KARNATAK LAW SOCIETY'S GOGTE INSTITUTE OF TECHNOLOGY

"JNANA GANGA" UDYAMBAG, BELAGAVI-590008,

KARNATAKA, INDIA.

Approved by AICTE & UGC

Estd: 1939

Estd: 1979

Permanently Affiliated and Autonomous Institution Under Visvesvaraya Technological University, Belagavi www.git.edu

2024-25 Scheme
Department: MCA
Programme: MCA

1st to 4th Semester Scheme of Teaching and Examination

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 creativityand entrepreneurial skills.

MISSION

To train the students to become Quality Engineers with High Standards of Professionalism andEthics 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 acongenial, 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 suggestionsfor 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)
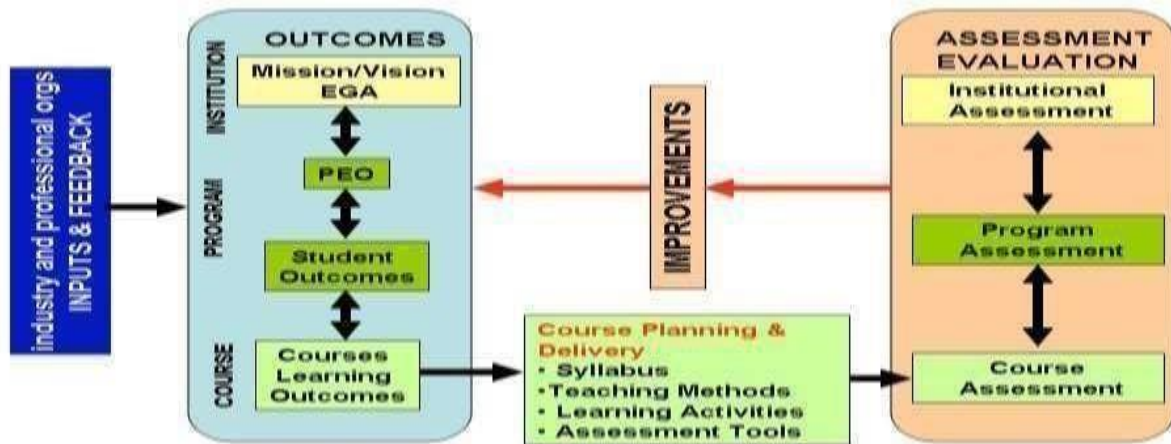
PROGRAM OUTCOMES (POs) :	
1.	**(Foundation Knowledge)**: Apply knowledge of mathematics, programming logic and coding fundamentals for solution architecture and problem solving.
2.	**(Problem Analysis)**: Identify, review, formulate and analyze problems primarily focusing on customer requirements using 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):

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

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

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

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

BLOOM'S TAXONOMY OF LEARNING OBJECTIVES

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

Lower order thinking skills(LOTS)		
L1	Remembering	Retrieve relevant knowledge from memory.
L2	Understanding	Construct meaning from instructional material including oral,written and graphic communication.
L3	Applying	Carry out or use a procedure in a given situation – usinglearned 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, usingpreviously learned knowledge.
L6	Creating	Combining or reorganizing elements to form a coherent orfunctional 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
1st year	1	22	43
	2	21	
2nd 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	Theory	Practical/Seminar	Tutorial/SDA	Duration in hours	CIE Marks		SEE Marks	Total Marks	Credits
								TH	**L**			
				L	P	T/SDA						
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	NCMC	MMC106	Basics of Programming Languages – Bridge Course	4	2	0	6	100		100	200	0
7	NCMC	MMAT107	Mathematics Bridge Course	3	0	0	3	100		-	100	0
				25	**8**	**2**	**35**	**700**		**600**	**1300**	**22**

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.

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	Theory	Practical/Seminar	Tutorial/SDA	Duration in hours	CIE Marks TH	CIE Marks L	SEE Marks	Total Marks	Credits
				L	P	T/SDA		TH	L			
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	0
5	PEC	MMC215X	Professional Elective Course-1	3	0	0	3	100		100	200	3
6	PEC	MMC216X	Professional Elective Course-2	3	0	0	3	100		100	200	3
7	AEC	MAEC257	Employability Skill	2	0	0	2	100		-	100	0
				19	8	2	30	700		500	1200	21

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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.

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		
				L	P	T/SDA		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

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.

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.

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				
				Theory	Practical/ Field work	Duration in hours	CIE Marks	SEE Marks Viva voce	Total Marks	Credits
				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.

PYTHON PROGRAMMING (I)

Course Code	MMC101	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 create the ability to design and build applications for problem solving using core and object oriented concepts of python programming
2.	To introduce file handling mechanism and usage of SQLite database with Python Programming
3.	To explore GUI, numpy, pandas libraries and key features visualization using matplotlib library

Required Knowledge of : NA

Unit – I	Contact Hours = 11 Hours
Basics of Python Programming: Features of python, writing and executing first python program, Literalconstants, variables and identifiers, data types, input operation, comments, reserved words, indentation, operators and expressions, operations on strings. Decision control statements. **Data Structures:** Lists, Tuple, Sets, Dictionaries. Textbook 1: Chapter 3.1, 3.4 - 3.12.4, 3.14, 4, 8.1, 8.2.1 – 8.2.6, 8.2.9 – 8.2.10, 8.3, 8.4 – 8.6	

Unit – II	Contact Hours = 11 Hours
Functions: Introduction, Function Definition, Function Call, Variable scope and lifetime, the return statement, more on defining functions. Lambda functions. **Modules:** The from…import statement, Name of Module, Making your own Modules, The dir() function. **Working with Database:** Connecting to a SQLite database, execute select statements, execute insert, update, delete statements. Textbook 1: Chapter 5.1 – 5.7, 5.11.1 – 5.11.4, Reference Book: Chapter 17.1 – 17.4	

Unit – III	Contact Hours = 10 Hours
Classes and Objects: Introduction, Classes and Objects, class method and self argument, The init method, Class Variables and Object Variables, The __del__() method, Other special methods, Public and Private data members, Private Methods, Calling a class method from another class methods, staticmethods. **Operator Overloading:** Introduction, Concept of Operator Overloading, Reverse adding. Textbook 1: Chapter 9.1 – 9.10, 9.15, 11.1 – 11.3	

Unit – IV	Contact Hours = 10 Hours
Error and Exception Handling: Introduction to Errors and Exceptions, Handling Exceptions, Multiple Except Blocks, Multiple Exceptions in a Single Block, Except Block Without Exception, The else	

Clause, Rising Exceptions, Handling Exceptions in invoked functions, Built-in and user defined exceptions, The finally block. **Multi-threading:** Introduction, starting a new thread using the _thread module, The threading module, Synchronizing threads. **GUI Programming with tkinter Package:** Introduction, Widgets.
Textbook 1: Chapter 12.1 – 12.11, Appendix A, Appendix B

Unit – V	Contact Hours = 10 Hours

Understanding Data Types in Python: A Python Integer Is More Than Just an Integer, A Python List Is More Than Just a List, Fixed-Type Arrays in Python ,Creating Arrays from Python Lists ,Creating Arrays from Scratch , NumPy Standard Data Types ,The Basics of NumPy Arrays , NumPy Array Attributes Array Indexing: Accessing Single Elements, Array Slicing: Accessing Subarrays Reshaping of Arrays , Array Concatenation and Splitting ,Computation on NumPy Arrays: Universal Functions,The Slowness of Loops, Aggregations: Min, Max, and Everything in Between ,Summing the Values in an Array Minimum and Maximum.
Data Manipulation with Pandas: Installing and Using Pandas,Introducing Pandas Objects, The Pandas Series Object ,The Pandas DataFrame Object, The Pandas Index Object ,Data Indexing and Selection ,Data Selection in Series , Data Selection in DataFrame.
Visualization with Matplotlib: General Matplotlib Tips 218 Importing matplotlib ,Setting Styles , show() or No show()? How to Display Your Plots,Saving Figures to File,Two Interfaces for the Price of One, Simple Line Plots, Adjusting the Plot: Line Colors and Styles, Adjusting the Plot: Axes Limits, Labeling Plots. Scatter plot.
Textbook 2 : Chapter 2 Page No : 34-58, : Chapter 3   Page No : 97-111, Chapter 4 Page No : 217-226

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
I	1	1. Decision Control Structure Statements, List/Dictionary
II	2	2. User Defined Functions
		3. Working with database
III	2	4. Object Oriented Concepts
		5. Overloading Operator
IV	1	6. GUI Programming
V	2	7. Numpy/Pandas
		8. Visualization

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

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	OBA/Course Project /Course Seminar
3.	Practice session/Demonstrations in Labs	3.	Lab Test
		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.	**Explain** core elements of Python Programming and key features of Object Oriented Programming	L2	PO1
2.	**Build** applications for problem solving using core and object oriented concepts of python programming	L3	PO1, PO3, PO5
3.	**Utilize** NumPy, pandas, Matplotlib, and GUI library (Tkinter) for efficient data manipulation, analysis, visualization, and user interface design.	L3	PO3, PO5
4.	**Analyze** the problem to determine the operations and constraints and choose the right data structure & other programming elements that best meets these requirements for implementation	L4	PO3, PO5

Scheme of Continuous Internal Evaluation (CIE):
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. No objective part in IA question paper 2. All questions 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 ≥40 &, however overall score of CIE+SEE should be ≥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. 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 and 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	Solid foundation in Python syntax, data types, data structures, control structures,functions, modules, and error handling Problem-solving: Ability to analyze, designand implement solutions for a wide rangeof problems Ability to build graphical user interfaces and create desktop applications.	Workflow automation Test Automation Data AnalyticsGaming	Software Developer, Test Automation Engineer DataAnalyst Web Developer

Name & Signature of Faculty members
involved in designing the syllabus

Name & Signature of Faculty members
verifying/approving the syllabus

DATABASE MANAGEMENT SYSTEM (I)

Course Code	MMC102	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 gain knowledge of fundamental database concepts such as data models schema, instances, keys, constraints, and normalization.
2.	To design databases by understanding requirements gathering, entity-relationship (ER) modeling, converting ER diagrams to relational schemas, and applying normalization techniques to ensure data integrity and efficiency.
3.	To master SQL (Structured Query Language) for data manipulation (insert, update, delete) and retrieval (select), including complex queries involving joins, subqueries, aggregations, and nested queries.
4.	To understand ACID properties (Atomicity, Consistency, Isolation, Durability) and how they ensure transactional integrity.

Required Knowledge of : NA

Unit – I	Contact Hours = 10 Hours

Basic concepts: Characteristics of Database approach, Actors on the Scene, Workers behind the scene, Advantages of using DBMS approach, Data models, schemas and instances, Three -schema architecture and data independence, Database languages and interfaces, the database system environment, Centralized and client -server architectures, Classification of Database Management systems.
Textbook Chapter 1.1 to 1.8, 2.1 to 2.6

Unit – II	Contact Hours = 11 Hours

Database Design using ER modeling and Relational Model: Entity-Relationship Model: Conceptual Database using high level conceptual data models for Database Design, A Sample Database Application, Entity types, Entity sets Attributes and Keys Relationship types, Relationship Sets, Roles and Structural Constraints Weak Entity Types, Relational Database Design Using ER-to-Relational Mapping, RelationalModel Concepts, Relational Model Constraints and Relational Database Schema, Functional Dependencies, Normalization (1 NF, 2 NF, 3 NF, BCNF)
Textbook Chapter 7.1 to 7.9, 15.1 to 15.6

Unit – III	Contact Hours = 11 Hours

Structured Query Language: SQL Data Definition and Data Types, specifying basic constraints in SQL, Schema change statements in SQL, Basic queries in SQL, JOINs and types of JOINs, More complex SQL Queries. Insert, Delete and Update statements in SQL, Views (Virtual Tables) in SQL.
Textbook Chapter 4.1 to 4.5, 5.1 to 5.4

Unit – IV	Contact Hours = 10 Hours
PL/SQL: Introduction to PL/SQL, language fundamentals, conditional and sequential control, Iterative processing and loops. Exception handlers, triggers. Stored functions, stored procedures. Creating cursors, accessing cursor, attributes of cursors (explicit and implicit). Textbook 2: Chapter 1, 2, 3 ,4, 5, 6, 7	

Unit – V	Contact Hours = 10 Hours
Transaction Processing and Concurrency Control: Introduction to Transaction Processing Concepts and Theory, Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability, Characterizing Schedules Based on Serializability, Concurrency Control Techniques, Two-Phase Locking Techniques for Concurrency Control. Textbook Chapter 15.1 – 15.10, 16.1-16.5	

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
2	1	ER Modeling
3	2	Structured Query Language
4	3	PL/SQL (Triggers, Cursors and Stored Procedures)

Books	
	Text Books:
1.	Elmasri and Navathe: Fundamentals of Database Systems, 6thEdition, Addison -Wesley, 2011.
2.	Steven Feuerstein, Bill Pribyl & Chip Dawes: Oracle PL/SQL Language Pocket Reference, 5th Edition, Orielly.
	Reference Books:
1.	Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2003.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://onlinecourses.nptel.ac.in/

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Lab Test
3.	Practice session/Demonstrations in Labs	3.	OBA/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.	**Describe** the basic concepts of database management systems	L2	PO1
2.	**Apply** different modeling techniques and formal design guidelines to develop a database schema.	L3	PO1,PO2
3.	**Develop** efficient SQL queries and PL/SQL programs to access the database.	L3	PO1,PO3
4.	**Examine** the given requirements and create a database by taking into consideration the various modeling techniques, normalization, SQL and PL/SQL	L4	PO1,PO3

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 is (**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. No objective part in IA question paper 2. All questions 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 ≥40 &, however overall score of CIE+SEE should be ≥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. 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 and 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	Able to query the database for useful data/information. Able to administer the usage and enhancethe performance of the database.	Healthcare, Banking, ERPs, HRmanagement etc	Database Admin, Databaseprogrammer, Database Designer.

Name & Signature of Faculty members
involved in designing the syllabus

Name & Signature of Faculty members
verifying/approving the syllabus

COMPUTER NETWORKS AND COMMUNICATIONS (I)

Course Code	MMC103	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 computer networks and data communications with its types, topology, models and its uses.
2.	To impart the knowledge of layers in computer networks along with their functionalities, services and study important protocols in higher layers of network.
3.	To identify the key design issues in each layer and use the algorithms solve the design issues.
4.	To simulate the wired and wireless network functions and protocols using a simulation tool.

Required Knowledge of :NA

Unit – I	Contact Hours = 11 Hours

Introduction to computer networks and Physical Layer
Introduction to Network: Characteristics of Data Communication; Components of Data Communication; Data Representation and Data Flow, Network Criteria; Types of Connection; Physical Topology; Uses of Computer Networks; Types of Networks. Reference models: TCP/IP Model, the OSI Model, comparison of the OSI and TCP/IP reference model.
Physical Layer: Theoretical Basis for Data Communication. Guided Transmission Media and Wireless Transmission, Digital Modulation and Multiplexing.
Textbook 1: Chapter 1, 2

Unit – II	Contact Hours = 11 Hours

Data Link Layer
Data Link Layer: Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols. Experiments on: Framing techniques
Textbook 1: Chapter 3

Unit – III	Contact Hours = 10 Hours

Network Layer
Network Layer Design issues, Routing algorithms- The Optimality Principal, Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, Hierarchical routing, Routing for Mobile Host, Congestion Control Algorithms, Quality of Service, Internetworking, The Network Layer in the Internet, IP Addressing.
Textbook 1: Chapter 5

Unit – IV	Contact Hours = 10 Hours

Transport Layer
The transport services, Elements of Transport Protocols, Congestion control, The Internet Transport Protocols: TCP and UDP.
Textbook 1: Chapter 6

Unit – V	Contact Hours = 10 Hours

Application Layer
Introduction to Network Tools: NS-2, Wireshark and Packet Tracer. DNS-Domain Name System, Email, WWW, Introduction to Streaming Audio andVideo.
Textbook 1: Chapter 7

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1,5	1.	Using WIRESHARK observe the data transferred in client server communication using UDP and identify the UDP datagram.
1,5	1.	Using WIRESHARK analyze three-way handshaking connection establishment, data transfer and connection termination in client server communication using TCP.
1,2	2.	Simulate a full duplex connection in an wired network using NS2.
1,5	4.	Simulate a simple wireless UDP application using NS2.
3	1.	Simulate the working of distance vector routing algorithm.

Books	
	Text Books:
1.	Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, 5th edition, Pearson Education.
	Reference Books:
1.	Behrouz A. Forouzan, Data Communications and Networking, 4th Edition, Tata McGraw-Hill, 2018.
2.	William Stallings, Data and Computer Communication, 10th Edition, Pearson Education, 2014.
	E-resources (NPTEL/SWAYAM. Any Other)- mention links
1.	https://www.digimat.in/nptel/courses/video/106105183/L01.html

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Lab Test
3.	Flipped Classes	3.	Semester End Examination
4.	Practice session/Demonstrations in Labs	4.	
5.	Virtual Labs (if present)		

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** Computer Network concepts with it types, topologies, transmission media, layeredprotocols and network models and architectures in layered architecture.	L2	PO1
2.	**Identify** different data transmission modes along with error detection and correction techniques and solve routing and congestion control algorithms in data transmission.	L3	PO1
3.	**Experiment** the working principles of various network types, topologies, architecture, algorithms and protocols in different layers using a simulation tool.	L3	PO1, PO3
4.	**Analyze** the design issues, services, interfaces,protocols and flow of data in computer networks and explain different performance issues related to networking.	L4	PO1,PO3

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. No objective part in IA question paper 2. All questions 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 ≥40 &, however overall score of CIE+SEE should be ≥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. 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 and 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	Enhancement of Computer Network Knowledge and ability to experiment the computer concepts learnt using simulation tool.	Networking	Network Administrator andNetwork Analyst.

Name & Signature of Faculty members
involved in designing the syllabus

Name & Signature of Faculty members
verifying/approving the syllabus

RESEARCH METHODOLOGY and IPR

Course Code	MMC104	Course type	PCC	Credits L-T-P	3 – 0 - 0
Hours/week: L - T- P	3 – 0 – 0			Total credits	3
Total Contact Hours	L = 45 Hrs; T = 0 Hrs; P = 0 Hrs Total = 45 Hrs			CIE Marks	100
				SEE Marks	100

	Course learning objectives
1.	To provide an overview of the research methodology and to elaborate the technique of defining a research problem.
2.	To elaborate various aspects of reviewing the literature and to develop concepts of research designs.
3.	To explore details of sampling design and to elaborate tests of hypotheses.
4.	To provide different methods of analysis and display of data and develop the art of interpreting and writing of research reports.
5.	To explore various forms of the intellectual property rights and its relevance.

Required Knowledge of : NA

Unit – I	Contact Hours = 9 Hours
Research Methodology, Defining the Research Problem Meaning of Research, Objectives of Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Research Process,Criteria of Good Research, Problems Encountered by Researchers in India. Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration. Textbook 1 Chapter 1,2	

Unit – II	Contact Hours = 9 Hours
Reviewing the literature, Research Design Place of the literature review in research, How to Review the literature, Searching the existing literature, reviewing and developing theoretical or conceptual framework, Writing about the literature reviewed. Meaning of Research Design, Need for Research Design, Features of a Good Design, Important ConceptsRelating to Research Design, Different Research Designs, Basic Principles of Experimental Designs. Textbook 2 Chapter 3 Textbook 1 Chapter 3	

Unit – III	Contact Hours = 9 Hours
Data Collection, Sampling Design Census and Sample Survey, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method. Implications of a Sample Design, Steps in Sampling Design, Criteria of Selecting a Sampling Procedure, Characteristics of a Good Sample Design, Different Types of Sample Designs, How to Select a Random Sample, Random Sample from an Infinite Universe, Complex Random Sampling Designs. Textbook 1 Chapter 4, 6	

Unit – IV	Contact Hours = 9 Hours
Analysis and Display of Data, Interpretation and Report Writing	
Types of Analysis, Statistics in Research, Measures of Central Tendency, Measures of Dispersion, Measures of Asymmetry (Skewness), Measures of Relationship, Simple Regression Analysis, Methodsof Communicating and Displaying Analyzed Data, Text, Tables, Graphs. Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Precautions for Writing Research Reports. Textbook 1 Chapter 7, 14 Textbook 2 Chapter 16	

Unit – V	Contact Hours = 9 Hours
Overview of Intellectual Property, Patents	
Introduction and the need for intellectual property right (IPR) – Kinds of Intellectual Property Rights:Patent, Copyright, Trade Mark, Design, IPR in India: Genesis and development – IPR in abroad – MajorInternational Instruments concerning Intellectual Property Rights: Patents – Elements of Patentability: Novelty, Non Obviousness (Inventive Steps), Industrial Application - Non – Patentable Subject Matter - Registration Procedure, Rights and Duties of Patentee, Assignmentand license, Restoration of lapsed Patents, Surrender and Revocation of Patents Textbook 3 Chapter 1, 2	

Books		
	Text Books:	
1.	C.R. Kothari, Research Methodology: Methods and Techniques, New Age International Publishers, Second Revised Edition. ISBN (13) : 978-81-224-2488-1	
2.	Ranjit Kumar (2011), Research Methodology a step-by-step guide for beginners, SAGE Publications Ltd, 3rdEdition.	
3.	Nithyananda, K V. (2019). Intellectual Property Rights: Protection and Management. India, IN: Cengage Learning India Private Limited.	
	Reference Books:	
1.	Neeraj, P., &Khusdeep, D. (2014). Intellectual Property Rights. India, IN: PHI learning Private Limited.	
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links	
1.	World Intellectual Property Organization. (2004). WIPO Intellectual property Handbook. Retrieved from	

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

Course Outcome (COs)			
At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)			
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		Learning Level	PO(s)
CO1	**Illustrate** the fundamentals of Research methodology, Research problem, Literature review, Research Design, Data Collection, Data Analysis, Data Interpretation, Report Writing, Intellectual Property and Patents.	L2	PO 1
CO2	**Model** a research problem using proper literature review and **plan** a research design	L3	PO 1, PO2
CO3	**Plan** a proper research process involving all its steps	L3	PO 1, PO2, PO8
CO4	**Analyze** and Interpret the data collected.	L4	PO 1, PO2, PO8

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study/Survey Paper Writing etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

 -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.
 -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 ≥ 40%, however overall score of CIE + SEE should be ≥ 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. 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 and 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	i)Develop fundamental knowledge ofresearch process and methodology ii) Make use of techniques involved in defining research problems iii) Develop requisite skills for an effectiveresearch Develop good understanding ofintellectual property rights	Universities, Research labs	Research Associate, Research Scholar(JRF)

Name & Signature of Faculty members
involved in designing the syllabus

Name & Signature of Faculty members
verifying/approving the syllabus

DISCRETE MATHEMATICS AND STATISTICS

Course Code	MMC105	Course type	BSC	Credits L-T-P	3 – 1 – 0
Hours/week: L – T- P	3 - 1 – 0			Total credits	4
Total Contact Hours	L =45 Hrs; T = 12 Hrs; P = 0 Hrs Total = 57 Hrs			CIE Marks	100
				SEE Marks	100

Course learning objectives

1.	To explore the concepts of set theory and logic.
2.	To impart the knowledge of relations and functions.
3.	To recognize the applicability of regression analysis for the purpose of estimation.
4.	To provide the clear sense of statistics and probability distributions.
5.	To identify the potential areas to apply concepts of graph theory.

Required Knowledge: Basics of Mathematics

Unit – I	Contact Hours = 9 Hours
Set Theory and Logic: Fundamentals of Set theory, inclusion-exclusion principle, Basic Connectives and Truth Tables, Logic Equivalence, The laws of Logic, Logical Implications: Rules of Inference, Textbook 1 Chapter 1,2,3,5.4 Textbook 6 Chapter 2.13	

Unit – II	Contact Hours = 9 Hours
Relations and Functions Properties of Relations, n-ary Relations and Their Applications, Representing Relations, Closures of Relations, Computer recognition-Zero One Matrices and Directed graphs, Posets and Hasse Diagrams, Equivalence relation and Partitions, lattices. Functions- types of functions, Special Functions, Function composition and Inverse function Textbook 1 Chapter 5,6	

Unit – III	Contact Hours = 9 Hours
Statistics and Regression Analysis	
Measures of Central Tendency (Mean, Median, Mode, Other averages), Measures of Dispersion (range, mean deviation, standard deviation),	
Correlation and linear regression analysis. Introduction, Methods of Studying Correlation, Scatter diagram method, Karl Pearson's Coefficient of Correlation, Probable Error, Correlation in Bivariate Frequency table, Rank Correlation Method. Linear Regression Analysis: Introduction, Lines of regression, Coefficients of regression. Correlation Analysis Vs Regression Analysis Textbook 2 Chapter 9.3 to 9.11, 10.3 to 10.8 Textbook 3 Chapter: 8, 9	

Unit – IV	Contact Hours = 9 Hours

Probability and Distributions   Introduction, Probability, A Priori Probability, Mathematics of probability, Addition Rule of Probability, Conditional Probabilities, The Multiplication Rule, Bayes Theorem on inverse probability, Binomial distribution, Poisson distribution and Normal distribution.

Textbook 2 Chapter 16.1 to 16.9, Textbook 4 Chapter 1, 2.

Unit – V	Contact Hours = 9 Hours

Graph Theory and Semi graphs

Graphs and Graphs models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring, Introduction to Semi graphs and their applications.

Textbook 5 Chapter 1, 4.1, 5.4

Books	
Text Books:	
1.	Dr D. S. Chandrasekhariah, "Discrete Mathematical Structures", 4th Edition, Prism Books Pvt Ltd
2.	C B Gupta, Vijay Gupta "An Introduction to Statistical Methods", 23rd Edition, Vikas publishing House Pvt. Ltd, India
3.	S C Gupta : Fundamentals of Statistics, 6th Revised and Enlarged Edition, Himalaya Publishing House,2009
4.	R H Dhareshwar and Sangeeta Shetti, Business Statistics – II, R Chand & CO Publishers, 1st Edition, 2018
5.	Dr. D. S. Chandrasekharaiah, "Applied Mathematics – Part II (Graph Theory)", Prism Books Pvt Ltd, 2001
6.	B S Grewal, "Higher Engineering Mathematics", 42nd Edition, Khanna Pubishers 2012
Reference Books:	
1.	Discrete and Combinatorial Mathematics, An Applied Introduction, Ralph P Grimaldi, B.V.Ramana, 5 thEdition, 2007, Pearson Education, ISBN-10: 8177584243, ISBN- 13: 9788177584240
E Resources:	
1.	https://onlinecourses.nptel.ac.in/noc22_cs123/preview

Course delivery methods		**Assessment methods**	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)
3.	Practice session	3.	Online Quizzes (Surprise and Scheduled)
		4.	Semester End Examination

Course Outcome (COs)			
At the end of the course, the student will be able to		Bloom's Level	PO(s)
CO1	**Illustrate** the fundamental concepts of sets, relations, functions, logic, statistics, probability and graph theory	L2	PO1
CO2	**Make use of** concepts of sets, relations, functions, logic, statistics, probability and graph theory to solve problems.	L3	PO1
CO3	**Identify** the suitable mathematical and or statistical construct to use for the given problem to find solution.	L3	PO1
CO4	**Analyze** mathematical concepts like logic, sets, relations and functions, statistics, probability and graph theory to optimize the solutions of engineering problem.	L4	PO3

CO-PO Mapping (Planned)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
1	✓							
2	✓							
3	✓							
4	✓		✓					
Tick mark the CO, PO and PSO mapping								

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study/Survey etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

 -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.
 -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 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.

Sl No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	Fundamentals of Mathematics and Statistics	Data Analyst	Data analyst and roles related to data science field

Name & Signature of Faculty members
involved in designing the syllabus

Name & Signature of Faculty members
verifying/approving the syllabus

BASICS OF PROGRAMMING LANGUAGES BRIDGE COURSE (I)

Course Code	MMC106	Course type	IPCC	Credits L-T-P	NCMC
Hours/week: L - T- P	4 - 0 - 2			Total credits	0
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 provide knowledge on the basics of programming like decision making, looping and arrays.
2.	To explore implementation of functions and structures.
3.	To emphasize on pointers and dynamic memory allocation.
4.	To introduce the concepts of classes, objects, member functions and constructors.
5.	To impart the knowledge of object-oriented concepts like encapsulation, inheritance and Polymorphism.

Required Knowledge of : Fundamentals of programming

Unit – I	Contact Hours = 10 Hours

C Programming: decision making, control structures and arrays: Decision making with if statement, simple if statement, the if..else statement, nesting of if..else statements, the switch statement, the ?: operator, programming examples. The while statement, the do...while statement, for statement, nested loops, jumps in loops, the continue statement, programming examples. One dimensional and two-dimensional arrays, declaration, and initialization of arrays, reading, writing and manipulation of above types of arrays. Textbook 1: Chapter 6, 7, 8, 9

Unit – II	Contact Hours = 12 Hours

Functions, Recursion, Structures: Concept of Function, User defined Function, System Defined Function, Types of parameter passing in function, Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, operations on individual members, array of structures, structures within structures, structures and functions, Unions, size of structures.
Textbook 1 Chapter 10, 11

Unit – III	Contact Hours = 10 Hours

Pointers, Dynamic Memory Allocations: Introduction to pointers, understanding pointers, Accessing the address of a variable, declaring pointer variable, initialization of pointer variable, accessing a variable through its pointers. Pointers as function arguments, functions returning pointers. Dynamic memory allocation, allocating a block of memory MALLOC, allocating multiple blocks of memory: CALLOC, releasing the used space: free.
Textbook 1 Chapter 12, 14

Unit – IV	Contact Hours = 10 Hours

Introduction to C++: Introduction to classes and objects, defining member functions, making an outside function inline, nesting of member functions, private member functions, arrays within a class, memory allocation for objects, static data member as static member functions, arrays of objects, objects as function arguments, returning objects. Constructors and destructors: introduction, constructors, parameterized constructors, multiple constructors in a class, constructors with default arguments, dynamic initialization of objects, copy constructor, destructors.

Textbook 2 Chapter 5, 6

Unit – V	Contact Hours = 10 Hours
Object Oriented concepts in C++: Introduction to inheritance, defining derived classes, single inheritance, multilevel inheritance, multiple inheritance, hierarchical inheritance, hybrid inheritance, abstract classes. Constructors in derived classes. Pointers, virtual functions and polymorphism. Textbook 2 Chapter 8, 9	

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	3	1. Programs on Looping constructs like if..else, do…while, for etc., 2. Programs on constructs like switch 3. Programs on array handling.
2	2	4. Programs on functions, parameter passing in function 5. Programs on handling structures.
3	3	6. Programs on handling pointers, Accessing the address of a variable 7. Programs on Pointers as function arguments, functions returning pointers 8. Programs on Dynamic memory allocation (MALLOC, CALLOC etc.,)
4	2	9. Programs on classes and objects 10. Programs on Constructors and destructors
5	2	11. Programs on inheritance 12. Programs on polymorphism

Books	
	Text Books:
1.	E. Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw-Hill.
2.	Object oriented programming with C++, E. Balaguruswamy, Tata McGraw Hill.
	Reference Books:
1.	Brian W. Kernighan and Dennis M. Ritchie, The 'C' Programming Language, Prentice Hall of India.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	elearning.vtu.ac.in/econtent/courses/video/BS/15PCD23.html
2.	https://nptel.ac.in/courses/106/105/106105171/ MOOC courses can be adopted for more
3.	clarity in understanding the topics and verities of problem solving methods.

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

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 usage of basic concepts of procedural programming and object oriented programming.	L2	PO1
CO2	Apply the concepts of procedural programming based on the given problem statements.	L3	P01, PO2
CO3	Build software solutions with object oriented programing concepts as per the needs and specifications.	L3	PO1,PO2
CO4	Analyze complex problems and discover the need for decision making, looping, basic data structures, user defined and built-in functions or use of Object Oriented concepts like classes objects inheritance, polymorphism to solve the problem.	L4	PO1, PO2, PO3

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. No objective part in IA question paper 2. All questions 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 ≥40 &, however overall score of CIE+SEE should be ≥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. 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	✓	✓	✓					

Sl No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	Logic buildingand basic programming skills	Information technology, Product based software companies	Software Developer

Name & Signature of Faculty members
involved in designing the syllabus

Name & Signature of Faculty members
verifying/approving the syllabus

MATHEMATICS BRIDGE COURSE

Course Code	MMAT107	Course type	NCMC	Credits L-T-P	3 – 0 - 0
Hours/week: L - T- P	3 – 0 – 0			Total credits	0
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			CIE Marks	100
				SEE Marks	NA

Course learning objectives	
1.	To explore the concepts of set theory and logic.
2.	To impart the knowledge of matrices and determinants.
3.	To illustrate the knowledge related to sequences and series.
4.	To provide the clear sense permutations, combinations and probability

Required Knowledge of : Basics of Mathematics

Unit – I	Contact Hours = 8 Hours
Set Theory : Introduction. Representation of sets, Types of Sets, Finite set, Infinite set, equivalent set, disjointset, Subset, Power set, Finding elements of power set for a given set, Venn diagram, Pigeonhole principle. Textbook 1 : chapter 1, 2	

Unit – II	Contact Hours = 8 Hours
Logic and Propositions : Logic Statement, Propositions, Connectives, Basic Logic Operations: Conjunction, Disjunction, Negation, Implication and Double Implication. Truth table, Logical Equivalence/Equivalent Statements, Tautologies and Contradictions. Textbook 1 : chapter 3, 5	

Unit – III	Contact Hours = 8 Hours
Matrices and Determinants : Matrix Introduction, Types of matrices, Scalar multiplication, Addition of matrices, Product of matrices. Transpose of a matrix, Symmetric and Skew Symmetric matrix, Rank of a matrix, Determinant of a matrix. Singular matrix. Textbook 3 : chapter 2	

Unit – IV	Contact Hours = 8 Hours
Sequence and Series : Introduction, Sequences, Series, Arithmetic Progression, Sum of Finite number of terms in A.P, Arithmetic Means, Geometric Progression, sum to n terms of G.P, Geometric Mean, relation between A.M and G.M. Textbook 3 : chapter 9, 10	

Unit – V	Contact Hours = 8 Hours

Permutations, Combinations and Probability : Permutations and Combinations, Probability: Introduction, Definition, random experiments, sample space, events and algebra of events, laws of addition and multiplication, independent events. Textbook 2 : Chapter 16

Books	
	Text Books:
1.	Dr D. S. Chandrasekhariah, "Discrete Mathematical Structures", 4th Edition, Prism Books Pvt Ltd
2.	C B Gupta, Vijay Gupta "An Introduction to Statistical Methods", 23rd Edition, Vikas publishing House Pvt. Ltd, India
3.	Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 43rd Edition, 2015.
	Reference Books:
1.	Discrete and Combinatorial Mathematics, An Applied Introduction, Ralph P Grimaldi, B.V.Ramana, 5 thEdition, 2007, Pearson Education, ISBN-10: 8177584243, ISBN- 13: 9788177584240
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://onlinecourses.nptel.ac.in/noc22_cs123/preview

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

Course Outcome (COs) At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)			
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		Learning Level	PO(s)
1.	**Summarize** the fundamental concepts of sets, relations, matrices and determinants, logic, sequences and probability	L2	PO1
2.	**Make use of** concepts of sets, relations, matrices and determinants, logic, sequences and probability for the given problem.	L3	PO1
3.	**Identify** the suitable mathematical construct to use for the given problem to find solution.	L3	PO1
4.	**Analyze** mathematical concepts like logic, sets, relations, matrices, determinants and probability to solve complex engineering problem.	L4	PO1

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study/Survey etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

 -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.
 -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.

CO-PO Mapping (Planned)								
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
1	✓							
2	✓							
3	✓							
4	✓							
Tick mark the CO and 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	Fundamentals of Mathematics	Software Domain	

Name & Signature of Faculty members
involved in designing the syllabus

Name & Signature of Faculty members
verifying/approving the syllabus

WEB DESIGN AND DEVELOPMENT (I)

Course Code	MMC201	Course type	IIPC	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 introduce the basics of designing webpage with HTML, CSS, and JavaScript.
2.	To emphasize the server side scripting using PHP.
3.	To guide on connecting web applications to backend database MySQL.
4.	To provide knowledge of sessions and cookies.

Required Knowledge of : Basics of programming

Unit – I	Contact Hours = 11 Hours
Coding the front end - HTML and CSS: Structuring the Page with HTML, Learning the Fundamental Structure of an HTML5 Web Page, Applying the Basic Text Tags, images, Creating Links, Building Bulleted and Numbered Lists, Table, Forms, Carving Up the Page. Styling the Page with CSS: Adding Styles to a Page, Styling Page Text, Working with Colors, Using CSS Selectors, Sizing and Positioning Page Elements. Textbook No 1 Book 2: Chapter 1, Chapter 2, Textbook No 2 Chapter 2.8, Chapter 2.9	

Unit – II	Contact Hours = 11 Hours
Coding the front end - JavaScript: An overview of JavaScript, understanding variables, building expressions, controlling the flow of JavaScript, harnessing the power of functions, working with arrays, Manipulating Strings, and Dates. Textbook No 1 Book 3	

Unit – III	Contact Hours = 10 Hours
Dynamic Documents with JavaScript: Introduction, Positioning Elements, Moving Elements, Element Visibility, Changing Colors and Fonts, Dynamic Content, Stacking Elements, Locating the Mouse Cursor, Reacting to a Mouse Click, Slow Movement of Elements, Dragging and Dropping Elements Textbook 2 Chapter 6	

Unit – IV	Contact Hours = 10 Hours
Coding the back end – PHP and MySQL: Learning the Basic Syntax of PHP Scripts, Outputting Text and Tags, Working with PHP Arrays, Controlling the Flow of Your PHP Code, Working with PHP Functions, Using PHP to Access MySQL Data. Textbook No 1 Book 5	

Unit – V	Contact Hours = 10 Hours
Advanced PHP Techniques: File Handling, Using cookies in PHP: setting a cookie, accessing a cookie, Using sessions in PHP: starting a session, ending a session, setting a time-out. Textbook No 3 Chapter 7, Chapter 12	

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	2	1. HTML 2. CSS
2	2	3. JavaScript functions 4. JavaScript Strings
3	1	5. Dynamic Document with JavaScript
4	1	6. MySQL and PHP
5	2	7. File handling 8. Sessions in PHP

Books	
	Text Books:
1.	Paul McFedries, Web Coding & Development All-in-One For Dummies, 2018 and onwards
2.	Robert W. Sebesta, Programming the World Wide Web, 4th Edition, Pearson Education, 2008 and onwards
3.	Robin Nixon, Learning PHP, MySQL & JavaScript, 1st Edition, O'Reilly, 2015 and onwards
	Reference Books:
1.	Chris Bates, Web Programming Building Internet Applications, 3rd Edition, Wiley India, 2006 and onwards
2.	W. Jason Gilmore, Beginning PHP and MySQL from Novice to Professional, 4th Edition, Apress.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://www.paulmcfedries.com/webcodingfordummies/

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Lab Test
3.	Flipped Classes	3.	Semester End Examination
4.	Practice session/Demonstrations in Labs	4.	
5.	Virtual Labs (if present)		

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 the basic constructs of the web programming concepts.	L 2	PO1
2.	Make use of scripting languages for making web pages.	L 3	PO1, PO4
3.	Build dynamic web applications using JavaScript events.	L 3	PO 1, PO4
4.	Apply the knowledge of PHP and MySQL to give solutions to the real world problems.	L 3	PO 1, PO3
5.	Analyze the relevant web components in building an application.	L 4	PO 1, PO3

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. No objective part in IA question paper 2. All questions 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 ≥40 &, however overall score of CIE+SEE should be ≥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. 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	✓		✓					
5	✓		✓					
6								
Tick mark the CO and 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	Design and build dynamic web applications for various domains	Healthcare, Banking, Social Media, Education etc	Web Developer, Web Designer, Front end designer, jQuery developer, PHP programmer,JavaScript developer etc.

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

DATA STRUCTURES AND ALGORITHMS (I)

Course Code	MMC202	Course type	IIPC	Credits L-T-P	3 - 1 - 1
Hours/week: L - T- P	3 - 1 – 2			Total credits	5
Total Contact Hours	L = 45 Hrs; T = 12 Hrs; P = 20 Hrs Total = 77 Hrs			CIE Marks	100
				SEE Marks	100

Course learning objectives	
1.	To provide knowledge about fundamentals of data structures and algorithms
2.	To explore applications of data structures.
3.	To elaborate design of algorithms, manipulate algorithms, understand algorithms, analyze algorithms, compare algorithms and appreciate the working of an efficient algorithm
4.	To impart the knowledge of algorithmic power and how the limitation can be coped up by using design techniques like backtracking and branch-and-bound, and finally conclude with a discussion of few approximation algorithms

Required Knowledge of : Basics of Programming

Unit – I	Contact Hours = 09 Hours
Data structures, Types of Data structures, Applications of Data structure, Stack: Primitive operation, implementing the push operation. Example: Infix, postfix and prefix, evaluating a postfix expression, converting an expression from infix to postfix Queue: Queues, Priority Queues, Circular queue and its implementation, de-queue (doubly ended queue) Textbook 1 : Chapter 1, 4.1	

Unit – II	Contact Hours = 09 Hours
Singly linked list, primitive operations on singly linked list, doubly linked lists, primitive operations on doubly linked list, Trees – Binary tree and operations, tree traversals, Binary Search Tree, Depth First Search, Breadth First Search Textbook 1 : Chapter 4.2, 5.1, 5.2, 5.5	

Unit – III	Contact Hours = 09 Hours
Analysis of algorithmic efficiency, Divide and Conquer: Notion of Algorithm, Fundamentals of algorithmic problem solving, Analysis Framework, Asymptotic Notations and Basic efficiency classes, Mathematical Analysis of Non-Recursive and Recursive Algorithms, Examples Divide and Conquer technique, Merge Sort, Quick Sort, Binary Search Textbook 2 : Chapter 1, 2	

Unit – IV	Contact Hours = 09 Hours
Dynamic Programming, Greedy techniques: Warshall's Algorithm, Floyd's Algorithm, 0/1 Knapsack Greedy Knapsack Problem, Kruskal's Algorithm, Dijikstra's Algorithm, Huffman Trees. Textbook 2 : Chapter 8, 9	

Unit – V	Contact Hours = 09 Hours
Backtracking, branch and bound : Backtracking and Branch-and-bound Backtracking: n – Queens's problem, Subset – Sum Problem. **Branch-and-Bound**: Assignment Problem. Textbook 2 : Chapter 12.1, 12.2	

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	2	1. Application of stack 2. Application of queue
2	2	3. Linked List 4. Tree / Binary Search tree
3	1	5. Divide and Conquer
4	2	6. Dynamic programming 7. Greedy technique
5	1	8. Backtracking

Books	
	Text Books:
1.	Yedidyah Langsam, Moshe J.Augenstein and Aaron M. Tenanbaum, Data structures using C, PHI.
2.	Anany Levitin, Introduction to design and analysis of algorithms, Pearson Education, 2003
	Reference Books:
1.	Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education Asia.
2.	Robert Kruse, C L Tondo, Bruce Leung and Shashi Mogalla: Data Structures and Program Design in C, 2nd Edition, Pearson Education.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://www.geeksforgeeks.org/data-structures/
2.	https://www.geeksforgeeks.org/fundamentals-of-algorithms/

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Lab Test
3.	Flipped Classes	3.	Semester End Examination
4.	Practice session/Demonstrations in Labs		
5.	Virtual Labs (if present)		

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 the basic concepts of data structures and algorithms	L2	PO1
2.	Identify the relevant data structures and make use of the same for solving the given problem.	L3	PO1, PO2
3.	Apply suitable algorithms for the given problem	L3	PO1, PO2
4.	Analyze and examine the approaches of algorithms based on the data structures used and order of notation.	L4	PO1, PO2

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. No objective part in IA question paper 2. All questions 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 ≥40 &, however overall score of CIE+SEE should be ≥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. 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 and 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	Problem Solving Skills	Software Development	Software Developer
2	Problem Optimization		

Name & Signature of Faculty members
members involved in designing the syllabus

Name & Signature of Faculty
verifying/approving the syllabus

PROGRAMMING USING JAVA & J2EE (I)

Course Code	MMC203	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 provide emphasize on the strengths of Java Language like interface, Multithreaded programming and exceptions.
2.	To introduce the core components of advanced Java programming language like JSP, Servlets, JDBC and Java Beans.
3.	To explore servlet life cycle and handling request headers, response headers, and status codes in servlets
4.	To elaborate life cycle of JSP with the advantages of JSP and how to make use of action tags, implicit objects, directive tags, and scriptlet tags
5.	To explore database connectivity using JDBC API

Required Knowledge of :Basics of Programming

Unit – I	Contact Hours = 10 Hours
The Java Language, Inheritance and Interfaces: The Java language: The Java Buzz words, ObjectOriented Programming, The Three OOP Principles, A first simple program, The Primitive Types, variables and Control Statements. Introducing Classes: class fundamentals, declaring objects, introducing methods, constructors, this keyword, Inheritance: Basics of inheritance, Method overloading and Method Overriding, Dynamic Method Dispatch, Introduction to JavaFX	
Textbook 1 Chapter 1 to 8.	

Unit – II	Contact Hours = 10 Hours
Interfaces and Exception Handling: Using Abstract classes, Interfaces, Default Interface Methods, Useof variables in an Interface Exception Handling: Exception Handling Fundamentals, Exception types, uncaught exceptions, using try and catch, Multiple catch clauses, Nested try statements, throw, throws, finally, Java's built-in Exceptions. Creating Your OwnException.	
Textbook 1 Chapter 9.	

Unit – III	Contact Hours = 11 Hours
Servlets: Servlet Structure, Lifecycle, and Single Thread model interface, Handling Client Request: Form Data, Handling Client Request: HTTP Request Headers. Generating server Response: HTTP Statuscodes, Generating server Response: HTTP Response Headers, Handling Cookies.	
Textbook 2 Chapter 3.1-3.8,4.1-4.4,5.1-5.3,6.1-6.2,7.1-7.5,8.1-8.7	

Unit – IV	Contact Hours = 10 Hours

Java Server Pages and Controlling the Structure of generated Servlets: Overview of JSP Technology,Need of JSP, Benefits of JSP, Basic syntax, using JSP expressions, writing scriptlets, using scriptlets to make parts of JSP conditional, predefined variables. The JSP page directive, import attribute, sessionattribute, isELignored attribute, buffer and auto flush attributes, info attribute, errorPage and isErrorPage attributes, isThreadsafe Attribute, extends attribute, language attribute, including files and applets in JSP Pages, using Java beans components in JSP documents.

Textbook 2 Chapter 10.1,10.2,10.3 and 10.6, 11.1 to 11.13,12.1 to 12.12,13.1 to 13.4,14.1 to 14.3

Unit – V	Contact Hours = 11 Hours

JDBC: Talking to Database, Types of JDBC, Essential JDBC program, JDBC Drivers, packages, Callable Statement, Statement Objects, using Prepared Statement JDBC in Action Result sets, Batch updates.
Textbook 3 Chapter 29 and Chapter 30.

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	1	1. GUI development using JavaFX
2	2	2. Interfaces.
		3. Exceptions
3	1	4. Servlet handling data from client (Client request)
4	3	5. JSP Scripting tags, all attributes of JSP Page directive tags, JSP Action tags (JSP: include, JSP: forward), JSP application using Java Bean class
5	1	6. JDBC (Database connectivity with different Statement objects) in Java/JSP /Servlet.

Books	
	Text Books:
1.	Herbert Schildt, Java The Complete Reference, Eight Edition. Tata McGraw-Hill Edition – 2011
2.	Marty Hall, Larry Brown, Core Servlets and Java Server Pages. Volume 1: Core Technologies. Second Edition
3.	Java 6 Programming Black Book, Dreamtech Press. 2012
	Reference Books:
1.	Web Technologies: HTML, Javascript, XML and , PHP, Java, JSP ASP.net, Ajax Black Book Kogent learning Solutions Inc/Wiley india 2008.
	E-resources (NPTEL/SWAYAM. Any Other)- mention links
1.	https://www.roseindia.net/java/

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

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** basic concepts of OOPs and other concepts of core Java technology.	L2	PO1
CO2	**Make use of** core Java concepts like interface, exception handling and GUI development in console applications.	L3	PO1,PO3
CO3	**Develop** enterprise web applications using J2EE technologies namely servlet, JSP and Java beans to process client request, cookies and session tracking.	L3	PO1,PO3,PO4
CO4	**Build and analyze** database enterprise applications for the business logic.	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. No objective part in IA question paper 2. All questions 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 ≥40 &, however overall score of CIE+SEE should be ≥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. 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	√		√	√				

Sl No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	General programming skills. Build Enterprise applications/web applications development along with database.	All the Programming Service sectors. Front end back end developers. Mobile Applications. Testing.	1.Software engineer. 2. Full stack developer 3. Front end developer Backend developer 4.System Engineer 5. Test Engineer 6. System architect

Name & Signature of Faculty members
involved in designing the syllabus

Name & Signature of Faculty members
verifying/approving the syllabus

PROFESSIONAL COMMUNICATION AND ETHICS

Course Code	MMC204	Course type	NCMC	Credits L-T-P	0 – 0 - 1
Hours/week: L - T- P	0 – 0 – 2			Total credits	0
Total Contact Hours	L = 25 Hrs; T = 0 Hrs; P = 0 Hrs Total = 25 Hrs			CIE Marks	100
				SEE Marks	NA

Course learning objectives	
1.	To prepare Learner to use appropriate English grammar and avoid the common errors in English while communicating.
2.	To train the learners to improve their listening, speaking, reading and writing skills.
3.	To prepare the learner to face job interviews and actively participate in group discussions.
4.	To provide the knowledge of professionalism and ethics in the world of Information Technology and study few case studies.

Required Knowledge of : NA

Unit – I	Contact Hours = 5 Hours
English Grammar and Common Errors in English English Grammar Articles, Prepositions, Tenses, Subject-Verb Agreement, Active and Passive Voice, Direct and Indirect Speech. Common Errors in English Word Confusion, Redundancies, Aesthetic Errors, Unique Indian English Expressions, Miscellaneous Errors. Textbook 3: Chapter 20, 21, 22, 23, 25 Textbook 2: Chapter 11, 12, 13, 15	

Unit – II	Contact Hours = 5 Hours
Reading and Writing Reading Techniques for Good Comprehension, SQ3 Reading Technique. Writing Letter Writing, Business Letters, Cover Letters, Resumes, Memos, Emails, Reports, Standards for Punctuation and Standards for the use of Numbers. Textbook 1: Chapter 10, 15	

Unit – III	Contact Hours = 5 Hours
Ethics in Information Technology Pillars of Professionalism, Professionalism and Ethical Responsibilities, Causes of Software Failures, Improving Software Quality, Producer Protection, Case Studies: Historic Examples of Software Risks. Textbook 4: Chapter 4, 8, 9	

Unit – IV	Contact Hours = 5 Hours

Listening and Speaking
Listening
Significance of Listening, Active Listening, Barriers to Active Listening, Types of Listening
Speaking
Vowels and Consonants, The Syllable, Weak Forms, Tone Groups, Rhythm and Intonation, Basic and Advanced Telephonic Skills.
Textbook 1: Chapter 4, 5

Unit – V	Contact Hours = 5 Hours

Interviews and Group Communication
Job Interviews: Stages of Interview, Face-to-face Interviews (Campus and On Site) and Telephonic Interviews.
Group Discussion as a part of Selection Process: Characteristics, Evaluation and Analysis.
Textbook 1: Chapter 5, 8

Unit No.	Self-Study Topics
3	Causes of Software Failures, Improving Software Quality, Producer Protection, Case Studies: Historic Examples of Software Risks.

Books	
	Text Books:
1.	Meenakshi Raman, Sangeeta Sharma, Technical Communication Principles and Practices, Second Edition: Oxford University Press.
2.	Sheetal Bandekar, Tarala Deshpande, Common Errors in English: An Indian Perspective, KindleEdition, Amazon Asia-Pacific Holdings Private Limited.
3.	English Language Communication Skills, Urmila Rai, Himalaya Publishing House.
4.	Joseph Migga Kizza, Ethical and Social Issues in the Information Age, Sixth Edition, Springer.
	Reference Books:
1.	Lesikar, Flatley, Basic Business Communication, Tenth Edition: Tata McGraw Hill.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1	https://learnenglish.britishcouncil.org/
2.	https://www.bbc.co.uk/learningenglish/

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Speaking Test
3.	Individual and Group Tasks	3.	Case Study Reports
		4.	MCQ on Listening Tasks

| Course Outcome (COs) |
| At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.) |

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		Learning Level	PO(s)
CO1	**Apply** the knowledge of English grammar in professional communication avoiding the common errors.	L3	PO5
CO2	**Apply** the traits of a good listener and speaker to communicate effectively in a professional setup like job interviews, group discussions, seminars etc.	L3	PO5
CO3	**Utilise** reading skills for effective communication and apply writing skills to develop different types of letters, emails, memos, reports and resumes.	L3	PO5
CO4	**Utilise** the knowledge of Ethics to make appropriate principle-based decisions when faced with difficult situations.	L3	PO7

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Speaking Test + MCQ on Listening Task	Case Study Report	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20	100

| Minimum marks required to pass the CIE |
| 1. 50% and above (50 marks and above) in theory component. |

CO-PO Mapping (planned)								
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
1					√			
2					√			
3					√			
4							√	

Sl No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	Enhancement in Listening, Speaking, Reading and Writing skills using English language at work place.	All technical andnon-technical domains.	Technical Content Writer, Customer Services related jobs where English is used for Communication.

Name & Signature of Faculty members
involved in designing the syllabus

Name & Signature of Faculty members
verifying/approving the syllabus

SOFTWARE PROJECT MANAGEMENT

Course Code	MMC215A	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 an overview of Software Project Management, Project Planning and Evaluation and to identify the different industry preferred project management tools.
2.	To impart the knowledge of using critical path and precedence networks, activity on arrow networks to model ideal activity plan.
3.	To introduce the notion of Risk Management and Resource Allocation and to explore the requirements for the continual monitoring of projects and contract management.
4.	To impart the factors that influence people's behavior in a project environment and to provide the knowledge of different types of team structures and styles of leadership needed in different situations

Required Knowledge : NA

Unit – I	Contact Hours = 9 Hours

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

Unit – II	Contact Hours = 9 Hours

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

Unit – III	Contact Hours = 9 Hours

Risk Management
Risks, categories of risks, a framework for dealing with risks, risk identification, risk assessment, risk planning, risk management, evaluating risks to the schedule, applying the pert technique. Resource Allocation- The nature of resources, identifying resource requirements, scheduling resources, creating

critical paths, counting the cost, being specific, publishing the resource schedule, cost schedule, scheduling sequence.

Textbook Chapter 7, 8

Unit – IV	Contact Hours = 9 Hours

Monitoring And Control

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

Textbook Chapter 9, 10

Unit – V	Contact Hours = 9 Hours

Managing People in Software Environments

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

Textbook Chapter 11,12

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

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

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

Course Outcome (COs)			
At the end of the course, the student will be able to		Learning Level	PO(s)
CO1	Illustrate the basic concepts of Software Project Management, Project Planning and Evaluation, Activity Planning, Risk Management	L2	PO1,PO6
CO2	Build activity on node and activity on Arrow networks. Make use of various techniques to Monitor and control project.	L3	PO1,PO5,PO6
CO3	Outline the factors related to Identifying the resources required for a project and Build work plan and resource schedule.	L3	PO1,PO6,PO7
CO4	Analyze the solutions to problems using modular programming constructs. Survey various ways in managing People in Software Environments.	L4	PO1,PO2,PO5,PO6

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study/Survey etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100
-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. -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 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.

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

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

Name and Signature of the

faculty who prepared the syllabus

Name and signature of

the reviewer

IT INFRASTRUCTURE MANAGEMENT

Course Code	MMC215B	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 practical implementation of Information Technology Service Management (ITSM)
2.	To impart knowledge on how an integrated ITSM framework can be utilized to achieve IT business integration, cost reductions and increased productivity
3.	To introduce the best practices of ITSM methodology.

Required Knowledge of : NA

Unit – I	Contact Hours = 9 Hours
Introduction: IT Infrastructure management, challenges in IT infrastructure management, design issuesof IT organizations and IT infrastructure Factors to be considered in designing IT organization and IT infrastructure, determining customers' requirements, IT systems management process, IT service management process, information system design process, patterns for IT systems management, IT infrastructure library(ITIL). Textbook 1 Chapter 2 Textbook 2 Chapter 3	

Unit – II	Contact Hours = 9 Hours
Service Delivery Process: Service level management, Goals and Objectives of Service level management, SLM Process, financial management, IT service continuity management, capacity management, Activities in Capacity Management, Functions of Capacity Management, availability management, Basic Concept of Availability Management. Textbook 1 Chapter 3 Textbook 2 Chapter 4	

Unit – III	Contact Hours = 9 Hours
Service Support Process: Configuration Management Need of Configuration Management, Activities of Configuration Management, Service Desks, Incident Management, Problem Management, Change Management & Release Management. Textbook 1 Chapter 4 Textbook 2 Chapter 5	

Unit – IV	Contact Hours = 9 Hours
Storage Management: Storage, Backup, Archive and Retrieve, Disaster Recovery, Space Management, Database and Application Protection and Data Retention. Textbook Chapter 5 Textbook 2 Chapter 6	

Unit – V	Contact Hours = 9 Hours

Security Management: Computer Security, Internet Security, Physical Security, Identity Management, Access Control System and Intrusion Detection.
Textbook 1 Chapter 6
Textbook 2 Chapter 6

Unit No.	Self-Study Topics
1.	ITIL Information Technology Infrastructure Library.
2.	Contingency plan in IT infrastructure Management.
3.	Job Responsibilities of Project Manager.
4.	Activities Involved in Disaster Recovery Plan in storage management.
5.	Biometric Technology used in E-Commerce Platform.

Books	
	Text Books:
1.	Phalguni Gupta, Surya Prakash & Umarani Jayaraman, "IT Infrastructure & Its Management", Tata McGraw-Hill Education.
2.	Anita Sengar, "IT Infrastructure Management", S.K. Kataria and Sons, 2nd Edition, 2009.
	Reference Books:
1.	Surendra Keshari, Narendra Kumar "IT Infrastructure and Management" Dreamtech press, Distributed by Wiley ISBN: 9788194668657 Edition: 2020.
	E-resource (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://www.classcentral.com/course/system-administration-it-infrastructure--10219

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

Course Outcome (COs)			
At the end of the course, the student will be able to (Highlight the action verb representing the learning level.)			
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		Learning Level	PO(s)
1.	Explain the various components of the IT infrastructure.	L 2	PO 1
2.	Make use of ITSM to ensure that IT services are implemented, managed and delivered in ways that meet an organization's needs	L 3	PO 1
3.	Implement storage and security measures in an IT infrastructure set up	L 3	PO1, PO7

4.	Inspect proper methodology to configure an IT infrastructure solution for a small organization, including a network based on standard technology components, servers, security devices, and several different types of computing clients.	L 4	PO1, PO3,PO7

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study/Survey etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

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.

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: 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	✓		✓			✓		

Sl No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1.	Address the challenges related to ITinfrastructure. Manage issues related to data storage andsecurity.	Healthcare, Banking, Education, Mission critical systems etc.,	Data Center admin.

Name & Signature of Faculty members
involved in designing the syllabus

Name & Signature of Faculty members
verifying/approving the syllabus

DIGITAL SYSTEMS AND COMPUTER ORGANIZATION

Course Code	MMC215C	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 explore different number system representation and conversion from one number system to another.
2.	To impart the theorems and properties of Boolean algebra.
3.	To provide a clear idea of the basic structure, operation, performance of a digital computer.
4.	To explore the different ways of communicating with I/O devices, interfaces, arithmetic operations and algorithms on signed fixed-point numbers
5.	To explore the working of hierarchical memory system including cache memory and virtual memory.

Required Knowledge of : NA

Unit – I	10 Hours
Binary Systems, Combinational Logic, Boolean Algebra and Logic Gates	

Digital Computers and Digital Systems, Binary Numbers, Number Base Conversion, Octal and Hexadecimal Numbers, Subtraction using r's and r-1 complements, Binary Code, Binary storage and Registers, Binary Logic.

Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates.

Textbook 1: Chapter 1, 2

Unit – II	8 Hours
Simplification of Boolean Functions	

The Map method, Two-and-Three variable maps, Four-variables Map, NAND and NOR Implementation, Other Two-Level Implementations, Don't Care Conditions. Introduction: Adders, Subtractors

Textbook 1: Chapter 3.1-3.8, 4.1-4.4

Unit – III	9 Hours
Basic Structure of Computers, Machine Instructions and Programs	

Computer types, Functional Units, Basic Operational Concepts, Bus Structure, Software, Performance, Multiprocessors and Multicomputer, Memory Locations and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Basic Input / Output operations.

Textbook 2: Chapter 1.1-1.7, 2.2-2.5, 2.7

Unit – IV	9 Hours

Input / Output Organization, Arithmetic

Accessing I/O Devices, Interrupts, DMA Processor Examples, Buses.

Addition and Subtraction of Signed Numbers, Multiplication of Positive Numbers, Signed Operand Multiplication.

Textbook 2: Chapter 4.1-4.5, 6.1-6.4

Unit – V	9 Hours

The Memory System

Some Basic Concepts, Semiconductor RAM Memories, Read-only Memories, Speed, Size, Cost, Cache Memories, Virtual Memories, Memory Management Requirements, Secondary Storage.
Textbook 2: Chapter 5

Unit No.	Self-Study Topics
I	Integrated Circuits
II	Code Conversion
III	Assembly Language

Books	
	Text Books:
1.	M. Morris Mano , Michael D. Ciletti,Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog, 6th Edition, 2018, Pearson
2.	Carl Hamacher, ZvonkoVranesicSafwatZaky, Computer Organization, 5th Edition, Tata McGraw-Hill, 2011
	Reference Books:
1.	Soumitra Kumar Mandal, Digital Electronics- Principles and Applications, TataMcGraw-Hill, 2015.
2.	John P. Hayes, Computer Architecture and Organization, Tata McGraw Hill, 3rdEdition,2012.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://nptel.ac.in/courses/117105080
2.	https://archive.nptel.ac.in/courses/106/106/106106092/

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Assignment- Open/Industry/Certification
3.	Flipped Classes	3.	Course Project
4.	Online classes	4.	Semester End Examination

Course Outcome (COs)			
At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)			
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		Learning Level	PO(s)
1.	Understand the fundamental concepts of binary systems, Boolean algebra, logic gates, simplification of Boolean functions, basic computer structure, I/O organization, arithmetic operations, and memory systems.	L2	PO1
2.	Apply the principles of Boolean algebra and logic gates to simplify Boolean functions and design combinational circuits using tools such as maps and multiplexer/de-multiplexer.	L3	PO1, PO2, PO3
3.	Make use of basic computer organization concepts, including machine instructions, I/O operations, and memory structures, to develop functional digital systems.	L3	PO1, PO2, PO3
4.	Analyze the efficiency of digital systems by evaluating the performance and organization of combinational logic circuits, computer structures, I/O mechanisms, arithmetic operations, and memory systems.	L4	PO1, PO2

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Assignments– (Open/Industry/Certification	Course project (CP)/ Case study/Survey etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

-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.

-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 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	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
1	√											
2	√	√	√									
3	√	√	√									
4	√	√										
Tick mark the CO and PO mapping												

Sl No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	Proficiency in designing and implementing combinational logic circuits using Boolean algebra and logic gates.	Companies involved in software development, IT services, and system integration.	Computer Systems Analyst
2	Enhanced problem-solving skills through the simplification of Boolean functions and optimization of digital circuits.		Network Engineer
3	Improved programming skills related to machine instructions, addressing modes, and instruction sequencing.		IoT Solutions Architect

Name & Signature of Faculty members
involved in designing the syllabus

Name & Signature of Faculty members
verifying/approving the syllabus

INTRODUCTION TO SALESFORCE

Course Code	MMC215D	Course type	PBE	Credits L-T-P	2 – 0 - 2
Hours/week: L - T- P	2 – 0 – 4			Total credits	4
Total Contact Hours	L = 30 Hrs; T = 0 Hrs; P = 20 Hrs Total = 50 Hrs			CIE Marks	100
				SEE Marks	100

Course learning objectives	
1.	To introduce fundamentals of Salesforce and its components used for multiple domains
2.	To gain an understanding of the Salesforce terminologies and the different operations involved in constructing an informative system
3.	To develop ability to access or populate tables as an object in Salesforce database to create new processes based on the demands by users.
4.	To provide a solution to real world problems with the help of lightning tools and extensions using reusable components.

Required Knowledge of: Cloud Computing, Database Management Systems and Enterprise Management.

Unit – I	Contact Hours = 6 Hours

Introduction to salesforce & related clouds: Getting Around the App, Salesforce Platform Basics: Get started with salesforce platform. Discover Use Cases for the Platform, Understand the Salesforce Architecture, Navigate Setup, Power Up with AppExchange, Data Model: Understand Custom & Standard Objects, Create Object Relationships, Work with Schema Builder, Lightning Experience: Get Your Bearings, Navigate Around, Work with List Views, Work with Your Data,
Company-Wide Org Settings: Learn About Regional Settings, Discover Multiple Currency Settings

Unit – II	Contact Hours = 6 Hours

Getting Profile Organization Ready for Users: Lightning Experience Productivity: Elevate Your Daily Productivity, Work with Notes and Files, Manage Your Tasks, Events, and Email, Find Your Stuff with Search, Collaborate with Feeds and Groups, Analyze Your Data with Reports and Dashboards, Configuring Search Settings: Choose the Right Search Solution, Optimize Search Results, Setting Up Chatter (Classic): Get Started with Chatter, Enable Feed Tracking, Create Publisher Actions, Approve Records from the Feed, Develop a Rollout Strategy, Support a New Business Unit: Manage User Access, Manage Chatter, Modify Your Data Model, Configure an Email Letterhead and Template,
Automate Your Business Process, Mobile Access with Salesforce1

Unit – III	Contact Hours = 6 Hours

Setting Up and Managing Users: Managing Users and Introduction to Data Security, Activity Management: Activities: Tasks, Events, and Calendars Documentation, Security and Data Access: Data Security, Who Sees What, Object Customizations: Creating Picklist and Picklist Administration, Creating Formula Fields and Validation Rule, Working with Page Layouts, Working with Record

Types, Introduction to Business Process, Maintaining Data Quality, Managing Data: Import Wizards, Export Wizards, Use Data Loader to Export Data, Data Loader To Import.

Unit – IV	Contact Hours = 6 Hours
Lightning Experience Customization: Customize the Lightning Experience user interface without writing any code, Reports and Dashboards: Introduction to Reports and Dashboards, Creating New Reports with the Report Builder, Running and Modifying Reports, Format Reports with Summary, Tabular, Matrix and Joined, Building Dashboards, Email Templates and Letterheads: Email Templates and LetterHeads, Automation: Difference Between Workflow Rules and Process Builder, Process Builder, Lead Automation.	

Unit – V	Contact Hours = 6 Hours
Managing the Support Process: Managing and Resolving Cases, Customizing a Support Process, Automating Support, Understanding the Salesforce Console for Service, Collaborating in the Service Cloud, Analyzing Support Data, Lightning App Builder: Build custom pages for Lightning Experience and the Salesforce mobile app quickly with point-and-click tools.	

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
I	1	Salesforce Trailhead account/ profile creating and customizing the interface
II	2	Create users & rights, Lightning Experience , Elevate Daily Productivity using tools, Notes and Files, Manage Your Tasks, Events, and Email
III	3	Introduction to Business Process: Who Sees What, Object Customizations: Creating Picklist and Picklist Administration, Creating Formula Fields and Validation Rule, Working with Page Layouts, Working with Record Types
IV	2	Lightning Experience Customization: Customize the Lightning Experience user interface without writing any code, Reports and Dashboards: Introduction to Reports and Dashboards, Creating New Reports with the Report Builder
V	2	Customizing a Support Process, Automating Support, Understanding the Salesforce Console for Service, Collaborating in the Service Cloud, Analyzing Support Data, Lightning App Builder

Unit No.	Self-Study Topics
I	Salesforce platform features and facilities available for business application development. A brief historical background towards customer relationship management (CRM).
II	Getting Profile Organization Ready for Users & Lightning Experience in salesforce
III	Salesforce business use-cases, modular approach to Project design and development
IV	Salesforce clouds and interfaces for business development
V	Business support and customer relationship management for business continuity

Books	
	Text Books:
1.	Paul Goodey-Salesforce CRM - The Definitive Admin Handbook,4th Edition- Packt Publishing © 2016
	Reference Books:
1.	Basics of salesforce- Salesforce Docs @salesforcedocs 19 Dec 2019
2.	Best Practices for Implementing Salesforce CRM- SalesforceDocs @ salesforcedocs 2019
3	Salesforce Solutions Help & Training by Bruce F. Magwn © 2012 Integration Technologies, Inc.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://salesforce.trailhead.com

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

Course Outcome (COs) At the end of the course, the student will be able to (Highlight the action verb representing the learning level.)			
At the end of the course, the student will be able to		Learning Level	PO(s)
1.	Understand the Salesforce terminologies to make use for products of different commodity	L2	PO1, PO2, PO4
2.	Identify the uses of Salesforce in the business world as a good promotional means for marketing the products.	L3	PO1, PO2, PO4, PO5
3.	Apply the techniques to retrieve the customer needs by means of Salesforce designs and options	L3	PO1, PO3, PO4, PO5, PO6
4.	Categorize and build the solutions with suitable mode of representation for the domain requirements using the lightning trends.	L4	PO1, PO3, PO4, PO6, 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					

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 - (20 marks write-up + 20 marks execution + 10 marks Vivavoce)	50 marks	100 marks
	Project evaluation a. Initial write up stating the objectives, methodology and the outcome	10 marks	
	b. Hardware project: Exhibiting and demonstration of working of project. Software project: Demonstration of the programming capabilities by writing flowchart, algorithm and codes related to a section of the project.	30 marks	
	c. Viva-voce	10 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	
1	✓	✓		✓					
2		✓		✓	✓				
3			✓	✓	✓	✓			
4				✓	✓		✓		✓	
Tick mark the CO and 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	Students can apply appropriate Components of salesforce to provide service to the customers.	Service based Industry	Salesforce Administrator Salesforce Business Analyst Salesforce Developer
2	Have a knowledge about Interactive applications and salesforce terminologies.		Salesforce Functional Consultant Salesforce Platform Manager
3	Students can solve real world problems.		Salesforce Solution Architect Salesforce Technical Architect

Name & Signature of Faculty members
involved in designing the syllabus

Name & Signature of Faculty members
verifying/approving the syllabus

NOSQL

Course Code	MMC216A	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 concepts of NoSQL, NoSQL in Cloud and explore different NoSQL tools and utilities.
2.	To explore different flavors of NoSQL like MongoDB, HBase, Cassandra.
3.	To give an insight in to the designing, storing and accessing the data base using NoSQL
4.	To emphasize on developing web application using PHP and NoSQL

Required Knowledge of : Database Management System (I)

Unit – I	Contact Hours = 9 Hours

Introduction to NoSQL
Definition of NoSQL, History of NoSQL and Different NoSQL products, Language Bindings for NoSQL Data Stores, NoSQL Storage Architecture.
Textbook 1: Chapter 1,2,3

Unit – II	Contact Hours = 9 Hours

NoSQL Basics
Performing CRUD operations with MongoDB and HBase, DBRef, Querying, Loading the MovieLens Data,Indexing and ordering datasets (MongoDB).
Textbook 1: Chapter 5,6,8

Unit – III	Contact Hours = 9 Hours

Advanced NoSQL
NoSQL in Cloud, Parallel Processing with Map Reduce, Basic Map Reduce, Partitioning and Combining,

Composing Map-Reduce Calculations, Big Data with Hive.

Textbook 1: Chapter 10,11,12

Ref. Book 1: Chapter 7.1,7.2,7.3

Unit – IV	Contact Hours = 9 Hours

Database Internals and Cassandra
Surveying Database Internals, using MySQL as a NoSQL solution, the Cassandra Data Model, Reading and Writing Data: Query Basic write properties, basic read properties,and Deleting data.
Textbook 1: Chapter 13
Textbook 2: Chapter 3, 7

Unit – V	Contact Hours = 9 Hours

Developing Web Application with NoSQL
Comparing Documents in MongoDB and PHP, MongoDB Classes, Connecting and Disconnecting, Inserting Data, Listing Your Data, returning a Single Document, Listing All Documents, Modifying Data with PHP, Deleting Data.
Textbook 3: Chapter 6, 7, 8

Unit No.	Self-Study Topics
2	Redis database
4	CRUD operations in Cassandra

Books	
	Text Books:
1.	Shashank Tiwari, Professional NOSQL, WROX Press, 2011.
2.	Eben Hewitt, Cassandra: The Definitive Guide, O'Reilly
3.	The Definitive guide to MongoDB, The NoSQL Database for Cloud and DesktopComputing, Apress 2010
	Reference Books:
1.	Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications,1st Edition ,2019
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://nptel.ac.in/courses/106104135
2.	https://www.ibm.com/cloud/learn/nosql-databases
3.	https://www.geeksforgeeks.org/introduction-to-nosql

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

Course Outcome (COs) At the end of the course, the student will be able to (Highlight the action verb representing the learning level.)		
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create	Learning Level	PO(s)
1. Outline the need of NoSQL. Illustrate the different NoSQL products with their storage architecture and MongoDB internal database.	L2	PO 1, PO2, PO3
2. Apply CRUD operations in MongoDB, HBase, Cassandra and indexing data along with MongoDB.	L3	PO 4
3. Make use of data modelling classes provided in GAE NoSQL cloud store and storing, accessing in Amazon SimpleDB	L3	PO 4
4. Build the applications using MongoDB with PHP also implement various update modifiers and functions with accessing, inserting and deleting the data.	L4	PO1,PO2,PO3,PO4

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study/Survey etc.	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100
-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. -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				

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. 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 and 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	Knowledge about NOSQL Products viz; MongoDB, Cassandra and Web Application with NoSQL.	DatabaseCloud Mobile ApplicationsE-Commerce E-Gaming	MongoDB Developer NOSQL DBA Java Full Stack(NoSQL) NOSQL Sr Engineer NOSQL Data Engineer

Name & Signature of Faculty members

involved in designing the syllabus

Name & Signature of Faculty members

verifying/approving the syllabus

DATA ANALYSIS WITH R

Course Code	MMC216B	Course type	PBE	Credits L-T-P	2 – 0 - 2
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 emphasize on learning R Programming language.
2.	To explore Graphics, modelling, functions and database with R in an efficient way.
3.	To fit some basic types of statistical models and use R in real world problems.
4.	To perform data analytics, data visualization using R.
5.	To emphasize students to become data analyst.

Required Knowledge of:
- Basics of Mathematics and Statistics
- Basics of Programming

Unit – I	Contact Hours = 09 Hours
Introduction	

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

Unit – II	Contact Hours = 09 Hours
R Programming Structures	

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

Unit – III	Contact Hours = 09 Hours
Doing Math and Simulation in R	

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

Unit – IV	Contact Hours = 09 Hours
Graphics and working with databases in R	

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

Unit – V	Contact Hours = 09 Hours
Probability Distributions	
Probability Distributions, Normal Distribution- Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance. Linear Models, Simple Linear Regression, - Multiple Regression Generalized Linear Models, Logistic Regression, - Poisson Regression- other Generalized Linear Models-Survival Analysis, Nonlinear Models- Decision- Random Forests Textbook 2 Chapter 17 (17.1 to 23.67)	

List of Experiments:

Unit No.	No. of Experiments	Topic(s) related to Experiment
I	1	Implementing data frame using R
II	1	Implementation of Quick Sort
III	1	Reading & writing files
IV	1	Graphical analysis of a dataset
IV	1	Database connectivity & basic operations
V	1	Implementing clustering model using K- means algorithm

Unit No.	Self-Study Topics
2	Extended Example: A Binary Search Tree.
3	Extended Example: Finding Stationary Distribution of Markov Chains

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

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

Course Outcome (COs) At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create	Learning Level	PO(s)
1. **Illustrate** the basic structures of R Programming, built-in functions for math, visualization, probability distributions and database connectivity.	L2	PO1
2. **Experiment with** basic structures, advanced data structures in R, built-in functions for math, statistical distributions and database connectivity for solving given problem.	L3	PO1, PO2, PO4, PO8
3. **Identify and utilize** applicable constructs of R among various basic structures of R, built-in functions for math, basic types of statistical distributions, data visualization in R and database connectivity for performing effective data analytics.	L3	PO1, PO2, PO4, PO8
4. **Examine** the given engineering problem and apply the suitable and useful R programming constructs to solve the same.	L4	PO1, PO2, PO3, PO4

Scheme of Continuous Internal Evaluation (CIE):

THEORY (40 marks)		PROJECT (60 marks)			
IA 1 (Theory)	IA 2 (Lab)	Project Phase 1	Project Phase 2	Project report	Total
25 marks	15 marks	25 marks	25 marks	10 marks	100 marks
Theory IA test should be of one-hour duration. Lab IA test should be of two / three-hour duration. Project batch will ideally consist of 2 students (maximum of 3). Project Phase 1 presentation will be conducted after 6 weeks and Project Phase 2 presentation will be conducted after 13 weeks from the start of the semester. Submitting Project report is compulsory.					
Eligibility for SEE: 4. 50% and above (20 marks and above) in theory component 5. 50% and above (30 marks and above) in project component 6. Not eligible in any one of the two components will make the student Not Eligible for SEE					

1.	It will be conducted for 100 marks having 3 hours duration.		
	1 Lab program/problem/experiment (10 marks write-up + 10 marks Loading Libraries + 10 marks Data Analysis, Plotting & Visualization + 10 marks Execution + 10 marks Modification)	50 marks	100 marks
2.	Project evaluation d. Problem Definition e. Presentation f. Data Analysis, Plotting & Visualization g. Viva-voce	15 marks 10 marks 15 marks 10 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	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
1	√											
2	√	√		√				√				
3	√	√		√				√				
4	√	√	√	√								

Tick mark the CO and PO mapping

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

Name & Signature of Faculty members
involved in designing the syllabus

Name & Signature of Faculty members
verifying/approving the syllabus

CLOUD COMPUTING

Course Code	MMC216C	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 fundamental concepts in the area of cloud computing, Parallel and Distributed Computing
2.	To introduce the concept of virtualization.
3.	To give an insight in to knowledge applications of cloud computing and various cloud platforms in industry.
4.	To introduce the features of cloud security.

Required Knowledge of : Computer Networks

Unit – I	Contact Hours = 10 Hours
Introduction, Cloud Computing at a Glance: The Vision of Cloud Computing, defining a Cloud, A Closer Look, Cloud Computing Reference Model, Characteristics and Benefits, Challenges Ahead, Historical Developments: Distributed Systems, Virtualization, Web 2.0, Service-Oriented Computing, Utility- Oriented Computing, Building Cloud Computing Environments: Application Development, Infrastructure and System Development, Computing Platforms and Technologies. Principles of Parallel and Distributed Computing: Parallel vs. distributed computing, Elements of parallel computing, what is parallel processing? Hardware architectures for parallel processing. Elements of distributed computing, Components of a distributed system, System architectural styles, Technologies for distributed computing, Remote procedure call. Textbook 1: Chapter 1, 2.2, 2.3, 2.4, 2.5, 2.5.1.	

Unit – II	Contact Hours = 9 Hours
Virtualization: Introduction, Characteristics of virtualized environments: Increased security, Managed execution, Portability, Taxonomy of virtualization techniques: Execution virtualization, Other types of virtualization, Virtualization and cloud computing, Pros and cons of virtualization: Advantages of virtualization, The other side of the coin: disadvantages, Technology examples: Xen: paravirtualization, VMware: full virtualization, Microsoft Hyper-V. Textbook 1: Chapter: 3	

Unit – III	Contact Hours = 9 Hours
Cloud Platforms in Industry: Amazon web services, Compute services, Storage services, Communication services, Additional services, Google AppEngine: Architecture and core concepts, Application life cycle, Cost model, Observations, Microsoft Azure: Azure core concepts, SQL Azure, Windows Azure platform appliance, Observations. Textbook 1: Chapter: 9	

Unit – IV	Contact Hours = 9 Hours
Cloud Computing Applications: Cloud Applications Scientific Applications, Healthcare: ECG Analysis in the Cloud, Biology: Protein Structure Prediction, Biology: Gene Expression data analysis for cancer diagnosis, Geoscience: Satellite Image Processing, Business and Consumer Applications, CRM and ERP Productivity, Social Networking, Media Applications, Multiplayer Online Gaming. Textbook 1: Chapter: 10	

Unit – V	Contact Hours = 8 Hours
Cloud Security: Cloud Security Risks, Security: The Top Concern for Cloud Users, Privacy and Privacy Impact Assessment, Trust, Operating System Security, Virtual Machine Security, Security of Virtualization, Security Risks Posed by Shared Images, Security Risks Posed by a Management OS, Xoar: Breaking the Monolithic Design of the TCB, A Trusted Virtual Machine Monitor. Textbook 2: Chapter: 9	

Unit No.	Self-Study Topics
1.	Cloud Automation.
2.	Data and Analytics in the Cloud.
3.	Cloud Cost Management.
4.	Real-World Cloud Computing Use Cases.

Books	
	Text Books:
1.	Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi Mastering Cloud. Computing McGraw Hill Education edition, 2013
2.	Dan C. Marinescu, cloud Computing Theory and Practice, Elsevier Inc., 2013
	Reference Books:
1.	Judith Hurwitz, R. Bloor, M. Kanfman, F. Halper, Cloud Computing for Dummies, Wiley India Edition
2.	Ronald Krutz and Russell Dean Vines, Cloud Security, Wiley-India
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://nptel.ac.in/courses/106105167

2.	https://onlinecourses.nptel.ac.in/noc23_cs27/preview
3.	https://docs.aws.amazon.com/
4.	https://learn.microsoft.com/en-in/azure/?product=popular

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

Course Outcome (COs)		
At the end of the course, the student will be able to (Highlight the action verb representing the learning level.)		
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create	Learning Level	PO(s)
1. Outline the fundamental concepts of cloud computing and the importance of cloud security.	L2	PO1,PO2, PO4
2. Make use of the cloud resource virtualization concept.	L2	PO1,PO2
3. Apply cloud platforms that are used in industry related works.	L3	PO1,PO4
4. Distinguish the different cloud applications in various fields.	L4	PO1, PO4

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study/Survey etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

 -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.
 -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 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	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
1	✓	✓		✓								
2	✓	✓										
3	✓			✓								
4	✓			✓								
Tick mark the CO and PO mapping												

Sl No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	General skills that are needed to build a career in cloud computing	Google Cloud Amazon Cloud Microsoft Azure All the cloud computing service sectors	Cloud administrator. Cloud support Engineer. Cloud software engineer. Cloud security analyst. Cloud network engineer. Cloud consultant. Cloud data scientist. Cloud architect

Name & Signature of Faculty members
involved in designing the syllabus

Name & Signature of Faculty members
verifying/approving the syllabus

Cryptography and Network Security

Course Code	MMC215D	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 establish the foundation for understanding the basics of Cryptography and Network Security.
2.	To provide an understanding on Secure a message over insecure channel by various means.
3.	To Maintain the Confidentiality, Integrity, Reliability and Availability of a data.

Required Knowledge of : Computer Networks and communications (I)

Unit – I	Contact Hours = 9 Hours

Symmetric Ciphers
Classical Encryption Techniques: Symmetric Cipher Model, Cryptography, Cryptanalysis and BruteForce Attack, Substitution Techniques, Caesar Cipher, Mono-alphabetic Cipher, Playfair Cipher, Hill Cipher, Poly alphabetic Cipher, One Time Pad. Block Ciphers and the data encryption standard: Traditional block Cipher structure, stream Ciphers and block Ciphers, Motivation for the Feistel Cipher structure, the Feistel Cipher, The data encryption standard, DES encryption, DES decryption, A DES example, results, the avalanche effect, the strength of DES, the use of 56-Bit Keys, the nature of the DES algorithm, timing attacks, Block cipher design principles, number of rounds, design of function F, key schedule algorithm.
Textbook 1 Chapter 3, Chapter 4

Unit – II	Contact Hours = 9 Hours

Asymmetric Ciphers
Public-Key Cryptography and RSA: Principles of public-key cryptosystems. Public-key cryptosystems. Applications for public-key cryptosystems, requirements for public-key cryptosystems. Public-key cryptanalysis. The RSA algorithm, description of the algorithm, computational aspects, the security of RSA. Other Public-Key Cryptosystems: Diffie-Hellman key exchange, The algorithm, key exchange protocols, man in the middle attack, Elgamal Cryptographic systems, Elliptic curve arithmetic, abelian groups, Elliptic curve Cryptography.
Textbook 1 Chapter 9, Chapter 10

Unit – III	Contact Hours = 9 Hours

Mutual Trust
Key Management and Distribution: Symmetric key distribution using Symmetric encryption, A key distribution scenario, Hierarchical key control, session key lifetime, a transparent key control scheme, Decentralized key control, controlling key usage, Symmetric key distribution using asymmetric encryption, simple secret key distribution, secret key distribution with confidentiality and authentication, A hybrid scheme, distribution of public keys, public announcement of public keys, publicly available directory, public key authority, public keys certificates, X-509 certificates. Certificates, X-509 version 3, public key infrastructure. User Authentication: Remote user Authentication principles, Mutual Authentication, one way Authentication, remote user Authentication using Symmetric encryption, Mutual Authentication, one way Authentication, Kerberos, Motivation , Kerberos version 4, Kerberos version 5, Remote user Authentication using Asymmetric encryption, Mutual

Authentication, one way Authentication, federated identity management, identity management, identity federation, personal identity verification.
Textbook 1 Chapter 14, Chapter 15

Unit – IV	Contact Hours = 9 Hours

Network and internet Security-1
Wireless network security: Wireless security, Wireless network threats, Wireless network measures, mobile device security, security threats, mobile device security strategy, IEEE 802.11 Wireless LAN overview, the Wi-Fi alliance, IEEE 802 protocol architecture. Security, IEEE 802.11i services, IEEE 802.11i phases of operation, discovery phase, Authentication phase, key management phase, protected data transfer phase, the IEEE 802.11i pseudorandom function. Web Security Considerations: Web Security Threats, Web Traffic Security Approaches. Secure Sockets Layer: SSL Architecture, SSL Record Protocol, Change Cipher Spec Protocol, Alert Protocol, and shake Protocol, Cryptographic Computations. Transport Layer Security: Version Number, Message Authentication Code, Pseudorandom Functions, Alert Codes, Cipher Suites, Client Certificate Types, Certificate Verify and Finished Messages, Cryptographic Computations, and Padding. HTTPS Connection Initiation, Connection Closure. Secure Shell(SSH) Transport Layer Protocol, User Authentication Protocol, Connection Protocol
Textbook 1 Chapter 17, Chapter 18

Unit – V	Contact Hours = 9 Hours

Network and internet Security-2
Electronic Mail Security: Pretty good privacy, notation, operational; description, S/MIME, RFC5322, Multipurpose internet mail extensions, S/MIME functionality, S/MIME messages, S/MIME certificate processing, enhanced security services, Domain keys identified mail, internet mail architecture, E-Mail threats, DKIM strategy, DKIM functional flow. IP Security: IP Security overview, applications of IPsec, benefits of IPsec, Routing applications, IPsec documents, IPsec services, transport and tunnel modes, IP Security policy, Security associations, Security associations database, Security policy database, IP traffic processing, Encapsulating Security payload, ESP format, encryption and authentication algorithms, Padding, Anti replay service, transport and tunnel modes, combining security associations, authentication plus confidentiality, basic combinations of security associations, internet key exchange, key determinations protocol, header and payload formats, cryptographic suits.
Textbook 1 Chapter 19, Chapter 20

Unit No.	Self-Study Topics
2	Pseudo random number generation based on an Asymmetric cipher
4	Transport Layer Security, Version Number, Message Authentication Code
5	Encapsulating Security payload

Books	
	Text Books:
1.	Cryptography and Network Security, William Stallings, Pearson, 7th Edition
	Reference Books:
1.	Cryptography and Information Security,V K Pachghare, PHI, 3rd Edition
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://www.coursera.org/specializations/computer-network-security

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

Course Outcome (COs)		
At the end of the course, the student will be able to (Highlight the action verb representing the learning level.)		
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create	Learning Level	PO(s)
1. Understand and Summarize the vulnerabilities in any computing system and hence be able to design a security solution.	L2	PO1, PO7
2. Identify the security issues in the network and resolve it.	L3	PO1, PO7
3. Analyze security mechanisms using rigorous approaches, including theoretical.	L3	PO6, PO7
4. Inspect the various protocols for network security to protect against the threats in the networks	L4	PO1, PO4

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study/Survey etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100
-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. -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 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 and 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	Clear understanding of information security principles and able to formulate interdisciplinary solutions for system vulnerabilities.	Government sectors, corporate Business organizations, Defense organizations.	Chief information officer(CIO), Chief information security officer(CISO), Risk assessment specialist and Security professionals

Name & Signature of Faculty members
involved in designing the syllabus

Name & Signature of Faculty members
verifying/approving the syllabus