks**
- For presented in reputed conferences / accepted in Journals (like **Scopus**/IEEE/Springer/ACM etc.)- **08 marks**
- **For submitted in reputed conferences/submitted in Journals (like Scopus/IEEE/Springer/ACM etc.)- 05 marks**
- For publication in **Non-Scopus** journal/conference (peer-reviewed / refereed) - **04 marks.**
- For publication in conferences / Journal (not peer-reviewed / not refereed) – **02 marks.**

CO PO mapping (planned)								
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
1	✓	✓			✓		✓	
2	✓		✓	✓	✓			
3	✓				✓			
4	✓				✓		✓	✓
Tick mark the CO 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

Name and Signature of the
faculty who prepared the syllabus

Name and signature of
the reviewer

**Karnatak Law Society's
GOGTE INSTITUTE OF TECHNOLOGY**

Udyambag, Belagavi -590008

**(Autonomous Institution under Visvesvaraya Technological University, Belagavi)
(APPROVED BY AICTE, NEW DELHI)**

DEPARTMENT OF MASTER COMPUTER APPLICATIONS



Technical Seminar Report on

“<<Title of the Technical Seminar >>”

is submitted in partial fulfilment of the requirements for the award of degree of

Master of Computer Applications

Submitted by

<< Name 1 >> << USN >>

<< Name 2 >> << USN >>

Under the Guidance of

<< Name of Internal guide >>

<<Designation>>

Department of M.C.A.
K.L.S. Gogte Institute of Technology,
Udyambag Belagavi

Academic Year: 202X – 2X

Karnatak Law Society's
GOGTE INSTITUTE OF TECHNOLOGY
Udyambag, Belagavi -590008
202X – 2X



Department of Master of Computer Applications

Certificate

This is to certify that <<Name 1>> and <<Name 2>> have completed their Technical seminar (MMC452) entitled "<title>" as a partial fulfilment for the award of the Master of Computer Applications degree, during the academic year 202X-2X under my supervision.

Internal Guide

<< Name of Internal guide >>

<<Designation>>

Department of M.C.A.

K.L.S. Gogte Institute of Technology, Belagavi

Head of Department

Dr. J. B. Madalgi

Assoc. Prof.

K.L.S. Gogte Institute of Technology, Belagavi

Principal

Dr. M. S. Patil

K.L.S. Gogte Institute of Technology,

Belagavi

Date of Exam	Examiner1 Name & sign	Examiner2 Name & Sign	Examiner3 Name & Sign

Professional Practice (Internship)

Course Code	MINT483	Course type	INT	Credits L-T-P	---
Hours/week: L -T- P	--			Total credits	3
Total Contact Hours	4 to 6 weeks			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.
- 3 To adopt emerging technologies in alignment with industry standards.

Guidelines for Internship

1. The student shall undergo Internship for 4-6 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. The preferred mode of conducting the internship is offline; however, if conducted online, it must be closely monitored by the supervisor on a daily basis to ensure consistent engagement and progress.
4. Two guides will supervise the internship work, one from the department and another one from the workplace where internship is being carried out.
5. The students shall report the progress of the Internship to the guide at regular intervals and seek his/her advice.
6. After the completion of internship, the students shall submit a report with completion certificate from the respective industry/organization/industry.
7. 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.
8. 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: <ul style="list-style-type: none"> • 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.)?

	<ul style="list-style-type: none"> • 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	<p>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</p> <ul style="list-style-type: none"> • Week number • Activity Title • Activity description • Implementation with necessary code snippets • Screenshots of Execution
10	<p>Chapter 3. Internship Outcomes This section shall address the following:</p> <ul style="list-style-type: none"> • 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	<p>Chapter 4. Conclusions of the report This section should include:</p> <ul style="list-style-type: none"> • 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)

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

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 Outcome (COs)			
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create			
At the end of the course, the student will be able to		Learning Level	PO(s)
1.	Apply theoretical concepts and principles from the curriculum to practical tasks and challenges encountered during the internship experience.	L3	PO1, PO2
2.	Analyze and apply appropriate tools, technologies, or methodologies relevant to the internship context to effectively perform assigned tasks	L4	PO1, PO2, PO3, PO4, PO5, PO7, PO8
3.	Apply communication skills ideas and information clearly and professionally in both written and oral forms, tailored to workplace standards and expectations	L3	PO1, PO2, PO5, PO7, PO8
4.	Function with professional behavior, ethical responsibility, and adherence to industry standards in workplace settings.	L4	PO1, PO5, PO7, PO8

CO PO Mapping (planned)								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	✓	✓						
CO2	✓	✓	✓	✓	✓		✓	✓
CO3	✓	✓			✓		✓	✓
CO4	✓				✓		✓	✓
Tick mark the CO PO mapping								

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, PO4, PO5, PO7, PO8
Ability to take Initiative	20	1,2,4	PO1, PO2, PO3, PO4, PO5, PO7, PO8
Ability to Learn New Technology	20	1,2	PO1, PO2, PO3, PO4
Quality of Work	20	1,2	PO1, PO2, PO3, PO4
Oral/Written Communication	20	3	PO7, PO8
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, PO3, PO4, PO5, PO7, PO8
Knowledge gained	20	1,2,4	PO1, PO2, PO3, PO4, PO5, PO7, PO8
Presentation	20	1,3	PO1, PO4, PO7, PO8
Internship Report Evaluation	20	1,3	PO1, PO4, PO7, PO8
Viva	10	3	PO7, PO8
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

Name & Signature of Faculty members
involved in designing the syllabus

Name & Signature of Faculty members
verifying/approving the syllabus

Project Work

Course Code	MPRJ484	Course type	PROJ	Credits L-T-P	---
Hours/week: L - T- P	--			Total credits	11
Total Contact Hours	22 to 25 hrs per week			CIE Marks	100
				SEE Marks	100

Course learning objectives

- 1 To provide hands-on experience in industry environments using modern tools and technologies.
- 2 To cultivate skills in conducting literature reviews, problem identification, and formulating research questions.
- 3 To explore various design methodologies for scalable solutions.
- 4 To train students in implementing projects using industry-standard protocols, tools, and version control systems.
- 5 To validate software/applications through rigorous testing frameworks (unit, integration, system).
- 6 To refine technical communication through structured presentations, reports, and peer reviews.

Pre-requisite:

Guidelines

- 1 Students must undertake **individual projects**.
- 2 The project can be carried out on-campus or in an industry or an organization with prior approval from the Department of MCA
- 3 Students carrying out the Project In house are required to be present in the college every day and report to the Internal Guide
- 4 The project must span a **minimum of 4 months** and involve **real-time work**.
- 5 Projects can be **application-oriented** or **research-oriented**, depending on the interests of the student and guide. Project report formats will differ accordingly.
- 6 Students must submit a **project offer letter** to their respective internal guides **before commencing** the project work.
- 7 **Seminars/presentations** must be given at various project phases to showcase the advancements in project development in front of a panel.
- 8 If the project report does not follow the **specified format** or is not based on a **real-time project**, **external examiners** have the right to **reject** the project.
- 9 Students are encouraged to showcase their **project's runtime behavior** (via video) along with a **PowerPoint presentation** during the **viva-voce examination**.
- 10 Students are encouraged to present or publish their **project outcomes** in **reviewed conferences or journals**.
- 11 Problem statements, literature surveys, and project synopses must be submitted to the project committee with internal guide approval within three weeks of commencing the 4th semester.
- 12 Submission and certification of the **project report** are **mandatory** for qualifying in the **Semester End Examination (SEE)**.
- 13 Failure to comply with any of the above-mentioned steps may lead to **disqualification** of the student's **Project Work (MPRJ484)** and may affect the **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 dry tone 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.

Heading	Example	Font Size and Style
Title	Chapter 1 Introduction	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 <i>Creation of database</i>	12 Point Bold Italicized

Table captions should always be positioned above the tables. The final sentence of a table caption should end without a period

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.

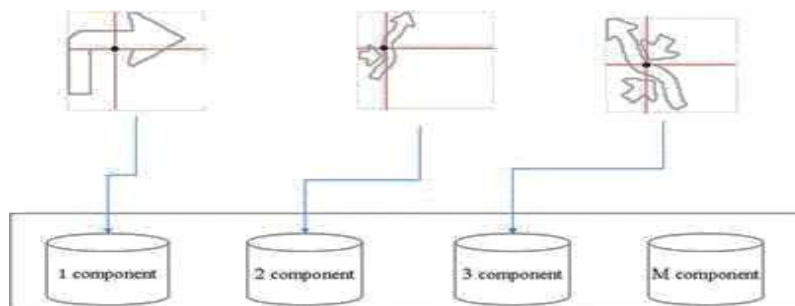


Fig 1.1. The last sentence of a figure caption should generally end without a period

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 in parentheses 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 in typewriter font, e.g., CMTT10 or Courier. Example of an Algorithm.

Algorithm-1: Database Creation (Mean and Standard Deviation based approach)

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 and academic year)

<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 suggested corrections, 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
 2. Certificate
 3. Project Completion certificate from Company / College
 4. Declaration (by student)
 5. Acknowledgement
 6. Abstract
 7. Table of Contents
 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.

Additional Notes

1. Proper attention must be given to both the technical content and the organization of the project report. Ensure clarity of expression and professional presentation throughout the document.
2. All students are required to submit the report for each project phase to their respective internal guides at least one week prior to the scheduled phase presentation dates.
3. Two hard bound dissertation reports are to be submitted. The report must be in Parrot Green color.
4. Plagiarism report must be less than 20% and the plagiarism scanning certificate by the department approved software to be included in the report.

KARNATAK LAW SOCIETY'S
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UDYAMBAG, BELAGAVI-590008
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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 Applications** 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 cooperation 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>

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Course Outcome (COs)			
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create			
At the end of the course, the student will be able to (Highlight the action verb representing the learning level.)		Learning Level	PO(s)
1.	Plan a software development project demonstrating the ability to define scope, objectives, and deliverables effectively.	L3	PO1, PO2, PO5, PO6
2.	Build a software application using suitable software development methodologies, tools, and technologies adhering to professional ethics.	L3	PO1, PO2, PO3, PO4, PO5, PO7, PO8
3.	Apply effective communication techniques and Defend the project through presentations and dissertation report.	L5	PO1, PO5, PO7
4.	Develop self-learning, lifelong learning skills towards sustainable solutions.	L3	PO1, PO8

Scheme of Continuous Internal Evaluation (CIE)

Theory Component:			
Components	Phase-1	Phase-2	Total Marks
Project Committee Panel	50	50	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.	Project Problem definition and Objective	05 marks	75 marks
2.	Presentation of Literature review and system design	15 marks	
3	UI Design and Development / Data pre-processing	15 marks	
4	Implementation and Testing	20 marks	
5	Results and Conclusion	10 marks	
6	Viva	10 marks	
Dissertation Report Evaluation			
1.	Critical understanding of the topic and Literature review	05 marks	25 marks
	Clarity and completeness of problem formulation/ experiment design	05 marks	
	Result presentation and discussion	10 marks	
	Adherence to report format	05 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).		

CO-PO Mapping (Planned)								
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
1	✓	✓			✓	✓		
2	✓	✓	✓	✓	✓		✓	✓
3	✓				✓		✓	
4	✓							✓
Tick mark the CO, 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.	Collaboration, Teamwork Communication, Leadership, Critical thinking.	Healthcare, Sports, Public Safety, Farming etc.	Software developer, DevOps Engineer, Data Scientist, Systems Analyst, IT Project Manager, Research Scientist etc.

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus