Dr. M.G.R.
EDUCATIONAL AND RESEARCH INSTITUTE
DEEMED TO BE UNIVERSITY
University with Graded Autonomy Status
(An ISO 21001 : 2018 Certified Institution)
Periyar E.V.R. High Road, Maduravoyal, Chennai-95. Tamilnadu, India.

FACULTY OF COMPUTER APPLICATIONS

LEARNING OUTCOME BASED CURRICULUM

Curriculum and Syllabus

MCA

REGULATION 2022

DEPARTMENT OF COMPUTER APPLICATIONS

FACULTY OF COMPUTER APPLICATIONS

DECLARATION

I, **Dr.Viji Vinod**, Head of Computer Applications Department, hereby declare that this copy of the syllabus (MCA, Full time 2022 Regulation) from page number 1 to 106 is the final version which is being taught in the class and uploaded in our University website. I assure that the Syllabus available in our University website is verified and found correct. The Curriculum and Syllabi have been approved by our Academic Council / Vice Chancellor.

Date:

Signature

FACULTY OF COMPUTER APPLICATIONS

VISION / MISSION / QUALITY POLICY

Vision

- To become a leading centre for computer applications, fostering an environment of constant learning and innovation.

Mission

M 1 :	To create and maintain an environment for the pursuit of academic excellence with the use of computing technology.
M 2 :	To develop intellectual strength of students and guiding them towards technical, professional and entrepreneurship excellence.
M 3 :	To nurture analytical skills, inter- personal skills and build higher level of attitude, ethics and confidence.
M 4 :	To identify areas of cooperation with Industries and Institutions and implement them well within time-frame to mutual advantage and satisfaction.
M 5 :	Collaborate with industry and other agencies for academic and research programs.

Quality Policy

- Imparting quality education and achieve academic excellence through planning, leadership, brilliance, inspiration and effectiveness.

FACULTY OF COMPUTER APPLICATIONS

PROGRAM EDUCATIONAL OBJECTIVE (PEO)

PEO 1:	Excel in professional career and/or higher education by acquiring knowledge in mathematical, computing and engineering principles...
PEO 2:	Analyze real life problems, design computing systems appropriate to its solutions that are technically sound, economically feasible and socially acceptable
PEO 3:	Exhibit professionalism, ethical attitude, communication skills, team work in their profession and adapt to current trends by engaging in life long learning
PEO 4:	Design, develop and implement interdisciplinary application software projects to meet the demands of industry requirements using modern tools and technologies.
PEO 5:	Analyze the societal needs to provide novel solutions through technological based research

MAPPING PEO WITH MISSION

	M 1	M2	M3	M4	M5
PEO 1	3	3	2	3	3
PEO 2	3	3	1	3	3
PEO 3	2	3	2	3	3
PEO 4	2	3	3	3	3
PEO 5	3	3	2	3	3

FACULTY OF COMPUTER APPLICATIONS

PROGRAM OUTCOMES (PO)

PO 1:	To demonstrate a sound knowledge in key areas of Computer Sciences and Industrial Computing
PO 2:	To demonstrate a substantial understanding of concepts in key areas of Computer Sciences
PO 3:	To carry out the required analysis and synthesis involved in Computer Systems, Information systems and Computer Applications
PO 4:	To demonstrate professional competence in developing software and in its design and implementation.
PO 5:	To develop sound Practical Skills to enable them to addressing problems which arise from Computer systems and Applications
PO 6	To provide students with an opportunity to strengthen their knowledge in a specific are of computing
PO 7	To develop tremendous Computer Skills to the learners.
PO 8	To exhibit practical knowledge of the management concepts and principles in the work scenario.
PO 9	To develop programming and networking skills of the learners.
PO 10	To attain theoretical as well as practical knowledge and demonstrate application of technical principles in a professional work setting.
PO 11:	To sustain effective individual and organizational performance by Leveraging IT skills in a given context.
PO 12:	To attain research writing skills through research methodologies

MAPPING PEO WITH PO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
PEO 1	2	3	1	3	2	3	2	3	1	3	2	3
PEO 2	3	3	3	3	3	3	3	3	3	3	3	2
PEO 3	2	3	2	3	2	3	2	3	2	3	2	3
PEO 4	3	3	3	3	3	3	3	3	3	3	3	3
PEO 5	2	3	1	3	2	3	2	3	1	3	2	3

FACULTY OF COMPUTER APPLICATIONS

PROGRAM SPECIFIC OBJECTIVES

PSO 1:	Ability to design and develop computing systems using concepts of Mathematics, Computer Engineering and other related disciplines to meet customers' business objectives.
PSO 2:	Ability to test and analyze the quality of various subsystems and to integrate them in order to evolve a larger computing system.
PSO 3:	Design, develop and implement interdisciplinary application software projects to meet the demands of industry requirements using modern tools and technologies.
PSO 4:	Analyze the societal needs to provide novel solutions through technological based research
PSO 5:	Ability to select the suitable data model, appropriate architecture and platform to implement a system with good performance. Ability to design and integrate various system-based components to provide user interactive solutions for various challenges.

MAPPING PEO WITH PSO

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
PEO 1	2	3	1	3	3
PEO 2	3	3	3	3	3
PEO 3	2	3	2	3	3
PEO 4	3	3	3	3	3

MCA(Full Time)
Curriculum & Syllabus
2022 Regulations

I SEMESTER							
S.NO	**Sub.Code**	**Title of the Subject**	**TY/LB/ ETL/IE**	**L**	**T/ SLR**	**P/R**	**C**
1.	CMCA22001	Advanced Database Technologies	Ty	3	0/0	0/0	3
2.	CMCA22002	Advanced Data Structures and Algorithms	Ty	3	1/0	0/0	4
3	CMCA22ET1	Programming fundamentals with C++	ETL	3	0/0	2/0	4
4.	CMCA22EXX	Elective I	Ty	3	0/0	0/0	3
5.	HMCC22001	Research Methodology	Ty	3	0/0	0/0	3
6.	CMCA22L01	Advanced Database Technologies Laboratory	Lb	0	0/0	4/0	2
7.	CMCA22L02	Advanced Data Structures and Algorithms Laboratory	Lb	0	0/0	4/0	2
8.	HMAC22IXX	Audit Course	Ty/IE	2	0/0	0/0	0
Total							**21**

II SEMESTER							
S.NO	**Sub.Code**	**Title of the Subject**	**TY/LB/ ETL/IE**	**L**	**T/ SLR**	**P/R**	**C**
1.	CMCA22003	Advanced Java Programming	TY	3	0/0	0/0	3
2.	CMCA22004	Python Programming	TY	3	0/0	0/0	3
3.	CMCA22ET2	Full Stack Web Development	ETL	3	0/0	2/0	4
4.	CMCA22EXX	Elective II	TY	3	0/0	0/0	3
5.	HMCC22002	Intellectual Property rights and Patents	TY	3	0/0	0/0	3
6.	CMCA22L03	Advanced Java Programming Laboratory	LB	0	0/0	4/0	2
7.	CMCA22L04	Python Programming Laboratory	LB	0	0/0	4/0	2
8.	CMCA22I01	Summer Internship	IE	0	0/0	4/0	2
TOTAL							**22**

III SEMESTER							
S.NO	**Sub.Code**	**Title of the Subject**	**TY/LB/ ETL/IE**	**L**	**T/ SLR**	**P/R**	**C**
1.	CMCA22005	Cyber Security	Ty	3	1/0	0/0	4
2.	CMCA22006	C# and .Net Programming	Ty	3	1/0	0/0	4
3.	CMCA22007	IOT and Cloud Computing	Ty	3	1/0	0/0	4
4.	CMCA22ET3	Data Analytics and R Programming	ETL	2	0/0	2/0	4
5.	CMOL22IE1	Open Elective – Swayam/NPTEL/Any MOOC	IE	3	0/0	0/0	3
6.	CMCA22L05	C# and .Net Programming Laboratory	Lb	0	0/0	4/0	2
TOTAL							**21**

IV SEMESTER							
S.NO	**Sub.Code**	**Title of the Subject**	**TY/LB/ ETL/IE**	**L**	**T/ SLR**	**P/R**	**C**
1.	CMCA22L06	**Project Work**	LB	0	0/0	9/9	9
2.	CMCA22I02	**Research Publication**	IE	0	0/0	4/0	2
TOTAL							**11**

Summary of Credits

1st Semester - 21

2nd Semester - 22

3rd Semester - 21

4th Semester - 11

Total - 75

LIST OF ELECTIVES

Electives							
S.No	**Sub.Code**	**Title of the Subject**	**Ty/Lb/ ETL/IE**	**L**	**T/ SLR**	**P/R**	**C**
1	CMCA22E01	Data Communication and Networks	Ty	3	0/0	0/0	3
2	CMCA22E02	Distributed Systems	Ty	3	0/0	0/0	3
3.	CMCA22E03	Soft Computing	Ty	3	0/0	0/0	3
4	CMCA22E04	Entrepreneurial Development	Ty	3	0/0	0/0	3
5	CMCA22E05	Object Oriented Software Engineering	Ty	3	0/0	0/0	3
6	CMCA22E06	Data Science	Ty	3	0/0	0/0	3
7	CMCA22E07	Image Processing	Ty	3	0/0	0/0	3
8	CMCA22E08	Web Content-Development	Ty	3	0/0	0/0	3
9	CMCA22E09	Enterprise Resource Planning	Ty	3	0/0	0/0	3
10	CMCA22E10	Software Project Management	Ty	3	0/0	0/0	3
11	CMCA22E11	Object Oriented Modeling And Design	Ty	3	0/0	0/0	3
12	CMCA22E12	Cryptography and Network Security	Ty	3	0/0	0/0	3
13	CMCA22E13	Block chain Technology	Ty	3	0/0	0/0	3
14	CMCA22E14	Machine Learning	Ty	3	0/0	0/0	3
15	CMCA22E15	Data Visualization	Ty	3	0/0	0/0	3
16	CMCA22E16	Data Mining And Warehousing	Ty	3	0/0	0/0	3

LIST OF AUDIT COURSES

AUDIT COURSE							
S.No	**Sub.Code**	**Title of the Subject**	**Ty/Lb/ ETL/IE**	**L**	**T/SLR**	**P/R**	**C**
1	HMAC22I01	English for Research paper Writing	Ty	2	0/0	0/0	0
2	HMAC22I02	Disaster Management	Ty	2	0/0	0/0	0
3	HMAC22I03	Sanskrit for Technical Knowledge	Ty	2	0/0	0/0	0
4	HMAC22I04	Value Education	Ty	2	0/0	0/0	0
5	HMAC22I05	Constitution of India	Ty	2	0/0	0/0	0
6	HMAC22I06	Pedagogy Studies	Ty	2	0/0	0/0	0
7	HMAC22I07	Stress Management by Yoga	Ty	2	0/0	0/0	0
8	HMAC22I08	Personality Development through Life Enlightenment Skills	Ty	2	0/0	0/0	0
9	HMAC22I09	Life skill	Ty	2	0/0	0/0	0

Table 1:Credit Distribution

S. No	CATEGORY	Description	No.of Courses	Credits	Total	Credit Weightage	Contact hours
1	CORE COURSES	Core Theory	7	25	35	46%	375
		Core Lab	5	10			150
2	ELECTIVE COURSES	Department Core Electives/ Skill enhancement electives	2	6	6	8%	90
3	OPEN ELECTIVES	Open Elective theory	1	3	3	4%	45
		Open Elective Lab					
4	INTERDISCIPLINARY/ ALLIED COURSES	Theory					
		Lab					
5	HUMANITIES & SOCIAL SCIENCES , LIFE SKILLS &SOFT SKILLS	Language 1 & 2			0		
		English 1 & 2					
		Soft Skills					
		Life Skill	1	0			15
		Foreign Language					
		Environmental Studies					
		Management Papers					
		Entrepreneurship Development					
6	PROJECTS/INTERNSHIP/ CORE SKILL	Project	1	9	23	31%	135
		Core Skills(ETL)	3	12			180
		Internship / NSS /NCC	1	2			30
7	ENGINEERING SCIENCES						
8	ANY OTHER	Research Methodology Intellectual Property Rights Research Publication	1 1 1	3 3 2	8	11%	45 45 30
Total			**24**	**75**	**75**		**1140**

Table 2:

Revision/modification done in syllabus content:

S.No	Course(Subject) Code	Course (Subject) Name	Concept/ topic if any, removed in current curriculum	Concept/topic added in the new curriculum	% of Revision/ Modification done
1	CMCA22C01	Advanced Database Technologies	-	Unit 4 & 5 modified from MCA20G003	40
2	CMCA22C02	Advanced Data Structures And Algorithms	-	Unit 4 & 5 modified from MCA20G001	30
3	CMCA22C03	Advanced Java Programming	-	Topics revised in 3rd,4th and 5th unit	80
4	CMCA22L03	Advanced Java Programming Laboratory	-	Modified the list of programs	80
5	CMCA22L04	Core Lab IV – Python Programming Laboratory	-	Some more programs added	50
6	CMCA22006	C# and .Net Programming	-	Modified 4th and 5th unit	50
7	CMCA22L05	C# and .Net Programming Laboratory	-	Modified the list of programs	20

Table3:

List of New courses/ value added courses//life skills/Electives/interdisciplinary /courses focusing on employability/entrepreneurship/skill development.

S. No.	New courses (Subjects)	Value added courses	Life skill	Electives	Inter Disciplinary	Focus on employability/entrepreneurship/skill development.
1	ETL – Full Stack Web Development	Research Methodology	Life Skills	Object Oriented Software Engineering	Entrepreneurial Development	Summer Internship
2	Core V – Cyber Security	Intellectual Property rights and Patents		Web Content-Development	Enterprise Resource Planning	Project Work
3	Core VII – IOT and Cloud Computing	Open Elective – Swayam/NPTEL/Any MOOC		Data Science		
4		**Research Publication (Internal Evaluation)**		Object Oriented Modeling And Design		
5				Cryptography and Network Security		
6				Block chain Technology		
7				Machine Learning		

SubjectCode: CMCA22001	Subject Name : ADVANCED DATABASE TECHNOLOGIES	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: BASIC DATABASE KNOWLEDGE	Ty	3	0	0	3

L : Lecture T:Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- Understand basic database concepts- including the structure and operation of the relational data model.
- Construct simple and moderately advanced database queries using Structured Query Language (SQL).
- Focus on advanced database topics- such as object relational database systems and the data warehouse.

COURSE OUTCOMES (COs) : (3- 5)

CO1	To understand the concepts of Organization of Data and Database
CO2	To understand the Applications of Structure and operations of data model
CO3	To understand and apply the concepts of Structured Query Language (SQL).
CO4	To program the Advanced data base Applications and software
CO5	To exercise the coding in object relational database systems and the data warehouse**.**

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	2	1	1	1	1	2	2	1	1	2
CO2	2	3	1	1	1	1	1	2	1	1	1	2
CO3	1	3	1	2	1	1	1	2	2	1	2	1
CO4	2	3	2	2	1	1	1	1	1	1	2	2
CO5	1	3	1	2	1	1	1	1	1	1	1	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	2	2	1	1	1		
CO2	2	2	1	1	3		
CO3	1	1	2	2	1		
CO4	1	2	2	1	2		
CO5	1	2	1	1	1		

H/M/L indicates Strength of Correlation H- High, M- Medium ,L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/ Allied	Skill component	Practical Project / Internship	others			
		✓										
Approval												

SubjectCode: CMCA22001	Subject Name : ADVANCED DATABASE TECHNOLOGIES	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: BASIC DATABASE KNOWLEDGE	Ty	3	0	0	3

L : Lecture T:Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

1. Understand basic database concepts- including the structure and operation of the relational data model.
2. Construct simple and moderately advanced database queries using Structured Query Language (SQL).
3. Focus on advanced database topics- such as object relational database systems and the data warehouse.

UNIT I 9 Hrs

Introduction: An Overview of Database Systems-Introduction to Database Design -The Relational Model - RelationalAlgebra And Calculus- SQL - Queries- Constraints- Triggers.

UNIT II 9 Hrs

Storage And Indexing: Overview Of Storage And Indexing- Storing Data - Disks And Files- Tree-StructuredIndexingHash-Based Indexing. Transaction Management: Overview of Transaction Management

UNIT III 9 Hrs

Concurrency Control- Crash Recovery. Multi Version Locks – Recovery – POSTGRES – JASMINE –GEMSTONE - ODMGModel.

UNIT IV 9 Hrs

Object And Object Relational Databases: Concepts for Object Databases- Enhanced Data Models - Client/Server Model - Data Warehousing and Data Mining - Web Databases – Mobile Databases- XML and Web Databases.

UNIT V 9 Hrs

Emerging Technologies: XML and Internet Databases- CURRENT ISSUES Rules - Knowledge Bases - Active and Deductive Databases - Multimedia Databases–Multimedia Data Structures – Multimedia Query languages - Spatial Databases.

Total No. of Hrs: 45

REFERENCES:

1. Raghu Ramakrishnan & Johannes Gehrke (2004)- Database Management Systems(3rd ed), McGraw Hill.(UNIT I- II & III)
2. Elmasri-R&Navathe-S.B(2007) Fundamentals of Database Systems(5th ed), Pearson Education/AddisonWesley(UNIT IV & V).
3. Henry F Korth- Abraham Silberschatz & Sudharshan .S(2006) Database System Concepts(5th ed)
4. Thomas Connolly and Carlolyn Begg, “Database Systems, A Practical Approach toDesign, Implementation and Management”, Third Edition, Pearson Education
5. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Fifth Edition,Pearson Education, 2006.
6. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”,Fifth Edition, Tata McGraw Hill, 2006.
7. C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, EighthEdition, Pearson Education, 2006.

SubjectCode: CMCA22002	Subject Name : ADVANCED DATA STRUCTURESAND ALGORITHMS	Ty/Lb/ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: BASIC DATA STRUCTURE KNOWLEDGE	Ty	3	1	0	4

L : Lecture T:Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To impart the basic concepts of data structures and algorithms
- To understand concepts about searching and sorting techniques
- To Understand basic concepts about stacks, queues, lists, trees and graphs
- To understand basic concepts of threaded binary trees and heaps
- To understand sting operations and pattern matching

COURSE OUTCOMES (COs) : (3- 5)

CO1	To understand and impart the basic concepts of data structures and algorithms
CO2	To apply the concepts of searching and sorting techniques of any type of data or their Structures
CO3	To apply the data or pointer on stacks, queues, lists, trees and graphs
CO4	To write algorithms and step by step approach in solving problems with fundamental data structures
CO5	To impart the nested concepts of data structures and algorithms

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	1	1	2	2	1	1	1
CO2	2	2	2	1	1	1	1	2	1	1	1	1
CO3	2	2	2	2	1	1	1	2	2	1	2	1
CO4	1	3	L	2	1	1	1	1	1	1	2	1
CO5	1	3	L	2	1	1	1	1	1	1	1	1

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	1	1	2	1	1			
CO2	1	1	2	1	3			
CO3	1	1	2	1	2			
CO4	1	1	2	1	2			
CO5	1	1	2	1	1			

H/M/L indicates Strength of Correlation H- High, M- Medium ,L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/ Allied	Skill component	Practical Project / Internship	others			
		✓										
Approval												

SubjectCode: CMCA22001	Subject Name : ADVANCED DATABASE TECHNOLOGIES	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: BASIC DATABASE KNOWLEDGE	Ty	3	0	0	3
L : Lecture T:Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

OBJECTIVES:

1. To impart the basic concepts of data structures and algorithms
2. To understand concepts about searching and sorting techniques
3. To Understand basic concepts about stacks, queues, lists, trees and graphs
4. To understand basic concepts of threaded binary trees and heaps
5. To understand sting operations and pattern matching

UNIT I 12 Hrs

Array -Polynomial -Sparse Matrixes-Representation of array - Stacks and Queues –Evaluation ofexpressions-Linked Lists-Singly Linked Lists-Circular lists- Doubly linked lists.

UNIT II 12 Hrs

Trees: Introduction-Binary Trees - Binary Tree Traversal- In order -Preorder- Post order-Binary Search Trees Balanced Trees-Threaded Binary trees- AVL Trees, Red Black Trees, 2-3 Trees, B-Trees, Splay Trees- Heaps-Priority Queues-Definition -Insertion and Deletion of Max heap.

UNIT III 12 Hrs

Algorithms for Insertion sort – Quick sort – Merge sort- Heap sort- Sorting on several keys- External sorting-k-way merging Buffer Handling for Parallel Operation.

UNIT IV 12 Hrs

Graphs: Representation – Operations-Depth first search-Breadth first search-spanning trees-Minimum Cost Spanning -Trees- Kruskals Algorithm-Prims Algorithm-Shortest Paths-Single source/All Destination - Nonnegative Edge Costs General Weights-Static Hashing-Dynamic Hashing.

UNIT V 12Hrs

Sting Operations, Brute-Force Pattern Matching, The Boyer- Moore Algorithm, The Knuth-Morris-PrattAlgorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman Coding Algorithm,

Total No. of Hrs: 60

REFERENCES:

1. Horowitz.E. Sahni-S& d Mehta (2002) Fundamentals of Data Structures in C++ (2nd ed), Galgotia
2. Weiss M.A (1994), Data structures & Algorithm Analysis in C++- (3rd ed) , Benjamin cummings.
3. Sara Baase (1998) Computer Algorithms – Introduction to Design and Analysis ,(3rd ed) AW.
4. . Anany Levitin “Introduction to the Design and Analysis of Algorithms” Pearson Education, 2015
5. Gilles Brassard, “Fundamentals of Algorithms”, Pearson Education 2015
6. Harsh Bhasin, “Algorithms Design and Analysis”, Oxford University Press 2015
7. John R.Hubbard, “Data Structures with Java”, Pearson Education, 2015
8. M. A. Weiss, “Data Structures and Algorithm Analysis in Java”, Pearson Education Asia, 2013

SubjectCode: CMCA22ET1	Subject Name : PROGRAMMING FUNDAMENTALS WITH C++	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	ETL	3	0	2	4

L : Lecture T:Tutorial S Lr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- The student will be able to understand the concepts of classes and object
- Define classes for a given situation for specific problem solving
- Reuse available classes after modifications if possible
- Possess skill in object oriented thought process

COURSE OUTCOMES (COs) : (3- 5)

CO1	To understand the Basic concepts in Programming Logics
CO2	To understand the Applications of Structured Language
CO3	To have knowledge on Basic concepts in Graphical User Interface
CO4	To program on the Basic concepts of Class and objects
CO5	To understand and coding the specific problem solving for different class and objects

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	2	1	1	1	1	2	2	1	1	2
CO2	2	3	1	1	1	1	1	2	2	1	1	2
CO3	1	3	1	2	1	1	1	2	2	1	2	2
CO4	2	3	2	2	1	1	1	1	2	1	2	2
CO5	1	3	1	2	1	1	1	1	2	1	1	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	2	2	1	1	1			
CO2	2	2	1	1	1			
CO3	1	2	2	2	1			
CO4	1	2	2	1	2			
CO5	2	2	1	1	1			

H/M/L indicates Strength of Correlation H- High, M- Medium ,L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/ Allied	Skill component	Practical Project/ Internship	others			
		✓										
Approval												

SubjectCode: CMCA22ET1	Subject Name : PROGRAMMING FUNDAMENTALS WITH C++	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	ETL	3	0	2	4

L : Lecture T:Tutorial S Lr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE:

- The student will be able to understand the concepts of classes and object
- Define classes for a given situation for specific problem solving
- Reuse available classes after modifications if possible
- Possess skill in object oriented thought process

UNIT I **12 Hrs**

Principles of OOPs: Programming paradigms - basic concepts - benefits of OOPs - applications of OOPs Introduction to C++: History of C++ - structure of C++ - basic data types - type casting - type modifiers- operators and control structures- input and output statements in C++ Classes and objects-class specification- member function specification- scope resolution operator- access qualifiers- instance creation.

UNIT II **12 Hrs**

Functions: Function prototyping- function components- passing parameters- call by reference- return by reference- inline functions- default arguments- overloaded function - Pointers - Array of objects- pointers to objects- this pointer- dynamic allocation operators- dynamic objects.

UNIT III **12 Hrs**

Constructors: Constructors- parameterized constructors- overloaded constructors- constructors with default arguments- copy constructors- destructors- static class members and static objects. Operator overloading - Overloading unary and binary operator- overloading the operator using friend function- stream operator overloading and data conversion.

UNIT IV **12 Hrs**

Inheritance: Defining derived classes- single inheritance- multiple inheritance- multi-level inheritance- hierarchical inheritance- hybrid inheritance- constructors in derived and base class- abstract classes- virtual function and dynamic polymorphism.

UNIT V **12 Hrs**

Exception Handling: Exception handling mechanism- multiple catch- nested try- throwing exception - Streams in C++ - Stream classes- formatted and unformatted data- manipulators- file streams- file pointer manipulation- file open and close - Template functions and Template classes. **Total No. of Hrs: 60**

REFERENCES:

2. Herbert Schilde (2017), *Complete Reference of C++*- (4th Ed)- McGraw Hill Education.
3. Core Ashok N. Kamthane(2006), *Object oriented Programming with ANSI & Turbo C++*,Pearson
4. H M Deitel & P J Deitel(2010), *C++: how to program*,Pearson Education.
5. Robert Lafore(2001),*Object Oriented Programming in Turbo C++*, Galgotia Publications.

Subject Code : HMCC22001	Subject Name : Research Methodology	Ty/Lb/ ETL/IE	L	T/ SLr	P/ R	C
	Prerequisite : None	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

- Design and formulation of research problem.
- Analyze research related information and statistical methods in research.
- Carry out research problem individually in a perfect scientific method
- Understand the filing patent applications processes, Patent search, and various tools of IPR, Copyright, and Trademark

COURSE OUTCOMES (Cos) : (3 – 5)
Students completing the course were able to

CO1	Design and Formulation of research problem.
CO2	Analyze research related information and statistical methods in research.
CO3	Carry out research problem individually in a perfect scientific method
CO4	Understand Patent Filing application Process.
CO5	Patent Search and various tools used.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/ POs	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO 8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	2	3	3	3	3	3	3
CO2	3	2	1	3	3	1	1	1	1	1	1	3
CO3	3	3	2	1	2	2	3	3	3	3	3	1
CO4	3	3	2	2	1	2	2	2	2	3	2	2
CO5	3	3	3	3	3	2	3	3	3	2	3	3

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others
									✓

Subject Code : HMCC22001	Subject Name : Research Methodology	Ty/Lb/ ETL/IE	L	T/ SLr	P/ R	C
	Prerequisite : None	Ty	3	0	0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab						

OBJECTIVES:

- Design and formulation of research problem.
- Analyze research related information and statistical methods in research.
- Carry out research problem individually in a perfect scientific method
- Understand the filing patent applications processes, Patent search, and various tools of IPR, Copyright, and Trademarks.

Unit 1 **9Hrs**

Introduction to research, Definitions and characteristics of research, Types of Research, Research Process, Problem definition, Objectives of Research, Research Questions, Research design, Quantitative vs. Qualitative Approach, Building and Validating Theoretical Models, Exploratory vs. Confirmatory Research, Experimental vs. Theoretical Research, Importance of reasoning in research.

Unit 2 **9Hrs**

Problem Formulation, Understanding Modeling & Simulation, Literature Review, Referencing, Information Sources, Information Retrieval, Indexing and abstracting services, Citation indexes, Development of Hypothesis, Measurement Systems Analysis, Error Propagation, Validity of experiments, Statistical Design of Experiments, Data/Variable Types & Classification, Data collection, Numerical and Graphical Data Analysis: Sampling, Observation, Interpretation of Results.

Unit 3 (This Unit has to be handled by Mathematics Faculty) **9Hrs**

Statistics: Probability & Sampling distribution, Estimation, Measures of central Tendency, Arithmetic mean, Median, Mode, Standard deviation, Co efficient of variation (Discrete serious and continuous serious), Hypothesis testing & application, Correlation & regression analysis, Orthogonal array, ANOVA, Standard error, Concept of point and interval estimation, Level of significance, Degree of freedom, Analysis of variance, One way and two way classified data, 'F' test.

Unit 4 **9Hrs**

Preparation of Dissertation and Research Papers, Tables and illustrations, Guidelines for writing the abstract, introduction, methodology, results and discussion, conclusion sections of a manuscript. References, Citation and listing system of documents.

Unit 5 **9Hrs**

Intellectual property rights (IPR) patents copyrights Trademarks Industrial design geographical indication. Ethics of Research Scientific Misconduct Forms of Scientific Misconduct. Plagiarism, Unscientific practices in thesis work, Ethics in science.

Total hours:45

Text Book:

1.K. S. Bordens, and B. B.Abbott, , "Research Design and Methods – A Process Approach", 8th Edition, McGraw Hill, 2011.
2.C. R. Kothari, "Research Methodology – Methods and Techniques", 2nd Edition, New AgeInternational Publishers

Subject Code: CMCA22L01	Subject Name: ADVANCED DATABASE TECHNOLOGIES LABORATORY	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: DATA BASE CONCEPTS	Lb	0	0	4	2

L : Lecture T:Tutorial SLr : Supervised Learning P : Project R : Research C:Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :

- Student has to acquire basic concept of DBMS
- Students will be familiar with SQL and its use in DBMS.
- Student has to acquire knowledge of implementation DDL COMMANDS.
- Students will be able to develop real time applications.

COURSE OUTCOMES (COs) : (3- 5)

CO1	To understand the concepts of Organization of Data and Database
CO2	To implement the Applications of Structure and operations of data model
CO3	To implement the concepts of Structured Query Language (SQL).
CO4	To practice the Advanced data base Applications and software
CO5	To experiment the object relational database systems and the data warehouse**.**

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	2	3	2	3	2
CO2	3	3	3	3	3	3	3	2	3	2	3	2
CO3	3	3	3	3	3	3	3	2	3	2	3	3
CO4	3	3	3	2	2	2	3	2	2	2	3	1
CO5	3	3	3	3	3	3	3	2	3	2	3	3

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	3	3	3	2	3		
CO2	3	3	3	2	3		
CO3	3	3	3	2	3		
CO4	2	3	3	3	3		
CO5	3	3	3	2	3		

H/M/L indicates Strength of Correlation H- High, M- Medium ,L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
								✓				

Approval	

Subject Code: CMCA22L01	**Subject Name: ADVANCED DATABASE TECHNOLOGIES LABORATORY**	**Ty/Lb/ ETL/IE**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: DATA BASE CONCEPTS	Lb	0	0	4	2

L : Lecture T:Tutorial SLr : Supervised Learning P : Project R : Research C:Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- Student has to acquire basic concept of DBMS
- Students will be familiar with SQL and its use in DBMS.
- Student has to acquire knowledge of implementation DDL COMMANDS.
- Students will be able to develop real time applications.

1. Online reservation system
2. Banking System
3. Personal information
4. Student mark processing system
5. Hotel Management
6. Stock Maintenance
7. College admission system

Total number of hours :60

Subject Code: CMCA22L02	Subject Name: ADVANCED DATA STRUCTURES AND ALGORITHMS LABORATORY	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: BASIC COMPUTER KNOWLEDGE	Lb	0	0	4	2

L : Lecture T:Tutorial SLr : Supervised Learning P : Project R : Research C:Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :

- To develop skills to design and analyze simple linear and non linear data structures
- To Strengthen the ability to identify and apply the suitable data structure for the given real world problem
- To Gain knowledge in practical applications of data structures

COURSE OUTCOMES (COs) : (3- 5)

CO1	Student has to acquire basic concept of data structure
CO2	Students will be able to implement data structure concepts using C++
CO3	Students will be able to develop real time applications.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	2	3	2	3	2
CO2	3	2	3	3	2	3	3	2	3	2	3	2
CO3	3	3	3	3	3	3	3	2	3	2	3	3

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	3	3	3	2	3			
CO2	3	2	3	2	3			
CO3	2	3	3	2	3			

H/M/L indicates Strength of Correlation H- High, M- Medium ,L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
								✓				

Approval	

Subject Code: CMCA22L02	Subject Name: ADVANCED DATA STRUCTURES AND ALGORITHMS LABORATORY	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: BASIC COMPUTER KNOWLEDGE	Lb	0	0	4	2

L : Lecture T:Tutorial SLr : Supervised Learning P : Project R : Research C:Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- To develop skills to design and analyze simple linear and non linear data structures
- To Strengthen the ability to identify and apply the suitable data structure for the given real world problem
- To Gain knowledge in practical applications of data structures

1. Implementation of Stack (Using Arrays & Pointers)
2. Implementation of Queue (Using Arrays & Pointers)
3. Singly Linked Lists
4. Doubly Linked Lists
5. Binary Tree Traversals
6. AVL Trees
7. Binary Search Trees.
8. Quick Sort, Heap Sort
9. DFS,BFS
10. Shortest Path-DJIKSTRA Algorithm

Total number of hours :60

SubjectCode: CMCA22003	Subject Name : ADVANCED JAVAPROGRAMMING	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: **Java Programming**	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- Understand fundamentals of object-oriented programming in Java, including defining classes,invoking methods, using class libraries,database etc.
- To learn server side programming like servlets and jsp
- To understand angular JS and react JS
- To learn the frameworks like strut, ajax.
- To know the concepts of spring and hibernate framework

COURSE OUTCOMES (COs) : (3- 5)

CO1	To understand the Basic concept of jave and JDBC
CO2	To understand the concept of servlet and JSP
CO3	To understand the basic concept of Angular JS and React JS
CO4	To understand the Struts and Ajax framework
CO5	To understand the basic concepts of spring and hibernate

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	1	1	2	2	2	1	2	2
CO2	3	3	1	2	1	1	2	2	2	1	2	2
CO3	3	3	1	2	1	1	2	2	2	1	2	2
CO4	3	3	1	2	1	1	2	2	2	1	2	2
CO5	3	3	1	2	1	1	2	2	2	1	2	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	2	1	1	2	1			
CO2	2	1	1	2	1			
CO3	2	1	1	2	1			
CO4	2	1	1	2	1			
CO5	2	1	1	2	1			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
		✓										
Approval												

SubjectCode: CMCA22003	Subject Name : ADVANCED JAVAPROGRAMMING	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: **Java Programming**	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, database etc.
- To learn server side programming like servlets and jsp
- To understand angular JS and react JS
- To learn the frameworks like strut, ajax.
- To know the concepts of spring and hibernate framework

UNIT I **9 Hrs**

Java: Introduction to Java - Features of Java - Classes – Objects – Methods - Constructors –Finalize() method- Overloading methods – Static and final methods – Inheritance – Overriding methods –Packages-Interface – Exception handling- Multithreaded programming - I/O Streams
JDBC: Introduction to JDBC - Types of JDBC Drivers - Implementing JDBC Statements and Result Set. Simple JDBC program.

UNIT II **9 Hrs**

Java Servlet: The Java Servlet Architecture – the GenericServlet and HttpServlet Classes – Building a Servlet- Concept of cookie- Session Tracking.
JSP: Introduction to JSP-Components of a JSP - JSP Directives - JSP Scripting Elements- JSP Actions – Managing session using JSP - Error Handling in JSP - JSTL - Using JDBC in JSP -Writing simple JSP Page

UNIT III **9 Hrs**

Angular JS: Angular JS Basics, Angular Expressions, Filters, Directives, Controllers, Angular JS Modules, Angular JS Forms
ReactJS: ReactJS Introduction, ReactJS Architecture, React Creating a React Application, React JSX, ReactJS Component, React Form programming

UNIT IV **9 Hrs**

Struts: Introduction to Struts Framework and MVC Model, Introducing the Struts Framework, Exploring the Struts Architecture, Implementing the Struts Framework.
AJAX: Exploring AJAX, Application Areas of AJAX, Advantages and Limitations of AJAX, Identifying Security Threats, Implementing Authentication and Authorization Using JAAS.

UNIT V **9 Hrs**

Spring: Introduction to Spring Framework – Spring Core Container – Accessing Spring Beans- Configuring Beans – Bean Scope and Life Cycle – Aspect Oriented Programming - Features of AOP.
Hibernate: Introduction to Hibernate- ORM, Features of Hibernate, Comparing Hibernate with EJB, Overview of Hibernate Architecture.

Total no. of Hrs : 45

REFERENCES:

1. Naughton,P & Schildt, H,*Java 2 The Complete Reference(*5th ed), TMH
2. Santosh Kumar K(2008), "*JDBC, Servlets and JSP Black Book* ", Kogent Solutions New Edition
3. Gerald Brose, Andreas Vogel & Keith Duddy(2001), "*Java Programming with CORBA: Advanced Techniques for Building Distributed Applications*(3rd ed.)", Wiley Publication.

SubjectCode: CMCA22004	Subject Name : PYTHON PROGRAMMING	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: PROGRAMMING FUNDEMENTS	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To learn how to design Python applications.
- To learn how to write loops and decisions statements in Python
- To learn how to use inheritance in Python for reusability.
- To learn how to read and write files in Python.
- To understand database application and web application framework

COURSE OUTCOMES (COs) : (3- 5)

CO1	To understand the Basics of Python programming
CO2	To understand control statements
CO3	To understand the concept of inheritance
CO4	To understand file handling
CO5	To understand the database concepts and web application framework

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	1	1	2	1	2	1	2	2
CO2	3	3	3	3	1	1	2	1	2	1	2	2
CO3	3	3	3	3	1	1	2	1	2	1	2	2
CO4	3	3	3	3	1	1	2	1	2	1	2	2
CO5	3	3	3	3	1	1	2	1	2	1	2	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	3	3	3	2	3			
CO2	3	3	3	2	3			
CO3	3	3	3	2	3			
CO4	3	3	3	2	3			
CO5	3	3	3	2	3			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
		✓										
Approval												

SubjectCode: CMCA22004	Subject Name : PYTHON PROGRAMMING	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: PROGRAMMING FUNDEMENTS	Ty	3	0	0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

OBJECTIVES:

- To learn how to design Python applications.
- To learn how to write loops and decisions statements in Python
- To learn how read and write files in Python.
- To learn how to use inheritance in Python for reusability.
- To understand database application and web application framework

UNIT I **9 Hrs**

Data Types and Data Structures: Introduction to Python - using the Python interpreter- Overview of programming in Python- Python built-in types- Arithmetic in Python- Program input and Program output- Variables and assignment. Strings and string operations - List basics - List operations- Dictionaries- Dictionary basics and Tuples

UNIT II **9 Hrs**

Control Structures: Control Statements: if statements- while statement- for statements- functions- formal arguments- variable-length arguments- Exceptions- detecting and handling exceptions.

UNIT III **9 Hrs**

Classes files and modules: Introduction to Classes and Objects: classes- class attributes- instances- instance attributes- binding and method invocation- inheritance- polymorphism- Built-in functions for classes and instances.

UNIT IV **9 Hrs**

Files and input/output: reading and writing files- methods of file objects- using standard library functions- dates and times

UNIT V **9 Hrs**

Database and : Python database application programmer's interface (DB- API)- connection and cursor objects - Type objects and constructors - python database adapters. Creating simple web clients - introduction to CGI- CGI module- building CGI applications - python web application frameworks - Django.

Total no. of Hrs : 45

REFERENCES:

1. Wesley J. Chun (2000), *Core Python Programming* (2nd ed.), Pearson Education.
2. Guido Van Russom, Fred L.Drake *(*2003), *An Introduction to Python*, Network Theory Limited.
3. Magnus Lie Hetland (2009) , *Beginning Python: From Novice To Professional* (2nd ed.).

SubjectCode: CMCA22ET2	**Subject Name :FULL STACK WEB DEVELOPMENT**	**Ty/Lb/ ETL/IE**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: **Java Programming**	ETL	3	0	2	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To understand the basics of JavaScript and importance of MERN stack
- To understand the role of React in designing front-end components
- To understand the design issues in the development of backend components using Node.jsand Express
- To understand the significance of using MongoDB as a database system
- To understand the advanced features of full stack development

COURSE OUTCOMES (COs) : (3- 5) After completion of the course student will

CO1	Understand basics of Java Script
CO2	Event handling and communication
CO3	Node basics and framework of node
CO4	Mongo DB basics, query language
CO5	Modularization and Navigation

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	2	2	2	2	2	1	2	2
CO2	3	3	2	2	1	1	2	2	2	2	2	2
CO3	3	3	1	2	2	2	2	2	3	1	2	2
CO4	3	3	1	2	1	1	2	2	2	3	2	2
CO5	3	3	2	2	1	2	2	2	2	1	2	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	2	1	1	2	2			
CO2	2	2	1	2	1			
CO3	2	1	2	2	1			
CO4	2	1	1	2	2			
CO5	2	2	1	2	1			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
		√										
Approval												

SubjectCode: CMCA22ET2	Subject Name :FULL STACK WEB DEVELOPMENT	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: **Java Programming**	ETL	3	0	2	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- To understand the basics of JavaScript and importance of MERN stack
- To understand the role of React in designing front-end components
- To understand the design issues in the development of backend components using Node.jsand Express
- To understand the significance of using MongoDB as a database system
- To understand the advanced features of full stack development

UNIT I

JAVASCRIPT AND BASICS OF MERN STACK **12 Hrs**

JavaScript Fundamentals - Objects - Generators, advanced iteration - Modules - DOM tree – Node properties - browser events - Event delegation - UI Events -Forms, controls - Document andresource loading - Mutation observer - Event loop: microtasks and macrotasks - MERN Components- React - Node.js - Express - MongoDB - Need for MERN - Server-Less Hello World - Server Setup- nvm - Node.js - npm.

UNIT II

REACT **12 Hrs**

React Introduction - React ES6 - React Render HTML - React JSX - Components -React Classes -Composing Components - Passing Data - Dynamic Composition - React state - setting State - AsyncState Initialization - Event Handling Communicating from Child to Parent - Stateless Components -Designing components- React Forms - React CSS - React SaaS

Unit III

NODE.JS AND EXPRESS **12 Hrs**

Node.js basics - Local and Export Modules - Node Package Manager - Node.js web server - Node.jsFile system - Node Inspector - Node.js EventEmitter - Frameworks for Node.js - Express.js WebApp - Serving static Resource - Node.js Data Access - Express REST APIs - REST - ResourceBased - HTTP Methods as Actions - JSON- Express - Routing - Handler Function - Middleware - The List API - Automatic Server Restart - Testing - The Create API - Using the List API - Using theCreate API- Error Handling - Template Engine.

Unit IV

MONGODB **12 Hrs**

MongoDB - MongoDB Basics - Documents - Collections - Query Language - Installation - The mongoShell - Schema Initialization - MongoDB Node.js Driver - Reading from MongoDB - Writing toMongoDB - CRUD operations - projections - Indexing Aggregaton - Replication - Sharding - Creating backup – Deployment.

Unit V ADVANCED FEATURES **12 Hr**

sModularization and Webpack - Routing with React Router - Forms - More Filters in the List API - UIComponents - Update API - Delete API - React-Bootstrap - Bootstrap Installation - Navigation -Table and Panel - Forms - Alerts - Modals -Server Rendering - Basic Server Rendering - HandlingState - MongoDB Aggregate - Pagination - Higher Order Components - Search Bar - Google SignIn - Session Handling

Total no of hr: 60

REFERENCES

2. Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node,
Vasan Subramanian, A Press Publisher, 2019.

Web Reference

- http://tutorialsteacher.com
- https://reactjs.org/
- https://nodejs.org
- www.Expressjs.

Subject Code: HMCC22002	Subject Name: INTELLECTUAL PROPERTY RIGHTS and PATENTS	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To introduce fundamental aspects of Intellectual property Rights to students who are going to play a major role in development and management of innovative projects in industries.
- To develop expertise in the learners in IPR related issues and sensitize the learners with the emerging issues in IPR and the rationale for the protection of IPR.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Imbibe the knowledge of Intellectual Property and its protection through various laws.
CO2	apply the knowledge of IPR for professional development
CO3	develop a platform for protection and compliance of Intellectual Property Rights & knowledge
CO4	create awareness amidst academia and industry of IPR and Copyright compliance
CO5	deliver the purpose and function of IPR and patenting

Mapping of Course Outcomes with Program Outcomes (POs)

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**2**	**2**	**2**	**3**	**3**	**2**	**2**			
CO2	**3**	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**2**			
CO3	**3**	**3**	**2**	**2**	**2**	**2**	**2**	**3**	**2**			
CO4	**3**	**3**	**2**	**3**	**2**	**2**	**2**	**1**	**2**			
CO5	**3**	2	**2**	2	**2**	**2**	**3**	**2**	**2**			

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
									√			

Approval	

Subject Code: HMCC22002	Subject Name: INTELLECTUAL PROPERTY RIGHTS and PATENTS	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To introduce fundamental aspects of Intellectual property Rights to students who are going to play a major role in development and management of innovative projects in industries.
- To develop expertise in the learners in IPR related issues and sensitize the learners with the emerging issues in IPR and the rationale for the protection of IPR.

UNIT – I: **9Hrs**

Introduction to IPRs, Basic concepts and need for Intellectual Property – Meaning and practical aspects of Patents, Copyrights, Geographical Indications, IPR in India and Abroad. Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

UNIT – II: **9Hrs**

Intellectual Property Rights. The IPR tool kit, Patents, the patenting process, Patent cooperation treaties: International Treaties and conventions on IPRs: Trade Related Aspects of Intellectual Property Rights Agreement, Patent Cooperation Treaty, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

UNIT – III: **9Hrs**

Intellectual Property Protections IPR of Living Species, protecting inventions in biotechnology, protections of traditional knowledge, biopiracy and documenting traditional knowledge, Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection. Case studies: The basmati rice issue, revocations of turmeric patent, revocation of neem patent.

UNIT – IV: **9Hrs**

Exercising and Enforcing of Intellectual Property Rights of an IPR owner, licensing agreements, criteria for patent infringement. Case studies of patent infringement, IPR – contract, unfair competitions and control, provisions in TRIPS.

UNIT- V: **9Hrs**

Role of Patents in Product Development & Commercialization Recent changes in IPR laws impacting patents and copy rights, intellectual cooperation in the science and allied industry. Patentable and non-patentable research. Case studies .

Total hours:45

Text book:

1. Nithyananda, K.V. (2019). Intellectual Property Rights : Protection and Management. India, IN: Cengage Learning India Private Limited.
2. Neeraj, P., & Khusdeep, D. (2014). Intellectual Property Rights. India, IN: PHI learning Private Limited.

References:

1.P.B. Ganguli, Intellectual Property Rights: Unleashing the Knowledge Economy. Tata Mc Graw Hill, 2001.
Steve Smith, The Quality Revolution.1st ed., Jaico Publishing House, 2002.
2. Kompal Bansal and Praishit Bansal. Fundamentals of IPR for Engineers, 1st Edition, BS Publications, 2012.
3. Prabhuddha Ganguli. Intellectual Property Rights. 1st Edition, TMH, 2012.
4. R Radha Krishnan & S Balasubramanian. Intellectual Property Rights. 1st Edition, Excel Books, 2012.
5. M Ashok Kumar & Mohd. Iqbal Ali. Intellectual Property Rights. 2nd Edition, Serial Publications, 2011.
VinodV. Scople, Managing Intellectual Property. Prentice Hall of India PvtLtd, 2012.
6.Deborah E. Bouchoux. Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets. Cengage Learning, 3rd ed. Edition, 2012.
7.Prabuddha Ganguli. Intellectual Property Rights: Unleashing the Knowledge Economy. McGraw Hill Education, 2011.
Edited by Derek Bosworth and Elizabeth Webster.The Management of Intellectual Property. Edward Elgar Publishing Ltd., 2013.
8.Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.
9.Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House

E-resources:

1.Subramanian,N.,&Sundararaman,M.(2018).Intellectual Property Rights – An Overview. Retrieved from http://www.bdu.ac.in/cells/ipr/docs/ipr-eng-ebook.pdf

2.World Intellectual property Organisation. (2004). WIPO Intellectual property Handbook. Retrieved from https://www.wipo.int/edocs/pubdocs/en/intproperty/489/wipo_pub_489.pdf

Reference Journal:

1.Journal of Intellectual Property Rights (JIPR): NISCAIR

Useful Websites:

1.Cell for IPR Promotion and Management (http://cipam.gov.in/)

2.World Intellectual Property Organisation (https://www.wipo.int/about-ip/en/)

3.Office of the Controller General of Patents, Designs & Trademarks (http://www.ipindia.nic.in/)

Subject Code: CMCA22L03	Subject Name: ADVANCED JAVA PROGRAMMING LABORATORY	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: JAVA PROGRAMMING LABORATORY	Lb	0	0	4	2

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- Develop the ability to solve real-world problems through Java programming
- Develop web pages using server-side programming through Servlets and Java server pages.
- Develop forms using angular JS and React JS
- Develop applications using strut , ajax, spring and hibernate frameworks

COURSE OUTCOMES (COs) : (3- 5)

CO1	Covers basics of java programming and database manipulation.
CO2	Design and develop web applications using servlets and JDBC.
CO3	Develop web pages using JSP
CO4	Design forms using angular JS and React JS
CO5	Develop applications using strut, ajax, spring and hibernate framework

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	2	2	3	3	2
CO2	3	3	3	2	3	3	3	2	2	3	3	2
CO3	3	3	3	3	3	3	3	2	2	3	3	3
CO4	3	3	3	3	3	3	3	2	2	3	3	3
CO5	3	3	3	3	3	3	3	2	2	3	3	3

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	3	3	3	2	3		
CO2	3	3	3	2	3		
CO3	3	3	3	2	3		
CO4	3	3	3	2	3		
CO5	3	3	3	2	3		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
								✓				

Approval	

CMCA22L03 ADVANCED JAVA PROGRAMMING LABORATORY 0 0 4 2

OBJECTIVES:

- Develop the ability to solve real-world problems through Java programming
- Develop web pages using server-side programming through Servlets and Java server pages.
- Develop forms using angular JS and React JS
- Develop applications using strut ,ajax, spring and hibernate frameworks

1. Write a Java program using inheritance to create a base class Teacher and a sub class PhysicsTeacher. PhysicsTeacher extends the designation and college properties and work() method from base class.
2. Write a java program that reads on file name from the user ,then displays information about whether the file exists, whether the file is readable , whether the file is writable, the type of the file and the length of the file in bytes.
3. Develop employee information systems using Servlets and JDBC
4. Develop basic arithmetic functions using JSP.
5. Write a angular program to develop guess the number application.
6. Write a program to develop a form application that perform two-way binding using angular.
7. Write a program to implement React in “to-do “ app.
8. Create a React Component by translating the HTML to JSX.
9. Create a responsive website using AJAX
10. Create a website with AJAX callback function to retrieve data from an XML file and display the data in an HTML table.(Use XMLHttpRequest)

Total number of hours :60

Subject Code: CMCA22L04	Subject Name PYTHON PROGRAMMING LABORATORY	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: PROGRAMMING FUNDEMENTS	Lb	0	0	4	2

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To acquire programming skills in core and object oriented python
- To understand the concepts of files and data structures like list, tuples, dictionary,etc
- To develop the skill of designing GUI
- To develop the ability to write the database application in python

COURSE OUTCOMES (COs) : (3- 5)

CO1	Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python
CO2	Express different Decision Making statements and Functions
CO3	Interpret Object oriented programming in Python
CO4	Understand and summarize different File handling operations
CO5	Explain how to design GUI Applications in Python and evaluate different database operations

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	1	2	1	2	3	2
CO2	2	3	3	3	3	3	1	2	1	3	3	2
CO3	3	3	2	3	3	3	1	2	1	2	3	2
CO4	3	3	3	2	3	2	1	2	1	2	3	2
CO5	3	3	3	3	2	3	1	2	1	2	3	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	3	3	3	2	1			
CO2	3	3	3	2	1			
CO3	3	3	3	2	1			
CO4	2	3	3	2	1			
CO5	3	3	3	2	1			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
								✓				

Approval	

Subject Code: CMCA22L04	Subject Name PYTHON PROGRAMMING LABORATORY	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: PROGRAMMING FUNDEMENTS	Lb	0	0	4	2

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: CreditsT/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- To acquire programming skills in core and object oriented python
- To understand the concepts of files and data structures like list, tuples, dictionary,etc
- To develop the skill of designing GUI
- To develop the ability to write the database application in python

1. A) Create a list and perform the following methods
   1) insert() 2) remove() 3) append() 4) len() 5) pop() 6) clear()
   B) Create a dictionary and apply the following methods
   1) Print the dictionary items 2) access items 3) use get() 4)change values 5) use len()
2. A) Write a program to create a menu with the following options
   1. TO PERFORM ADDITITON 2. TO PERFORM SUBTRACTION
   3. TO PERFORM MULTIPICATION 4. TO PERFORM DIVISION

   B) Write a python program to Sort Words in Alphabetic Order
3. A) Write a python program to construct the following pattern using nested for loop:

```
*
* *
* * *
* * * *
* * * * *
* * * *
* * *
* *
*
```

B) Using for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, ..1/10

4. Write a program in Python, A library charges a fine for every book returned late. For first 5 days the fine is 50 paisa, for 6-10 days fine is one rupee and above 10 days fine is 5 rupees. If you return the book after 30 days your membership will be cancelled. Write a program to accept the number of days the member is late to return the book and display the fine or the appropriate message.

5. Write a python program to implement Single, Multiple and Multilevel inheritance.

6. A)Write a python program to implement recursive function.
   B)Write a python program to create a class to implement pow(x,n)
7. Write a python program to compute the number of characters, words and lines in a file.

8. Write a python program to display different date and time formats.

9. Write a python program using database connection to execute the following SQL query.
   i)create ii) insert iii) select iv) delete operations

10. Write a python program to implement digital clock using GUI.

Total number of hours :30

Subject Code: CMCA22005	**Subject Name: Cyber Security**	**Ty/Lb/ ETL/IE**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Basic computer knowledge , Basic Networks knowledge, basic mathematics	Ty	3	1	0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To understand computer security and threats
- To understand security concepts in operating systems
- To understand cryptography concepts
- To establish privacy in cyber space
- Introduction of cyber laws

COURSE OUTCOMES (COs) : (3- 5)

CO1	To understand vulnerabilities in cyber security
CO2	Cyber Security attacks
CO3	Security requirements of data bases
CO4	Privacy impacts
CO5	Cyber crimes and warfare

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	3	3	2	2	2	2	1
CO2	3	3	2	3	3	2	3	3	3	2	2	1
CO3	3	3	3	3	3	3	2	2	3	2	2	1
CO4	3	3	3	2	2	2	3	2	2	2	2	1
CO5	3	3	3	3	3	3	3	2	1	2	1	1

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	3	3	3	2	2		
CO2	3	2	3	2	2		
CO3	3	3	2	2	2		
CO4	2	3	3	3	2		
CO5	3	3	3	2	2		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
		√										

Approval	

Subject Code: CMCA22005	Subject Name: Cyber Security	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Basic computer knowledge , Basic Networks knowledge, basic mathematics	Ty	3	1	0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To understand computer security and threats
- To understand security concepts in operating systems
- To understand cryptography concepts
- To establish privacy in cyber space
- Introduction of cyber laws

UNIT I **12 hours**

INTRODUCTION TO CYBER SECURITY - Introduction -Computer Security - Threats -Harm - Vulnerabilities - Controls - Authentication - Access Control and Cryptography - Web—User Side - Browser Attacks - Web Attacks Targeting Users - Obtaining User or Website Data - Email Attacks

UNIT II **12 hours**

SECURITY IN OPERATING SYSTEM & NETWORKS - Security in Operating Systems - Security in the Design of Operating Systems -Rootkit - Network security attack- Threats to Network Communications - Wireless Network Security - Denial of Service - Distributed Denial-of-Service.

UNIT III **12 hours**

DEFENCES: SECURITY COUNTER MEASURES - Cryptography in Network Security - Firewalls - Intrusion Detection and Prevention Systems - Network Management - Databases - Security Requirements of Databases - Reliability and Integrity - Database Disclosure - Data Mining and Big Data.

UNIT IV **12 hours**

PRIVACY IN CYBERSPACE - Privacy Concepts -Privacy Principles and Policies -Authentication and Privacy - Data Mining -Privacy on the Web - Email Security - Privacy Impacts of Emerging Technologies - Where the Field Is Headed.

UNIT V **12 hours**

MANAGEMENT AND INCIDENTS -Security Planning - Business Continuity Planning - Handling Incidents - Risk Analysis - Dealing with Disaster - Emerging Technologies - The Internet of Things - Economics - Electronic Voting - Cyber Warfare- Cyberspace and the Law - International Laws - Cyber crime - Cyber Warfare and Home Land Security. **TOTAL: 60**

REFERENCES:

1. Charles P. Pfleeger Shari Lawrence Pfleeger Jonathan Margulies, Security in Computing, 5th Edition , Pearson Education , 2015

2. George K.Kostopoulous, Cyber Space and Cyber Security, CRC Press, 2013.
3. Martti Lehto, Pekka Neittaanmäki, Cyber Security: Analytics, Technology and Automation edited, Springer International Publishing Switzerland 2015Nelson Phillips and Enfinger Steuart, ―Computer Forensics andInvestigations‖, Cengage Learning, New Delhi, 2009

Subject Code: CMCA22006	Subject Name : C# and .NET PROGRAMMING	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: INTERNET PROGRAMMING	Ty	3	1	0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- Learn the technologies of the .NET framework and Know the object oriented aspects of C#
- Understand windows forms and applications
- Learn ADO.NET using windows application
- Learn web based applications on .NET(ASP.NET)
- Learn Web Services and remoting

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand, analyze and use the concept of C#.
CO2	Know the object oriented aspects of C#
CO3	To develop windows application using database connectivity
CO4	Understand ,analyze and use exceptions- Windows Forms
CO5	Build interactive web applications using ASP.NET and Web services

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	1	2	1	2	3	2
CO2	3	3	3	3	3	3	1	2	1	2	3	2
CO3	3	3	3	3	3	3	1	2	1	2	3	2
CO4	3	3	3	2	3	2	1	2	1	2	3	2
CO5	3	3	3	3	3	3	1	2	1	2	3	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	3	3	3	2	1			
CO2	3	3	3	2	1			
CO3	3	3	3	2	1			
CO4	2	3	3	2	1			
CO5	3	3	3	2	1			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
		✓										

Approval	

Subject Code: CMCA22006	Subject Name : C# and .NET PROGRAMMING	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: INTERNET PROGRAMMING	Ty	3	1	0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- Learn the technologies of the .NET framework and Know the object oriented aspects of C#
- Understand windows forms and applications
- Learn ADO.NET using windows application
- Learn web based applications on .NET(ASP.NET)
- Learn Web Services and remoting

UNIT I **12 Hrs**

Introduction To **C# :** Introducing C#, Understanding .NET, overview of C#, Literals, Variables, Data Types, Operators, checked and unchecked operators, Expressions, Branching, Looping, Methods, implicit and explicit casting, Constant, Arrays, Array Class, Array List, String, String Builder, Structure, Enumerations, boxing and unboxing**.**

UNIT II **12 Hrs**

Object Oriented Aspects of C# : Class, Objects, Constructors and its types, inheritance, properties, indexers, index overloading, polymorphism, sealed class and methods, interface, abstract class, abstract and interface, operator overloading, delegates, events, errors and exception, Threading.

UNIT III **12 Hrs**

Application Development on .NET : Building windows application, Creating our own window forms with events and controls, menu creation, inheriting window forms, SDI and MDI application, Dialog Box(Modal and Modeless), accessing data with ADO.NET, DataSet, typed dataset, Data Adapter, updating database using stored procedures, SQL Server with ADO.NET, handling exceptions, validating controls, windows application configuration.

UNIT IV **12 Hrs**

Web Based Application Development on .NET : Programming web application with web forms, ASP.NET introduction, working with XML and .NET, Creating Virtual Directory and Web Application, session management techniques, web.config, web services, passing datasets, returning datasets from web services, handling transaction, handling exceptions, returning exceptions from SQLServer.

UNIT V **12 Hrs**

CLR And .Net Framework : Assemblies, Versioning, Attributes, reflection, viewing meta data, type discovery, reflection on type, marshalling, remoting, security in .NET

Total no. of Hrs : 60

REFERENCES:

1. Balagurusamy E(2004) *Programming in C#*- Tata McGraw-Hill.
2. Liberty J (2002) ,*Programming in C(*2nd ed.),O Reilly.
3. Herbert Schildt(2004) *The complete Reference:C#*-,Tata McGraw-Hill.
4. Robinson et al(2002*), Professional C#*(2nd ed.), Wwrox press.

Subject Code: CMCA22007	Subject Name: IOT and Cloud Computing	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Basic knowledge in Computer Science	Ty	3	1	0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- Learn the terminology, technology and applications of IoT
- Analyze Embedded suite widely used in IoT.
- Understand the cloud storage for IoT applications.
- To become familiar with Cloud Computing and its ecosystem
- To evaluate in-depth analysis of Cloud Computing capabilities

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand the various concept of the IoT and their technologies
CO2	Develop the IoT application using different hardware platforms
CO3	Implement the various IoT Protocols
CO4	Understand the basic principles of cloud computing
CO5	Develop and deploy the IoT application into cloud environment

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	3	3	2	2	1	2	1
CO2	2	3	3	2	3	2	3	3	3	2	2	2
CO3	3	2	3	3	3	3	2	2	3	2	2	1
CO4	3	3	3	2	2	2	3	2	2	2	2	1
CO5	2	3	2	3	3	3	2	2	1	1	2	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	3	3	3	2	2			
CO2	2	2	3	1	2			
CO3	3	3	2	2	3			
CO4	2	3	3	3	2			
CO5	3	3	3	2	2			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
		√										

Approval	

Subject Code: CMCA22007	Subject Name: IOT and Cloud Computing	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Basic knowledge in Computer Science	Ty	3	1	0	4
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credit T/L/ETL Theory/Lab/Embedded Theory and Lab						

Objectives:

- Learn the terminology, technology and applications of IoT
- Analyze embedded suite widely used in IoT.
- Understand the cloud storage for IoT applications.
- To become familiar with Cloud Computing and its ecosystem
- To evaluate in-depth analysis of Cloud Computing capabilities

UNIT I **12 Hrs**

Introduction to IoT – IoT definition – Characteristics – IoT Complete Architectural Stack – IoT enabling Technologies – IoT Challenges. Sensors and Hardware for IoT – Hardware Platforms – Arduino, Raspberry Pi, Node MCU. A Case study with any one of the boards and data acquisition from sensors.

UNIT II **12 Hrs**

Protocols for IoT – Infrastructure protocol (IPV4/V6/RPL), Identification (URIs), Transport (Wifi, Lifi, BLE), Discovery, Data Protocols, Device Management Protocols. – A Case Study with MQTT/CoAP usage-IoT privacy, security and vulnerability solutions.

UNIT III **12 Hrs**

Case studies with architectural analysis: IoT applications – Smart City – Smart Water – Smart Agriculture – Smart Energy – Smart Healthcare – Smart Transportation – Smart Retail – Smart waste management.

UNIT IV **12 Hrs**

Introduction to Cloud Computing – Service Model – Deployment Model- Virtualization Concepts – Cloud Platforms – Amazon AWS – Microsoft Azure – Google APIs.

UNIT V **12 Hrs**

IoT and the Cloud – Role of Cloud Computing in IoT – AWS Components – S3 – Lambda – AWS IoT Core -Connecting a web application to AWS IoT using MQTT- AWS IoT Examples. Security Concerns, Risk Issues, and Legal Aspects of Cloud Computing- Cloud Data Security.

Total no. of Hrs : 60

Reference Books:

1. The Internet of Things: Enabling Technologies, Platforms, and Use Cases, by Pethuru Raj and Anupama C. Raman, CRC Press.
2. Adrian McEwen, Designing the Internet of Things, Wiley, 2013.
3. Barrie Sosinsky, “Cloud Computing Bible”, Wiley India
4. . Antohy T Velte, et.al, “Cloud Computing: A Practical Approach”, McGraw Hill

SubjectCode: CMCA22ET3	Subject Name : DATA ANALYTICS AND R PROGRAMMING	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite PROGRAMMING FUNDEMENTS	ETL	2	0	2	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To work with Big data platform
- To analyze the HADOOP and Map Reduce technologies associated with big data
- To explore on Big Data applications Using Pig and Hive.
- To understand the fundamentals of various big data analysis techniques.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Explain the motivation for big data systems and identify the main sources of Big Data in the real world.
CO2	Demonstrate an ability to use framework Hadoop to efficiently store retrieve and process Big Data for Analytics.
CO3	Implement several Data Intensive tasks using the Map Reduce Paradigm
CO4	Apply several newer algorithms for Clustering Classifying and finding associations in Big Data

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	3	3	3	3	3	3	2	2
CO2	2	2	2	2	3	3	3	3	3	3	2	2
CO3	2	2	2	2	3	3	3	3	3	3	2	2
CO4	2	2	2	2	3	3	3	3	3	3	2	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	1	2	2	3	3			
CO2	1	2	2	3	3			
CO3	1	2	2	3	3			
CO4	1	2	2	3	3			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
		✓										
Approval												

SubjectCode: CMCA22ET3	Subject Name : DATA ANALYTICS AND R PROGRAMMING	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite PROGRAMMING FUNDEMENTS	ETL	2	0	2	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- To work with Big data platform
- To analyze the HADOOP and Map Reduce technologies associated with big data
- To explore on Big Data applications Using Pig and Hive.
- To understand the fundamentals of various big data analysis techniques.

UNIT I INTRODUCTION TO BIG DATA 12Hrs

Introduction to Big Data Platform – Challenges of conventional Systems – Nature of Data Evolution Of Analytic Scalability – Intelligent data analysis – Analytic Processes and Tools – Analysis vs Reporting – Modern Data Analytic Tools – Statistical Concepts: Sampling Distributions – Re-sampling – Statistical Inference – Prediction Error.

UNIT II MINING DATA STREAMS 12Hrs

Introduction to Streams Concepts – Stream Data Model and Architecture - Stream Computing – Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments - Counting Oneness in a Window – Decaying Window – Real time Analytics Platform (RTAP) Applications – Case Studies – Real Time Sentiment Analysis, Stock Market Predictions.

UNIT III INTRODUCTION TO BIG DATA ANALYTICS & R PROGRAMMING 12 Hrs

Analyzing, Visualization and Exploring the Data, Statistics for Model Building and Evaluation, Introduction to R and R Studio , Basic Analysis in R, Intermediate R, Intermediate analysis in R, Advanced Analytics – K-means clustering, Association rules-Speedup, Linear Regression, Logistic Regression, Naïve Bayes, Decision Trees, Time Series Analysis, Text Analysis.

UNIT IV HADOOP 12 Hrs

History of Hadoop – The Hadoop Distributed File System – Components of Hadoop Analyzing the Data with Hadoop– Scaling out – Hadoop Sreaming – Design of HDFS – Java Interfaces to HDFS Basics – Developing a Map Reduce Application – How Map Reduce Works – Anatomy of a Map Reduce Job run Failures - Job Scheduling – Shuffle and Sort – Task execution - Map Reduce Types and Formats – Map reduce features.

UNIT V FRAMEWORKS 12 Hrs

Applications on Big Data Using Pig and Hive - Data Processing operators in Pig – Hive services – HiveQL – Querying Data in Hive – fundamentals of Hbase and ZooKeeper – IBM InfoSphere BigInsights and Streams. Visualizations – Visual data analysis techniques, interaction techniques; Systems and applications.

Total No. of Hrs: 60

REFERENCES:

1.Prajapati, Big Data Analyties with R and Hadoop, 2014
2. Stephan Kudyba, Big Data, Mining and Analytics: Components of Strategic Decision Making. Auerbach Publications, March 12, 2014
3. Michael Minclli (Author), Michele Ch ambers (Author), Ambiga Dhiraj (Auther), Big Data, Big Analytics Emerging Business Intelligence and Analytic Trends for Today's Businesses, Wiley Publications.2013
4. Dr. Mark Gardener, Beginning R: The Statistical Programming Language (Wrox), 2013

SubjectCode: CMOL22IE1	Subject Name : Open Elective – Swayam/NPTEL/Any MOOC	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite:	IE	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

Students should register for the online course with a minimum course duration of 8 weeks through the online portals such as NPTEL/SWAYAM/Any MOOC in the beginning of the semester. The course can be core/interdisciplinary in such a way that the same course is not repeated during the course of study. Students are expected to attend the online classes regularly and submit the weekly assignments before the due dates. Students should appear for the online examination and submit the certificate at the end of the semester. Internal examination will be conducted by the examiners duly appointed by the head of the department.

Subject Code: CMCA22L05	Subject Name : C # and .NET PROGRAMMING LABORATORY	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: C # and .NET PROGRAMMING	Lb	0	0	4	2

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- Understand, analyze and use the concept of inheritance and override
- Understand ,analyze and use Windows Form and ADO.NET.
- Build interactive web applications using ASP.NET .
- Build the application using web services

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand, analyze and use the concept of inheritance and override
CO2	Understand ,analyze and use Windows Form and ADO.NET.
CO3	Build interactive web applications using ASP.NET .
CO4	Build the application using web services
CO5	Build interactive web applications using ASP.NET and C#.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	1	2	1	2	3	2
CO2	3	3	3	3	3	3	1	2	1	2	3	2
CO3	3	3	3	3	3	3	1	2	1	2	3	2
CO4	3	3	3	2	3	2	1	2	1	2	3	2
CO5	3	3	3	3	3	3	1	2	1	2	3	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	3	3	3	2	1			
CO2	3	3	3	2	1			
CO3	3	3	3	2	1			
CO4	2	3	3	2	1			
CO5	3	3	3	2	1			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
								✓				

Approval	

Subject Code: CMCA22L05	Subject Name : C # and .NET PROGRAMMING LABORATORY	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: **C # and .NET PROGRAMMING**	Lb	0	0	4	2

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- Understand, analyze and use the concept of inheritance and override
- Understand ,analyze and use Windows Form and ADO.NET.
- Build interactive web applications using ASP.NET .
- Build the application using web services

1)Write a program to implement multilevel inheritance. Accept and display data for one student.
Class : student Data Members : Roll_no , name
Class : Test Data Members : marks1 , marks2
Class : Result Data Members : total

2)Demonstrate Use Of Virtual and override keyword in C# with a simple Program.

3)Write a program to design a simple calculator using windows application.

4)Consider the Database STUDENT consisting of following tables:
tbl_Course (CourseID:int, CourseName: string)
tbl_Student (USN: string, StudName: string, Address: string,CourseID: int, YrOfAdmsn: int) Develop suitable windows application using C#.NET having following options:
a)Entering new course details.
B)Display the course details(in a grid)

5) Considet the above database STUDENT .Develop suitable windows application using C#.NET
a) Entering new student details.
b)Display the details the students who have taken admission in a particular year.

6) Create the application using ASP.NET Server controls that accepts name, password ,age , email id, and user id. All the information entry is compulsory. Password should be reconfirmed. Age should be within 21 to 30. Email id should be valid. User id should have at least a capital letter and digit as well as length should be between 7 and 20 characters.

7) Develop a Web Application using C#.NET and ASP.NET for a Bank. The BANK Database should consist of following tables:
a)tbl_Bank (BankID: int, BankName: string,BranchName:string)
b)tbl_Account (AccountNo:int, BankID: int, , CustomerName: string, Address: string, ContactNo: int, Balance: real)
(Note: AccountNo and BankID together is a composite primary key).
The master page of this web application should contain hyperlinks to New Bank Entry, New Customer Entry (based on branch and bank) and Report Generation.
The hyperlinks should navigate to respective content pages. These content pages provide the fields for respective data entry. The reports should be generated (display in grid) as below:

a. Display all records of particular bank.

b.The balance should be displayed for the entered account number (Bank and Branch are input through ComboBox controls and Account number is input through TextBox).

8) To calculate the interest for the above BANK databasee using Web Services

Total No. of Hours needed to Complete the Lab : 30

Subject Code: CMCA22L06	Subject Name : Project Work	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite:	LB	0	0/0	9/9	9
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

To make the students to make use of the knowledge and skill developed during their four years of study and to apply them for making an innovative product/process for the development of society and industries.

Students are expected to do a Project work either in an Industry or at the University in the field of relevant field /inter-disciplinary /multi-disciplinary area . The work to be carried out in Phase II should be continuation of Phase I. Each student will be allotted a guide based on the area of Project work. In case of industrial Project external guide has to be allotted from Industry. Inter disciplinary/ multi-disciplinary project can be done with guidance of relevant department. Monthly reviews will be conducted during the semester to monitor the progress of the project by the project review committee. Students have to submit the Project thesis at the end of the semester and appear for the Project Viva-Voce examination conducted by the examiners duly appointed by the Controller of Examination. In case of industrial project certificate in proof has to be included in the report along with the bonofide certificate.

Subject Code: CMCA22I02	**Subject Name : Research Publication**	**Ty/Lb/ ETL/IE**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite:	IE	0	0/0	4/0	2
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

Students are supposed to prepare and publish the article based on his/her area of research in peer reviewed referred journal. Code of research publication ethics should be followed. After publishing the article students should present a seminar in presence of department faculties and PG students. At the end of semester viva examination will be conducted by the examiners appointed by the Head of the department.

SubjectCode: CMCA22E01	Subject Name : DATA COMMUNICATION AND NETWORKS	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: BASIC COMPUTER KNOWLEDGE	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To study about the physical arrangement of networks, types and modes of networks, data conversions and transmission medium.
- To study the detection and correction of errors, link control and link protocols of data link layer
- To study about the standardized data interface and it's working principle
- To study the logic of link mechanisms used in networks and different layers of TCP/IP.

COURSE OUTCOMES (COs) : (3- 5)

CO1	To understand the Basic categories of networks
CO2	To understand the error control and data link protocol
CO3	To understand the multiplexing and switching
CO4	To understand the Design concepts of ATM
CO5	To understand the network devices and TCP/IP protocol

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	2	1	1	1	1	2	1	2	2
CO2	2	3	2	2	1	1	1	1	2	1	2	2
CO3	2	3	2	2	1	1	1	1	2	1	2	2
CO4	2	3	2	2	1	1	1	1	2	1	2	2
CO5	2	3	2	2	1	1	1	1	2	1	2	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	1	2	1	2	1			
CO2	1	2	1	2	1			
CO3	1	2	1	2	1			
CO4	1	2	1	2	1			
CO5	1	2	1	2	1			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
			√									
Approval												

SubjectCode: CMCA22E01	Subject Name : DATA COMMUNICATION ANDNETWORKS	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: BASIC COMPUTER KNOWLEDGE	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- To study about the physical arrangement of networks, types and modes of networks, data conversions and transmission medium.
- To study the detection and correction of errors, link control and link protocols of data link layer
- To study about the standardized data interface and it's working principle
- To study the logic of link mechanisms used in networks and different layers of TCP/IP.

UNIT I **9 Hrs**

Data Communication Introduction: Networks – Protocols and standards – Standards organizations – Line configurations – Topology – Transmission mode – Categories of networks –OSI model- Functions of the layers- Transmission media- Guided media – Unguided media – Transmission impairment – Performance.

UNIT II **9 Hrs**

Error Control And Data Link Protocols : Error detection and correction- Types of errors – Error Detection Techniques - Data link control - Flow control – Error control - Data link protocols –Asynchronous protocols – Synchronous protocols-Character oriented protocols – BIT oriented protocols

UNIT III **9 Hrs**

Multiplexing and Switching: LAN Project 802 – Ethernet – Token bus – Token ring – FDDI- IEEE 802.6 (DQDB) – SMDS - Switching

UNIT IV

9 Hrs

X. 5, FRAME RELAY, ATM : X.25 Layers - Frame relay - Introduction – Frame relay operation – Frame relay layers – Congestion control – Leaky bucket algorithm - ATM: Design goals – ATM architecture – ATM layers – ATM applications. SONET / SDH: Synchronous transport signals – Physical configuration – SONET layers – Applications.

UNIT V **9 Hrs**

Networking Devices And Tcp / Ip Protocol Suite : Repeaters – Bridges – Gateways – Routing algorithms – Overview of TCP/IP - Application layer - Domain Name System (DNS) – Telnet – File Transfer Protocol (FTP) – Trivial File Transfer Protocol (TFTP) – Simple Mail Transfer Protocol (SMTP), Simple Network Management Protocol(SNMP)

Total No of Hrs : 45Hrs

REFERENCES:

1. Behrouz A.Forouzan(2000), *Data Communication and Networking*(2nd ed.), Tata McGraw Hill.
2. William Stallings(2003), *Data and Computer Communication*(8th ed.) Pearson Education. Andrew Tannenbaum.S(2003),*Computer Networks*(4th ed.), Pearson Education.

SubjectCode: CMCA22E02	Subject Name : DISTRIBUTED SYSTEMS	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite : NIL	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To expose students to both the abstraction and details of file systems.
- To introduce concepts related to distributed computing systems.
- To focus on performance and flexibility issues related to systems

COURSE OUTCOMES (COs) : (3- 5)

CO1	To expose students to both the abstraction and details of file systems.
CO2	To introduce concepts related to distributed computing systems
CO3	To focus on performance and flexibility issues related to systems

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	3	1	2	1	1	1	1	1	1
CO2	3	2	2	3	1	3	1	1	1	1	1	1
CO3	3	3	1	3	2	2	1	1	1	1	1	1

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	3	2	3	1	2			
CO2	3	3	2	1	3			
CO3	3	2	2	1	3			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
			√									
Approval												

SubjectCode: CMCA22E02	Subject Name : DISTRIBUTED SYSTEMS	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite : NIL	Ty	3	0	0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

(Common to MCA, MCA-AI&ML, MCA-CC)

OBJECTIVES:

- To expose students to both the abstraction and details of file systems.
- To introduce concepts related to distributed computing systems.
- To focus on performance and flexibility issues related to systems

UNIT I **9 Hrs**

Introduction-Definition of a Distributed system-Goals- Types of Distributed system –Architectures-Architectural Styles-System Architectures –Architecture Versus middleware-Self management in Distributed systems.

UNIT II **9 Hrs**

Processes- Threads- Virtualization- Clients- Servers- Code migration-Communication-Fundamentals- Remote Procedure Call- Communication-Message – Stream – Multicast- Naming-Names, Identifiers and Addresses- Naming - Flat - Structured - Attributed based.

UNIT III **9Hrs**

Synchronization-Clock synchronization-Local clocks-Mutual Exclusion-Global positioning of nodes-Election Algorithm-Consistency and Replication-Data-Centric consistency models- Replica management-Consistency protocols.

UNIT IV **9 Hrs**

Fault Tolerance -Process Resilience-Reliable Client- Server Communication- Distributed Commit- Recovery- Security-Secure Channels- Access control- Security Management.

UNIT V **9 Hrs**

Distributed Systems-Distributed Object-based Systems- File Systems –Web based Systems –Coordination- based Systems.

Total no. of Hrs : 45

REFERENCES:

1. Andrew S. Tanenbaum & Maarten Van Steen(2007), *Distributed System-Principles and Paradigms*(2nd Ed), Pearson Education.
2. George Coulouris, Jean Dollimore& Tim Kindberg(2002), *Distributed Systems Concepts and Design*, (3rded), Pearson Education.
3. HagitAttiya& Jennifer Welch(2004),*Distributed Computing: Fundamentals, Simulations and Advanced Topics*, Wiley.
4. MukeshSinghal(1994), *Advanced Concepts In Operating Systems*", McGrawHill.
5. Tanenbaum & Van Steen,M(2004),*Distributed Systems,* Pearson Education.
6. Liu,M,L(2004),*Distributed Computing Principles and Applications*, Pearson Addison Wesley.

Subject Code: CMCA22E03	Subject Name: Soft Computing	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: BASIC COMPUTER KNOWDEGE & BASIC MATHEMATHICS	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To learn the key aspects of Soft computing
- To know about the components and building block hypothesis of Genetic algorithm.
- To understand the features of neural network and its applications
- To study the fuzzy logic components
- To gain insight onto Neuro Fuzzy modeling and control.
- To gain knowledge in machine learning through Support vector machines.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understanding the Soft Computing Constituents
CO2	Getting enriched the Building block hypothesis, working principle and the operators
CO3	Understand the Machine Learning using Neural Network, Adaptive Networks
CO4	Capable of performing the Operations on Fuzzy Sets and Fuzzy Relations
CO5	Computing the Fuzzy Inference Systems

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	3	3	2	2	2	2	1
CO2	3	3	3	3	3	2	3	3	3	2	2	1
CO3	3	3	3	3	3	3	2	2	3	2	2	1
CO4	3	3	3	2	2	2	3	2	2	2	2	1
CO5	3	3	3	3	3	3	3	2	1	1	1	1

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	3	3	3	2	2			
CO2	3	3	3	2	2			
CO3	3	3	3	2	2			
CO4		3	3	3	2			
CO5	3	3	3	2	2			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
			√									

Approval	

Subject Code: CMCA22E03	Subject Name: Soft Computing	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: BASIC COMPUTER KNOWDEGE & BASIC MATHEMATHICS	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

(Common to MCA, MCA-AI&ML, MCA-CC)

OBJECTIVES:

- To learn the key aspects of Soft computing
- To know about the components and building block hypothesis of Genetic algorithm.
- To understand the features of neural network and its applications
- To study the fuzzy logic components
- To gain insight onto Neuro Fuzzy modeling and control.
- To gain knowledge in machine learning through Support vector machines.

UNIT I INTRODUCTION TO SOFT COMPUTING **9 Hrs**

Evolution of Computing - Soft Computing Constituents – From Conventional AI to Computational Intelligence - Machine Learning Basics

UNIT II GENETIC ALGORITHMS **9 Hrs**

Introduction, Building block hypothesis, working principle, Basic operators and Terminologies like individual, gene, encoding, fitness function and reproduction, Genetic modeling: Significance of Genetic operators, Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, GA optimization problems, JSPP (Job Shop Scheduling Problem), TSP (Travelling Salesman Problem),Differences & similarities between GA & other traditional methods, Applications of GA.

UNIT III NEURAL NETWORKS **9 Hrs**

Machine Learning using Neural Network, Adaptive Networks – Feed Forward Networks– Supervised Learning Neural Networks – Radial Basis Function Networks - Reinforcement Learning– Unsupervised Learning Neural Networks – Adaptive Resonance Architectures – Advances in Neural Networks.

UNIT IV FUZZY LOGIC **9 Hrs**

Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions-Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Expert Systems – Fuzzy Decision Making

UNIT V NEURO-FUZZY MODELING **9 Hrs**

Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling – Classification and Regression Trees – Data Clustering Algorithms – Rule base Structure Identification – Neuro-Fuzzy Control – Case Studies.

Total no. of Hrs : 45

REFERENCES:

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, EijiMizutani(2003), *Neuro-Fuzzy and Soft Computing*, Prentice-Hall of India.
2. Kwang H.Lee(2005), *First course on Fuzzy Theory and Applications*, Springer–Verlag Berlin Heidelberg.
3. George J. Klir & Bo Yuan(1995),*Fuzzy Sets and Fuzzy Logic-Theory and Applications*, Prentice Hall.
4. James A. Freeman and David M. Skapura(2003), *Neural Networks Algorithms, Applications, and Programming Techniques*, Pearson Edn.
5. David E. Goldberg(2007), *Genetic Algorithms in Search, Optimization and Machine Learning*, Addison Wesley..
6. Mitsuo Gen & RunweiCheng(2000),*Genetic Algorithms and Engineering Optimization*, Wiley Publishers.

SubjectCode: CMCA22E04	Subject Name : ENTREPRENEURIAL DEVELOPMENT	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To impart basis managerial knowledge and understanding
- To develop and strengthen entrepreneurial quality and motivation
- To develop small and medium enterprises sector which is necessary for employment generation and widerdispersal of industrial ownership

COURSE OUTCOMES (COs) : (3- 5)

CO1	To know about nature and importance of entrepreneur
CO2	To develop and strengthen entrepreneurial quality and motivation
CO3	To develop small and medium enterprises sector which is necessary for employment generation and wider dispersal of industrial ownership
CO4	To understand the incentive and subsidies for different types of sector
CO5	To focus on growth of Entrepreneurial Venture

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	3	3	3	3	3	3	2	2
CO2	2	2	2	2	3	3	3	3	3	3	2	2
CO3	2	2	2	2	3	3	3	3	3	3	2	2
CO4	2	2	2	2	3	3	3	3	3	3	2	2
CO5	2	2	2	2	3	3	3	3	3	3	2	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	1	2	2	3	3			
CO2	1	2	2	3	3			
CO3	1	2	2	3	3			
CO4	1	2	2	3	3			
CO5	1	2	2	3	3			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
	√											
Approval												

SubjectCode: CMCA22E04	Subject Name : ENTREPRENEURIAL DEVELOPMENT	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Ty	3	0	0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

(Common to MCA, MCA-AI&ML, MCA-CC)

OBJECTIVES:

- To impart basis managerial knowledge and understanding
- To develop and strengthen entrepreneurial quality and motivation
- To develop small and medium enterprises sector which is necessary for employment generation and widerdispersal of industrial ownership

UNIT I **9 Hrs**

Entrepreneur: Meaning – Definition – Nature and Importance of Entrepreneur – Classification of Entrepreneurs - Characteristics and Qualities of Entrepreneur - Role of Entrepreneurs in the economic development – Factors affecting entrepreneurial growth.

UNIT II **9 Hrs**

Entrepreneurship: Concept – Distinction between Entrepreneur and Entrepreneurship - Entrepreneurship Development Programs (EDP): Meaning and Need of EDP – Role of EDP – Significance of EDP - Stages in EDP- Role of Government in Organizing EDP.

UNIT III **9 Hrs**

Establishing a Small Enterprise: Process of setting a New Business – Problems of New Venture – Selection of Viable Project – Project Development and Selection – Preparation of Project Report – Project Appraisal – Business Location – Legal Requirements – Legal Requirements of Establishing a New Unit - Steps to start an industrial unit

UNIT IV **9 Hrs**

Incentives and Subsidies: State and Central Govt. – Aims – Backward Areas – Industrial Estates –Role of DIC-SISI-TCO in Entrepreneurial Growth.

UNIT V **9 Hrs**

Growth of Entrepreneurial Venture: Importance of Strategic Planning for Emerging Ventures – Entrepreneurial Growth - Concept and Management – Raising funds for New Venture – Role and Significance of Venture Capital – Issues and Challenges of Family Owned Business

Total No of Hrs : 45

REFERENCES:

1. Sangeetha Sharma(2016), *Entrepreneurship Development*, PHI Learning Pvt Limited.
2. *Guide to Entrepreneurs Industrial Development* , Govt. of Tamil Nadu, SIPCOT
3. Singh P N(1986) , *Developing Entrepreneurship for Economic Growth*.

Subject Code: CMCA22E05	**Subject Name: Object Oriented Software Engineering**	**Ty/Lb/ ETL/IE**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Basic knowledge in Computer Science	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To train the students on Object Oriented Software Engineering features.
- To develop projects using object-oriented analysis, design and testing techniques.
- To Understand overview of system design
- To Understand design patterns
- To Understand testing and project management concepts

COURSE OUTCOMES (COs) : (3- 5)

CO1	Modeling with UML
CO2	Requirement elicitation and managing the requirements
CO3	System design goals and managing system design
CO4	Interface specification, concepts and activities
CO5	Testing and overview of project management

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	3	3	2	2	2	2	1
CO2	2	3	3	2	3	2	3	3	3	2	2	2
CO3	3	2	3	3	3	3	2	2	3	2	2	1
CO4	3	3	3	2	2	2	3	2	2	2	2	1
CO5	2	3	3	3	3	3	3	2	1	1	2	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	3	3	3	2	2		
CO2	2	2	3	2	2		
CO3	3	3	2	2	3		
CO4	2	3	3	3	2		
CO5	3	3	3	2	2		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
			√									

Approval	

Subject Code: CMCA22E05	Subject Name: Object Oriented Software Engineering	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Basic knowledge in Computer Science	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

Objective:

- To train the students on Object Oriented Software Engineering features.
- To develop projects using object-oriented analysis, design and testing techniques.
- To Understand overview of system design
- To Understand design patterns
- To Understand testing and project management concepts

UNIT-I **9Hrs**

Software Engineering: Software related problems, software engineering, concepts, development activities. Modelling: Concepts, Modelling with UML.

UNIT-II **9Hrs**

Project Organization & Communication: Project Organization & communication concepts and their activities. Requirements: Requirement's elicitation & its activities and managing requirements elicitation. Analysis: Analysis overview, concepts, activities and managing analysis

UNIT-III **9Hrs**

System Design: Decomposing the System: System Design overview, System design concepts, and System design Activities, and managing System Design System design: Addressing design goals: An overview of system design activities and concepts UML Development diagram, System design goals, Managing system design.

UNIT-IV **9Hrs**

Object Design: Reusing Pattern Solutions: An overview of object design Reuse Concepts, Solution objects, inheritance and design patterns. An Object Design: Specifying Interfaces: An overview of interface specification, interface specifications concepts & its activities and Managing object design

UNIT-V **9Hrs**

Testing: Testing concepts, activities and managing testing. Project Management -Introduction, An overview of project management, Project Management Concepts, Project Management Activities.

Total No of Hrs: 45

Text Book:

1.Object-Oriented Software Engineering: Using UML, Patterns and Java, Bernd Bruegge and Allen H.Dutoit, 2nd Edition, Pearson Education Asia.

Reference Books:

1. Object-Oriented Software Engineering: Practical software development using UML and Java Timothy C. Lethbridge and Robert Laganiere , McGraw-Hill Higher education

2. An Introduction to Object Oriented Systems Analysis and Design with UML and the Unified Process, Stephen R Schach, Tata McGraw-Hill

Subject Code: CMCA22E06	Subject Name: **DATA SCIENCE**	**Ty/Lb/ ETL/IE**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite : **Basic Computer knowledge and basic Mathematics.**	**Ty**	**3**	**0**	**0**	**3**

L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C: Credits
T/L/ETL :Theory / Lab / Embedded Theory and Lab

OBJECTIVES

- To understand the overview and definition of Data Science with its crucial role in current business world.
- To understand the importance of mathematics & Statistics in Data Science.
- To understand the role of machine learning techniques in Data Science and its different types.
- To know the integrated role of computers and its components in Data Science
- To understand the flow and process model of data science project management.

COURSE OUTCOMES (Cos)

Students completing this course were able to

CO1	After completing this course, students will be able to appreciate the need of data science in day to day life.
CO2	They will be able to understand the process and components of data science project.
CO3	Student will the Learn importance of probability and statistics in data science
CO4	Student will be able to understand the machine learning in today's business world.
CO5	Understands the various components of computer science being used for data science

Mapping of Course Outcome with Program Outcome (POs)

Cos/Pos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3	2	2	2	1	2
CO2	3	3	3	1	2	3
CO3	3	3	2	3	1	3
CO4	3	3	3	2	3	3
CO5	3	2	3	1	3	2

Cos/PSOs	**PS01**	**PS02**	**PS03**	**PS04**
CO1	3	3	2	3
CO2	2	1	2	2
CO3	2	3	2	2
CO4	3	3	3	3
CO5	3	3	2	3

H/M/L Indicates Strength Of Correlation, H – High, M- Medium, L- Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others
			√						

Subject Code: CMCA22E06	Subject Name: **DATA SCIENCE**	**Ty/Lb/ ETL/IE**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite : **Basic Computer knowledge and basic Mathematics.**	**Ty**	**3**	**0**	**0**	**3**
L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C: Credits T/L/ETL :Theory / Lab / Embedded Theory and Lab						

OBJECTIVES:

- To understand the overview and definition of Data Science with its crucial role in current business world.
- To understand the importance of mathematics & Statistics in Data Science.
- To understand the role of machine learning techniques in Data Science and its different types.
- To know the integrated role of computers and its components in Data Science
- To understand the flow and process model of data science project management.

UNIT I **9 Hrs**

Introduction: Introduction to Data Science – Evolution of Data Science – Data Science Roles – Stages in a Data ScienceProject – Applications of Data Science in various fields – Data Security Issues.

UNIT II **9 Hrs**

Data Collection and Data Pre-Processing: Data Collection Strategies – Data Pre-Processing Overview – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization.

UNIT III **9 Hrs**

Linear Algebra Basics: Matrices to represent relations between data, L,T,Y,C,X Shaped Matrix Diagrams, Roof Shaped diagram, Linear algebraic operations on matrices – Matrix decomposition: Singular Value Decomposition (SVD) and Principal Component Analysis (PCA).

UNIT IV **9 Hrs**

Exploratory Data Analytics: Descriptive Statistics – Mean, Standard Deviation, Skewness and Kurtosis – Box Plots – Pivot Table – Heat map, Correlation Statistics.

UNIT V **9 Hrs**

Basic Machine Learning Algorithms: Classifiers - Decision tree - Naive Bayes - k-Nearest Neighbors (k-NN), k-means – SVM

Total No of Hrs: 45

REFERENCE BOOKS

1. Mining of Massive Datasets. v2.1, Jure Leskovek, Anand Rajaraman and Jefrey Ullman., Cambridge University Press. (2019).
2. Big Data Analytics, paperback 2nd ed., Seema Acharya, Subhasini Chellappan, Wiley (2019).
3. Doing Data Science, Straight Talk From The Frontline, Cathy O'Neil and Rachel Schutt, O'Reilly (2014).
4. Data Mining: Concepts and Techniques", Third Edition, Jiawei Han, Micheline Kamber and Jian Pei, ISBN 012H814790,(2011).
5. Big Data and Business Analytics, Jay Liebowitz, CRC press (2013)
6. Data mining methods,2nd edition, C. Rajan, Narosa (2016)
7. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big data Analytics", EMC 2013

SubjectCode: CMCA22E07	Subject Name: IMAGE PROCESSING	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: BASIC MATHEMATHICS	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To understood the Image processing.
- To understood the image enhancement, image filtering and restoration

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understanding the Fundamental Steps in Image processing
CO2	Getting enriched the Image Enhancement Concepts
CO3	Understand the Image Filtering and Restoration
CO4	Capable of understand the Image Data compression Techniques
CO5	Computing the process of Image Segmentation

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	3	2	2	2	3
CO2	3	3	3	3	3	3	3	3	3	2	2	3
CO3	3	3	3	3	3	3	3	3	3	2	2	1
CO4	3	3	3	2	2	2	3	3	2	2	2	1
CO5	3	3	3	3	3	3	3	3	3	2	2	1

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	3	3	3	2	2			
CO2	3	3	3	2	2			
CO3	3	3	3	2	2			
CO4	2	3	3	3	2			
CO5	3	3	3	2	2			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
			√									

Approval	

SubjectCode: CMCA22E07	Subject Name: IMAGE PROCESSING	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: BASIC MATHEMATHICS	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

(Common to MCA, MCA-AI&ML, MCA-CC)

OBJECTIVES:

- To understood the Image processing.
- To understood the image enhancement, image filtering and restoration

UNIT I **9Hrs**

Introduction: Fundamental Steps in Image processing – Elements – Digital Image Fundamentals – Image representation – Modeling – Image enhancement – Image restoration – Image analysis – Image reconstruction from projections – Image data compression – Two-Dimensional Systems and Mathematical Preliminaries: Notation and definitions – Discrete and Fast Fourier Transform

UNIT II **9Hrs**

Image Enhancement: Point operations – Enhancement by point processing – Histogram modeling – Spatial operations – Enhancement in Frequency Domain – Transform operations – Multispectral Image Enhancement – Color Image Enhancement

UNIT III **9 Hrs**

Image Filtering and Restoration: Degradation model – Diagonalization of circulant and block circulant matrices - Algebraic approach to restoration – Inverse and Wiener filtering – Finite impulse response Wiener filters – Other Fourier Transform Filters – Smoothing splines and Interpolation – Least square filters – Recursive and semirecursive filtering – Maximum entropy restoration – Bayesian methods – Coordinate transformation and Geometric correction – Blind deconvolution – Extrapolation of band-limited signals

UNIT IV **9Hrs**

Image Data compression: Fundamentals – Image compression models – Elements of information theory – Pixel coding – Predictive techniques – Transform coding theory – Transform coding of images – Hybrid coding and vector DPCM – Inter frame coding – Image coding in the presence of channel errors – Coding of two tone images – color and multi-spectral Image coding – Lossless and lossy compressions - standards

UNIT V **9Hrs**

Image Segmentation – Representation and Description – Recognition – Interpretation – Image analysis and Computer vision – Image reconstruction from Projections – Artificial Neural networks for color classification - Realization for real time processing – Three-dimensional Filters

Total no. of Hrs : 45

REFERENCE:

1. Anil K. Jain, “Fundamentals of Digital Image Processing”, Second Edition, Prentice-Hall of India Private Limited, New Delhi, 1995.

2. Rafael C. Gonzalez and Richard E. Woods, “Digital Image Processing”, Addison-Wesley Publishing Company, New York, Third edition, 2008.

SubjectCode: CMCA22E08	Subject Name : Web Content Development	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Basic Computer Knowledge	Ty	3	0	0	3

L : Lecture T:Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To Learn the basic concepts in HTML, CSS, Javascript
- To Understand the responsive design and development
- To Understand the responsive design and development
- To Design a Website with HTML, JS, CSS / CMS - Word press

COURSE OUTCOMES (COs) : (3- 5)

CO1	To design website using HTML CSS and JS
CO2	To design website using CSS
CO3	To design website using JS
CO4	To design responsive sites
CO5	To Manage, Maintain and support Web Apps

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	3	3	2	2	2	1	1	2
CO2	2	2	3	3	3	2	2	3	3	3	1	2
CO3	3	2	2	2	3	2	2	2	2	1	2	1
CO4	2	3	2	2	3	3	1	2	3	3	2	1
CO5	2	3	2	2	3	3	3	3	2	1	1	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	2	2	2	1	1			
CO2	2	3	3	1	3			
CO3	2	2	2	2	1			
CO4	2	2	2	1	2			
CO5	3	2	1	1	1			

H/M/L indicates Strength of Correlation H- High, M- Medium ,L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
			√									
Approval												

SubjectCode: CMCA22E08	Subject Name : Web Content Development	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Basic Computer Knowledge	Ty	3	0	0	3

L : Lecture T:Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- To Learn the basic concepts in HTML, CSS, Javascript
- To Understand the responsive design and development
- To Understand the responsive design and development
- To Design a Website with HTML, JS, CSS / CMS - Word press

UNIT I -- WEB DESIGN - HTML MARKUP FOR STRUCTURE 9 hrs

Working of Web - HTML Markup for Structure - Creating simple page - Marking up text - Adding Links - Adding Images - Table Markup - Forms - HTML5

UNIT II CSS AND JAVASCRIPT 9 hrs

CSS - Formatting text - Colours and Background - Padding, Borders and Margins - Floating and positioning - Page Layout with CSS - Transition, Transforms and Animation - Javascript - Using Java Script

UNIT III RESPONSIVE WEB DESIGN 9 hrs

Sass for Responsive Web Design - Marking Content with HTML5 - Mobile-First or Desktop-First - CSS Grids, CSS Frameworks, UI Kits, and Flexbox for RWD - Designing small UIs by Large Finger - Images and Videos in Responsive Web Design - Meaningful Typography for Responsive Web Design

UNIT IV WEB PROJECT MANAGEMENT 9 hrs

Project Life Cycle - Project Definition - Discovery and Requirements - Project Schedule and Budgeting - Running the project - Technical Documentation - Development , Communicaton, Documentation - QA and testing -Deployment - Support and operations

UNIT V PROJECT CASE STUDY 9 hrs

Using HTML, CSS, JS or using Opensource CMS like Wordpress, design and develop a Website having Aesthetics, Advanced and Minimal UI Transitions based on the project - Host and manage the project live in any public hosting

TOTAL : 45 hrs

REFERENCE BOOKS:

1. Jennifer Niederst Robbins, "Learning Web Design", O'REILLY 4th Edition
2. Ricardo Zea, "Mastering Responsive Web Design", PACKT Publishing, 2015
3. Justin Emond, Chris Steins, "Pro Web Project Management", Apress,2011
4. Jon Duckett, "HTML and CSS: Design and Build Websites", John Wiley and Sons, edition 2014
5. Jon Duckett, Jack Moore, "JavaScript & JQuery: Interactive Front-End Web Development", John Wiley and Sons, edition 2014
6. Uttam K. Roy "Web Technologies" Oxford University Press, 13th impression, 2017
Wordpress - http://www.wpbeginner.com/category/wp-tutorials

SubjectCode: CMCA22E09	Subject Name : ENTERPRISE RESOURCEPLANNING	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite:NIL	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To learn about Introduction to ERP and the Benefits of Implementation
- Developing a Business Case to Justify an ERP Implementation
- To understand Business Process Alignment and the value chain process.
- To learn about implementing and expanding of ERP

COURSE OUTCOMES (COs) : (3- 5)

CO1	To understand the Basic concept of ERP
CO2	To understand the ERP and related technologies
CO3	To understand ERP modules
CO4	To understand ERP implementation life cycle
CO5	To understand the concepts of vendors

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	1	2	2	1	2	1	2	2
CO2	3	1	1	1	1	2	2	1	2	1	2	2
CO3	3	1	1	1	1	2	2	1	2	1	2	2
CO4	3	1	1	1	1	2	2	1	2	1	2	2
CO5	3	1	1	1	1	2	2	1	2	1	2	2

COs / PSOs	PSO1	PSO2	PSO3	PS04	PSO5			
CO1	2	2	1	2	2			
CO2	2	2	1	2	2			
CO3	2	2	1	2	2			
CO4	2	2	1	2	2			
CO5	2	2	1	2	2			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
	√											
Approval												

SubjectCode: CMCA22E09	Subject Name : ENTERPRISE RESOURCEPLANNING	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite:NIL	Ty	3	0	0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

(Common to MCA, MCA-CC)

OBJECTIVES:

- To learn about Introduction to ERP and the Benefits of Implementation
- Developing a Business Case to Justify an ERP Implementation
- To understand Business Process Alignment and the value chain process.
- To learn about implementing and expanding of ERP

UNIT I **9 Hrs**

Introduction to ERP – Evolution – Growth –Advantages of ERP- need of ERP- Integrated Management information - Business Modeling - Integrated Data Model - Chain – Supply and demand chain-Extended Supply chain

UNIT II **9 Hrs**

ERP and Related Technologies – BPR – MIS – DSS – EIS - Data Warehousing - Data Mining – OLAP - A Manufacturing Perspective – MRP - BOM - Closed Loop MRP- MRP-II – DRP - JIT and Kanban - CAD/CAM – PDM - Data Management Benefits of PDM - MTO and MTS – ATO - CRM

UNIT III **9 Hrs**

Benefits of ERP - ERP Modules – Finance - Plant Maintenance - Quality Management -Materials Management - ERP Market: SAP AG - People Soft - BAAN and ORACLE - JD Edwards

UNIT IV **9 Hrs**

ERP Implementation Life Cycle – Pro-evaluation Screening - package Evaluation - Project planning phase - Gap – Analysis – reengineering – configuration - implementation team-Training – Testing-Going Live – End User Training - Post implementation - Business Models and BAPIs - Convergence on Windows NT - Application platforms - New Business segment and Features

UNIT V **9Hrs**

ERP Procurement Issues – Market Trends – Outsourcing ERP – Economics – Hidden Cost Issues – ROI – Analysis of cases from five companies

Total no. of Hrs : 45

REFERENCES:

1. Alexis Leon(2004) *Enterprise Resource Planning* , Tata McGraw-Hill, New Delhi.
2. Alexis Leon (2006) *Enterprise Resource Planning Demystified* , Tata McGraw-Hill, New Delhi.

SubjectCode: CMCA22E10	**Subject Name :** Software Project Management	**Ty/Lb/ ETL/IE**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: BASIC COMPUTER KNOWLEDGE	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To know of how to do project planning for the software process.
- To learn the cost estimation techniques during the analysis of the project.
- To understand the quality concepts for ensuring the functionality of the software

COURSE OUTCOMES (COs) : (3- 5)

CO1	To know of how to do project planning for the software process
CO2	To learn the cost estimation techniques during the analysis of the project.
CO3	To understand the quality concepts for ensuring the functionality of the software

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	3	1	1	1	1	1	1	1	1
CO2	2	3	3	3	1	2	1	1	1	1	1	1
CO3	2	3	3	3	1	2	1	1	1	1	2	1

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	3	3	2	1	2			
CO2	2	3	3	1	3			
CO3	3	3	3	1	3			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
			√									
Approval												

SubjectCode: CMCA22E10	**Subject Name :** Software Project Management	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: BASIC COMPUTER KNOWLEDGE	Ty	3	0	0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

(Common to MCA, MCA-AI&ML, MCA-CC)

OBJECTIVES:

- To know of how to do project planning for the software process.
- To learn the cost estimation techniques during the analysis of the project.
- To understand the quality concepts for ensuring the functionality of the software

UNIT I **9 Hrs**

Software Project Management Concepts: Introduction to Software Project Management: An Overview of Project Planning: Select Project, Identifying Project scope and objectives, infrastructure, project products and Characteristics. Estimate efforts, Identify activity risks, and allocate resources- TQM, Six Sigma

UNIT II **9 Hrs**

Software Evaluation And Costing: Project Evaluation: Strategic Assessment, Technical Assessment, cost-benefit analysis, Cash flow forecasting - cost-benefit evaluation techniques, Risk Evaluation. Selection of Appropriate Project approach - Choosing technologies, choice of process models, structured methods.

UNIT III **9 Hrs**

Software Estimation Techniques: Software Effort Estimation: Problems with over and under estimations, Basis of software Estimation, Software estimation techniques - expert Judgment, Estimating by analogy. Activity Planning - Project schedules, projects and activities - sequencing and scheduling Activities, networks planning models, formulating a network model.

UNIT IV **9 Hrs**

Risk Management: Risk Management: Nature of Risk, Managing Risk, Risk Identification and Analysis, Reducing the Risk. Resource Allocation: Scheduling resources, Critical Paths, Cost scheduling, Monitoring and Control: Creating Framework, cost monitoring, prioritizing monitoring.

UNIT I **9 Hrs**

Globalization Issues In Project Management: Globalization issues in project management: Evolution of globalization- challenges in building global teams-models for the execution of some effective management techniques for managing global teams. Impact of the internet on project management

Total no. of Hrs : 45

REFERENCES:

1.Bob Hughes & Mike Cotterell(2012), *Software Project Management* (5th ed.), Tata McGraw- Hill Publications.

2.Futrell(2008), *Quality Software Project Management*, Pearson Education India.

3.Gobalswamy Ramesh(2003), *Managing Global Software Projects*, Tata McGraw Hill Publishing Company.

4.Richard H.Thayer "Software Engineering Project Management", IEEE Computer Society.

SubjectCode: CMCA22E11	Subject Name : OBJECT ORIENTEDMODELING AND DESIGN	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Programming fundamentals with C++	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- Develop a working understanding of formal object-oriented analysis and design processes.
- Develop an appreciation for and understanding of the risks inherent to large-scale software development-
- Develop the skills to determine which processes and OOAD techniques should be applied to a given project.

COURSE OUTCOMES (COs) : (3- 5)

CO1	To understand the Basic concepts of object oriented system development
CO2	To understand the methodology and UML
CO3	To understand the concept of object oriented analysis identifying use case
CO4	To understand the concept of object oriented design
CO5	To understand the concept of software quality assurance

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	1	1	2	2	2	1	2	3
CO2	3	3	3	2	1	1	2	2	2	1	2	3
CO3	3	3	3	2	1	1	2	2	2	1	2	3
CO4	3	3	3	2	1	1	2	2	2	1	2	3
CO5	3	3	3	2	1	1	2	2	2	1	2	3

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	2	1	1	2	1			
CO2	2	1	1	2	1			
CO3	2	1	1	2	1			
CO4	2	1	1	2	1			
CO5	2	1	1	2	1			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
			√									
Approval												

SubjectCode: CMCA22E11	Subject Name : OBJECT ORIENTEDMODELING AND DESIGN	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Programming fundamentals with C++	Ty	3	0	0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

OBJECTIVES:

- Develop a working understanding of formal object-oriented analysis and design processes.
- Develop an application and understanding of the risks inherent to large-scale software development.
- Develop the skills to determine which processes and OOAD techniques should be applied to a given project.

UNIT I **9 Hrs**

Introduction OOSD Methodology - Unified approach – Object basics – Object state and properties – Behavior – Methods – Messages – Information hiding – Class hierarchy – Relationships – Associations – Aggregations- Identity – Dynamic binding – Persistence – Meta classes – Object oriented system development life cycle – S/W device process- High quality Software Object Oriented System Development- Reusability.

UNIT II **9 Hrs**

Methodology and UML Introduction – Survey – Rumbugh- Booch- Jacobson methods – Patterns – Frameworks – Unified approach – Unified modeling language – Static and Dynamic models – UML diagrams – Class diagram – Use case diagrams – Dynamic modeling diagrams – Interaction Diagrams- sequence diagrams.

UNIT III **9 Hrs**

Object Oriented Analysis Identifying Usecase – Business object analysis – Usecase driven object oriented analysis – Usecase model – Documentation – Introduction- classification theory- Approaches for Identifying classes – Identifying object- relationships- attributes- methods – Super-sub class – Aggregation Class Responsibility – Object responsibility.

UNIT IV **9 Hrs**

Object Oriented Design -Design process – Axioms – Corollaries – Designing classes – Class visibility – Refining attributes – Methods and protocols – Object storage and object interoperability – DBMS – Object relational systems – Designing interface objects – Macro and Micro level processes – The purpose of a view layer interface

UNIT V **9 Hrs**

Software Quality assurance – Testing strategies – Object orientation testing – Test cases – Test Plan – Debugging principles – Usability – Satisfaction – Usability testing – Satisfaction testing.

Total no. of Hrs : 45

REFERENCES:

1. Ali Bahrami(2003), *Object Oriented System Development*, McGraw Hill International Edition.
2. Craig Larman(2002) *Applying UML and Patterns*(2nd ed.) Pearson.
3. James Rumbaugh(2004) *Object Oriented Modeling Language* (2nd ed.), PHI.

SubjectCode: CMCA22E12	Subject Name : CRYPTOGRAPHY AND NETWORK SECURITY	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Computer Networks	Ty	3	0	0	3

L : Lecture T:Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To understand Cryptography Theories, Algorithms and Systems.
- To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks.
- To understand IP Security, Web Security.
- To understand Digital Signature and Authentication.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand the fundamentals of networks security, security architecture, threats and vulnerabilities
CO2	Apply the different cryptographic operations of symmetric cryptographic algorithms
CO3	Apply the different cryptographic operations of public key cryptography
CO4	Apply the various Authentication schemes to simulate different applications.
CO5	Understand various Security practices and System security standards

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	1	1	1	1	2	2	1	1	2
CO2	2	3	1	1	2	1	2	2	1	2	2	2
CO3	1	2	3	2	1	1	2	2	2	1	2	1
CO4	2	3	2	2	1	1	1	1	1	2	2	2
CO5	1	3	1	2	3	1	2	2	2	1	3	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	2	2	1	1	2			
CO2	2	2	1	1	3			
CO3	1	1	2	2	1			
CO4	1	2	2	1	2			
CO5	2	2	3	2	1			

H/M/L indicates Strength of Correlation H- High, M- Medium ,L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
			√									
Approval												

SubjectCode: CMCA22E12	Subject Name : CRYPTOGRAPHY AND NETWORK SECURITY	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Computer Networks	Ty	3	0	0	3
L : Lecture T:Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

OBJECTIVES:

- To understand Cryptography Theories, Algorithms and Systems.
- To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks.
- To understand IP Security, Web Security.
- To understand Digital Signature and Authentication.

UNIT I INTRODUCTION 9

Security trends - Legal, Ethical and Professional Aspects of Security, Need for Security at Multiple levels, Security Policies – Model of network security – Security attacks, services and mechanisms – OSI security architecture – Classical encryption techniques: substitution techniques, transposition techniques, steganography).- Foundations of modern cryptography: perfect security – information theory – product cryptosystem – cryptanalysis.

UNIT II SYMMETRIC CRYPTOGRAPHY 9

MATHEMATICS OF SYMMETRIC KEY CRYPTOGRAPHY: Algebraic structures - Modular arithmetic-Euclid‘s algorithm- Congruence and matrices - Groups, Rings, Fields- Finite fields- SYMMETRIC KEY CIPHERS: SDES – Block cipher Principles of DES – Strength of DES – Differential and linear cryptanalysis - Block cipher design principles – Block cipher mode of operation – Evaluation criteria for AES – Advanced Encryption Standard - RC4 – Key distribution.

UNIT III PUBLIC KEY CRYPTOGRAPHY 9

MATHEMATICS OF ASYMMETRIC KEY CRYPTOGRAPHY: Primes – Primality Testing – Factorization – Euler‘s totient function, Fermat‘s and Euler‘s Theorem - Chinese Remainder Theorem – Exponentiation and logarithm – ASYMMETRIC KEY CIPHERS: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange – ElGamal cryptosystem – Elliptic curve arithmetic-Elliptic curve cryptography.

UNIT IV MESSAGE AUTHENTICATION AND INTEGRITY 9

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC – SHA – Digital signature and authentication protocols – DSS- Entity Authentication: Biometrics, Passwords, Challenge Response protocols- Authentication applications - Kerberos, X.509

UNIT V SECURITY PRACTICE AND SYSTEM SECURITY 9

Electronic Mail security – PGP, S/MIME – IP security – Web Security - SYSTEM SECURITY: Intruders – Malicious software – viruses – Firewalls.

TOTAL: 45 PERIODS

TEXT BOOK:

1. William Stallings, Cryptography and Network Security: Principles and Practice, PHI 3rd Edition, 2006.

REFERENCES:

1. C K Shyamala, N Harini and Dr. T R Padmanabhan: Cryptography and Network Security, Wiley India Pvt.Ltd
2. BehrouzA.Foruzan, Cryptography and Network Security, Tata McGraw Hill 2007.
3. Charlie Kaufman, Radia Perlman, and Mike Speciner, Network Security: PRIVATE Communication in a PUBLIC World, Prentice Hall, ISBN 0-13-046019-2

Subject Code: CMCA22E13	Subject Name: Block chain Technologies	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Basic knowledge in Computer Science	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To learn the fundamentals of Blockchain.
- To obtain knowledge about technologies of Blockchain.
- To learn basic cryptographic primitives
- To incorporate the models of Blockchain- Ethereum.
- To learn the models of Hyperledger Fabric.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Fundamentals of Blockchain
CO2	Models of Blockchain
CO3	Will understand primitives of cryptographic concepts
CO4	Use of smart contracts to enforce legal contracts
CO5	Understand Hyperledger Fabric models

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	3	3	2	2	1	2	1
CO2	2	3	2	2	3	2	3	3	3	2	2	2
CO3	3	2	3	3	2	3	2	2	3	1	2	1
CO4	2	3	3	2	2	2	3	2	2	2	2	1
CO5	2	3	2	3	3	3	2	2	2	1	2	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	3	3	3	2	2		
CO2	2	2	3	1	2		
CO3	3	3	2	2	3		
CO4	2	3	3	3	2		
CO5	3	3	3	2	2		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
			√									

Approval	

Subject Code: CMCA22E13	Subject Name: Block chain Technologies	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Basic knowledge in Computer Science	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

(Common to MCA, MCA-AI&ML, MCA-CC)

OBJECTIVES

- To learn the fundamentals of Block chain.
- To obtain knowledge about technologies of Block chain.
- To learn basic cryptographic primitives
- To incorporate the models of Block chain- Ethereum.

UNIT I - INTRODUCTION **9 hrs**

Basic Cryptographic primitives used in Block chain –Secure- Collision Resistant hash functions – Digital signature - Public key cryptosystems – Zero knowledge proof systems - Need for Distributed Record Keeping - Modelling faults and adversaries- Byzantine Generals problem - Consensus algorithms and their scalability problems - Why Nakamoto Came up with Block chain based crypto currency.

UNIT II **9 hrs**

Technologies Borrowed in Block chain –hash pointers- Consensus- Byzantine . Models of fault tolerance- Digital cash etc.- Bitcoin block chain - Wallet - Blocks - Merkley Tree - hardness of mining - Transaction verifiability - Anonymity - forks - Double spending - Mathematical analysis of properties of Bitcoin - Bitcoin- the challenges and solutions.

UNIT III **9 hrs**

Models f-GARAY model -RLA Model -Proof of Work (PoW) as random oracle - Formal treatment of consistency- Liveness and Fairness - Proof of Stake (PoS) based Chains -Hybrid models (PoW + PoS) - Bitcoin scripting language and their use

UNIT IV **9 hrs**

Ethereum -Ethereum Virtual Machine (EVM) -Wallets for Ethereum -Solidity - Smart Contracts - The Turing Completeness of Smart Contract Languages and verification challenges- Using smart contracts to enforce legal contractsComparing Bitcoin scripting vs. Ethereum Smart Contracts-Some attacks on smart contracts

UNIT V **9 hrs**

Hyperledger fabric- the plug and play platform and mechanisms in permissioned block chain - Beyond Cryptocurrency – applications of block chain in cyber security- integrity of information- E-Governance and other contract enforcement mechanisms - Limitations of block chain as a technology and myths vs reality of block chain technology

Total No. of Hrs: 45

REFERENCE BOOKS:

1. S.Shukla,M.Dhawan,S.Sharma,S. Venkatesan “Block chain Technology: Cryptocurrency and Applications” ,Oxford University Press 2019 .
2. Arvind Narayanan, Joseph Bonneau,Edward Felten,Andrew Miller and Steven Goldfeder, ”Bitcoin and cryptocurrency technologies: a comprehensive introduction”,Princeton University Press,2016.
3. Joseph Bonneau et al, SoK: “Research perspectives and challenges for Bitcoin and cryptocurrency”, IEEE Symposium on security and Privacy, 2015
4. J.A.Garay et al, “The bitcoin backbone protocol - analysis and applications”, EUROCRYPT 2015,Volume 2.
5. R.Pass et al, “Analysis of Blockchain protocol in Asynchronous networks”, EUROCRYPT 2017.
6. Pass et al,” Fruitchain- a fair blockchain”, Principles of Distributed Computing(PODC) 2017.

SubjectCode: CMCA22E14	**Subject Name : Machine Learning**	**Ty/Lb/ ETL/IE**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Basic Computer Knowledge and Basic Mathematics	Ty	3	0	0	3

L : Lecture T:Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To introduce students to the basic concepts and techniques of Machine Learning.
- To have a thorough understanding of the Supervised and Unsupervised learning techniques
- To study the various probability based learning techniques
- To understand graphical models of machine learning algorithms
- To understand GUI optimization for neural networks

COURSE OUTCOMES (COs) : (3- 5)

CO1	Distinguish between, supervised, unsupervised and semi-supervised learning
CO2	Apply the apt machine learning strategy for any given problem
CO3	Suggest supervised, unsupervised or semi-supervised learning algorithms for any given problem
CO4	Design systems that uses the appropriate graph models of machine learning
CO5	Modify existing machine learning algorithms to improve classification efficiency

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	3	3	2	2	2	1	1	2
CO2	2	2	3	3	3	2	2	3	3	3	1	2
CO3	3	2	2	2	3	2	2	2	2	1	2	1
CO4	2	3	2	2	3	3	1	2	3	3	2	1
CO5	2	3	2	2	3	3	3	3	2	1	1	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	2	2	2	1	1			
CO2	2	3	3	1	3			
CO3	2	2	2	2	1			
CO4	2	2	2	1	2			
CO5	3	2	1	1	1			

H/M/L indicates Strength of Correlation H- High, M- Medium ,L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
			√									

Approval	

SubjectCode: CMCA22E14	Subject Name : Machine Learning	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Basic Computer Knowledge and Basic Mathematics	Ty	3	0	0	3
L : Lecture T:Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

(Common to MCA, MCA-CC)

OBJECTIVES:

- To introduce students to the basic concepts and techniques of Machine Learning.
- To have a thorough understanding of the Supervised and Unsupervised learning techniques
- To study the various probability based learning techniques
- To understand graphical models of machine learning algorithms
- To understand GUI optimization for neural networks

Unit 1 **9 Hrs**

Introduction to Machine Learning, Examples of Machine Learning applications - Learning associations, Classification, Regression, Unsupervised Learning, Reinforcement Learning. Supervised learning- Input representation, Hypothesis class, Version space, Vapnik-Chervonenkis (VC) Dimension.

Unit 2 **9 Hrs**

Advanced machine learning topics: Bayesian modelling and Gaussian processes, randomized methods, Bayesian neural networks, approximate inference.

Unit 3 **9 Hrs**

Deep learning: regularization, convolutional neural networks, recurrent neural networks, variational autoencoders, generative models, applications.

Unit 4 **9 Hrs**

Applications of machine learning in natural language processing: recurrent neural networks, backpropagation through time, long short term memory, attention networks, memory networks, neural Turing machines, machine translation, question answering, speech recognition, syntactic and semantic parsing, GPU optimization for neural networks.

Unit 5 **9 Hrs**

Evaluation in ML: metrics, cross-validation, statistics, addressing the multiple comparisons problem.

Total No. of Hrs: 45

Reference Book:

1. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. MIT Press 2012
2. Ian Good fellow, Yoshua Bengio and Aaron Courville. Deep Learning. MIT Press 2016.
3. Bayesian Reasoning and Machine Learning David Barber, Cambridge University Press, 2012.

Subject Code: CMCA22E15	Subject Name: DATA VISUALIZATION	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: DATA BASE CONCEPTS	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To understand how accurately represent voluminous complex data set in web and from other data sources
- To understand the methodologies used to visualize large data sets

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understanding the Context of data visualization
CO2	Getting enriched the Fundamental Technology and Drawing with data
CO3	Understand the D3 Setup and Deployment
CO4	Capable of viewing Custom Data , Extracting Data and Fields Operations
CO5	Computing the Charts – Line Chart – Pie Chart – Scatter Plot – Bubble Chart –Gantt Chart

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	3	3	2	2	2	2	1
CO2	3	3	3	3	3	2	3	3	3	2	2	1
CO3	3	3	3	3	3	3	2	2	3	2	2	1
CO4	3	3	3	2	2	2	3	2	2	2	2	1
CO5	3	3	3	3	3	3	3	2	1	1	1	1

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	3	3	3	2	2		
CO2	3	3	3	2	2		
CO3	3	3	3	2	2		
CO4	2	3	3	3	2		
CO5	3	3	3	2	2		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
			√									

Approval	

Subject Code: CMCA22E15	Subject Name: DATA VISUALIZATION	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: DATA BASE CONCEPTS	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

(Common to MCA, MCA-AI&ML, MCA-CC)

OBJECTIVES:

- To understand how accurately represent voluminous complex data set in web and from other data sources
- To understand the methodologies used to visualize large data sets

UNIT I **9 Hrs**

Context of data visualization – Definition, Methodology, Visualization design objectives. Key Factors – Purpose, visualization function and tone, visualization design options – Data representation, Data Presentation, Seven stages of data visualization, widgets, data visualization tools. visualizing data methods - Mapping - Time series - Connections and correlations - Scatter plot maps - Trees, Hierarchies and Recursion - Networks and Graphs, Info graphics.

UNIT II **9Hrs**

INTERACTIVE DATA VISUALIZATION:Introduction to D3 - Fundamental Technology - Drawing with data – Scales – Axes – Updates, Transition and Motion – Interactivity - Layouts – Geomapping – Exporting- Data to create Visualizationwith SVG - SVG – Styling CSS – Shapes – SVG Properties – SVG Text - Drawing – Transformations – Building Chart with SVG (Scalable Vector Graphics) - Shaping Web Pages – Selections – Attributes – Chaining Methods –Data Joins - Sizing – scales – axes – Loading – Filtering – Interactive Charts – Buttons using Data Join – Transition using Key

UNIT III **9 Hrs**

D3-BASED REUSABLE CHART LIBRARY: Introduction to D3 – Setup and Deployment – Generate Chart – Customize Chart – How to Use APIs – Customize Style – Building Real time and Live Updating animated graphs with C3.

UNIT IV **9 Hrs**

TABLEAUE INTRODUCTION:Environment Setup – Navigation – File & Data Types. **DATA SOURCE:** Custom Data View – Extracting Data – Fields Operations – Editing Meta Data – Data Joining – Data Blending. Worksheets

UNIT V **9 Hrs**

TABLEAUE CHARTS: Bar Chart – Line Chart – Pie Chart – Scatter Plot – Bubble Chart –Gantt Chart – Histograms - Waterfall Charts. ADVANCED: Dashboard – Formatting – Forecasting – Trend Lines

Total no. of Hrs : 45

REFERENCES

1. Ben Fry, (2007) "Visualizing Data", O"Reilly Media, Inc.,
2. Ritchie S. King - *Visual Storytelling with D3 – An Introduction to Data Visualization with D3,* Addison-Wesley, ISBN 10: 0321933176
3. Elijah Meeks (2017*), Data visualization with JavaScript*(2nd ed.), Manning Publications, ISBN: 9781617294488

SubjectCode: CMCA22E16	Subject Name : DATA MINING AND WAREHOUSING	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: BASIC COMPUTER KNOWLEDGE	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- Will learn the techniques for Developing Proper Data Warehouses
- Designed to know about the recent techniques in data mining
- Understand and implement classical models and algorithms in data warehouses and data mining
- Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering

COURSE OUTCOMES (COs) : (3- 5)

CO1	To understand the Basic concepts of data warehousing
CO2	To understand the data mining functionalities
CO3	To understand the classification and prediction
CO4	To understand the cluster analysis
CO5	To understand the concept of mining object

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	3	2	1	1	2	1	2	1	2	2
CO2	1	1	3	2	1	1	2	1	2	1	2	2
CO3	1	1	3	2	1	1	2	1	2	1	2	2
CO4	1	1	3	2	1	1	2	1	2	1	2	2
CO5	1	1	3	2	1	1	2	1	2	1	2	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	1	2	2	2	1			
CO2	1	2	2	2	1			
CO3	1	2	2	2	1			
CO4	1	2	2	2	1			
CO5	1	2	2	2	1			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
			√									
Approval												

SubjectCode: CMCA22E16	Subject Name : DATA MINING ANDWAREHOUSING	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: BASIC COMPUTER KNOWLEDGE	Ty	3	0	0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

(Common to MCA, MCA-CC)

OBJECTIVES:

- Will learn the techniques for Developing Proper Data Warehouses
- Designed to know about the recent techniques in data mining
- Understand and implement classical models and algorithms in data warehouses and data mining
- Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering

UNIT I **9 Hrs**

Introduction to Data Warehousing – Defining features , architecture of a Data Warehousing – Data Warehousing Schema – Dimensional modeling – ETL Process – Testing, Growth and maintenance - OLAP in Data Warehousing.

UNIT II **9 Hrs**

Data Mining - Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction –Mining Frequent patterns , Associations & correlations - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint Based Association Mining.

UNIT III **9 Hrs**

Classification and Prediction - Issues Regarding Classification and Prediction – Classification by Decision Tree Induction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines - Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor.

UNIT IV **9 Hrs**

Cluster Analysis - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods .

UNIT V **9 Hrs**

Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web

Total no. of Hrs : 45

REFERENCES:

1. Jiawei Han & Micheline Kamber(2008), *Data Mining Concepts and Techniques* (2nd ed) , Elsevier, Reprit.
2. Alex Berson& Stephen J. Smith(2007) , *Data Warehousing, Data Mining & OLAP*, Tata McGraw – Hill Edition.
3. Soman,K,P, ShyamDiwakar&Ajay,V(2006),*Insight into Data mining Theory and Practice*, Easter Economy Edition, Prentice Hall of India.
4. Gupta,G,K(2006),*Introduction to Data Mining with Case Studies*", Easter Economy Edition, Prentice Hall of India.
5. Pang-Ning Tan, Michael Steinbach &Vipin Kumar(2007), *Introduction to Data Mining*, Pearson Education.

Subject Code: HMAC22I01	Subject Name ENGLISH FOR RESEARCH PAPER WRITING	Ty/Lb	L	T	P	C
	Prerequisite: Nil	Ty	2	0	0	0

L:LectureT:Tutorial P:Project ;R:ResearchC:CreditsT/L:Theory/Lab

Objectives

To know the art of writing the research paper and thesis .

To Ensure the good quality of paper at very first-time submission.

COURSEOUTCOMES(COs) :At the end of this course the students would be able to

CO1	Understand that how to improve your writing skills and level of readability
CO2	Learn about what to write in each section
CO3	Understand the skills needed when writing a Title

Mapping of Course Outcomes with Program Outcomes(POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	3	1	1	1	1	1	1
CO2	1	1	1	1	1	3	1	1	1	1	1	1
CO3	1	1	1	1	1	3	1	1	1	1	1	1

H/M/L indicates Strength of Correlation 3-High,2-Medium, 1-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
									√			

Subject Code: HMAC22I01	Subject Name ENGLISH FOR RESEARCH PAPER WRITING	Ty/Lb	L	T	P	C
	Prerequisite: Nil	Ty	2	0	0	0

L:LectureT:Tutorial P:Project ;R:ResearchC:CreditsT/L:Theory/Lab

Course objectives:

To know the art of writing the research paper and thesis .
To Ensure the good quality of paper at very first-time submission.

Syllabus

Units	CONTENTS	Hours
1	Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness	5
2	Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction	5
3	Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.	5
4	key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,	5
5	skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions	5
6	useful phrases, how to ensure paper is as good as it could possibly be the first- time submission	5

Suggested Studies:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 20

Subject Code: HMAC22I02	**Subject Name: DISASTER MANAGEMENT**	**Ty/Lb**	**L**	**T**	**P**	**C**
	Pre requisite: Nil	Ty	2	0	0	0

L : Lecture T :Tutorial P:Project R:Research C:Credits T/L:Theory/Lab

Objectives: Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.

COURSEOUTCOMES(COs) :At the end of this course the students would be able to

CO1	evaluate disaster risk reduction and humanitarian response policy and practice from Multiple perspectives.
CO2	Develop an understanding of standards of humanitarian response and practical relevance in Specific types of disasters and conflict situations.
CO3	Understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in.

Mapping of Course Outcomes with Program Outcomes(POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**
CO1	1	1	1	1	1	3	1	1	1	1	1	1
CO2	1	1	1	1	1	3	1	1	1	1	1	1
CO3	1	1	1	1	1	3	1	1	1	1	1	1

H/M/L indicates Strength of Correlation 3- High,2-Medium, 1-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
									√			

Subject Code: HMAC22I02	Subject Name: DISASTER MANAGEMENT	Ty/Lb	L	T	P	C
	Pre requisite: Nil	Ty	2	0	0	0

L : Lecture T :Tutorial P:Project R:Research C:Credits T/L:Theory/Lab

Course Objectives: -Students will be able to:

- Learn to demonstrate a critical understanding of key concepts in disaster risk reductionand humanitarian response.
- Critically evaluate disaster risk reduction and humanitarian response policy and practicefrom multiple perspectives.
- Develop an understanding of standards of humanitarian response and practical relevancein specific types of disasters and conflict situations.
- critically understand the strengths and weaknesses of disaster management approaches,planning and programming in different countries, particularly their home country or the countries they work in.

Syllabus

Units	CONTENTS	Hours
1	**Introduction** Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.	5
2	**Repercussions Of Disasters And Hazards**: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.	5
3	**Disaster Prone Areas In India** Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics	5
4	**Disaster Preparedness And Management** Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.	5
5	**Risk Assessment** Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.	5
6	**Disaster Mitigation** Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation,Programs Of Disaster Mitigation In India.	5

SUGGESTED READINGS:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'NewRoyal book Company.
2. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall OfIndia, New Delhi.
3. Goel S. L., Disaster Administration And Management Text And Case Studies",Deep &DeepPublication Pvt. Ltd., New Delhi

Subject Code: HMAC22I03	Subject Name SANSKRIT FOR TECHNICAL KNOWLEDGE	Ty/Lb	L	T	P	C
	Prerequisite: Nil	Ty	2	0	0	0

L :Lecture T :Tutorial P:Project R:Research C:CreditsT/L:Theory/Lab

Objectives To get a working knowledge in illustrious Sanskrit, the scientific language in the world Learning of Sanskrit to improve brain functioning, to develop the logic in mathematics, science & other subjects enhancing the Memory power. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature.

COURSEOUTCOMES(COs):At the end of this course the students would be able to

CO1	Understanding basic Sanskrit language
CO2	Understanding ancient Sanskrit literature about science & technology
CO3	Develop logic in students being a logical language.

Mapping of Course Outcomes with Program Outcomes(POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	3	1	1	1	1	1	1
CO2	1	1	1	1	1	3	1	1	1	1	1	1
CO3	1	1	1	1	1	3	1	1	1	1	1	1

H/M/L indicates Strength of Correlation 3-High,2-Medium, 1-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
									√			

Subject Code: HMAC22I03	Subject Name SANSKRIT FOR TECHNICAL KNOWLEDGE	Ty/Lb	L	T	P	C
	Prerequisite: Nil	Ty	2	0	0	0
L :Lecture T :Tutorial P:Project R:Research C:CreditsT/L:Theory/Lab						

Course Objectives

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. Learning of Sanskrit to improve brain functioning
3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects
4. enhancing the memory power
5. The engineering scholars equipped with Sanskrit will be able to explore the
6. huge knowledge from ancient literature

Syllabus

Unit	*Content*	*Hours*
1	• Alphabets in Sanskrit, • Past/Present/Future Tense, • Simple Sentences	10
2	• Order • Introduction of roots • Technical information about Sanskrit Literature	10
3	• Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics	10

Suggested reading

1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-VempatiKutumbshastri, Rashtriya SanskritSansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

Subject Code: HMAC22I04	**Subject Name VALUE EDUCATION**	**Ty/Lb**	**L**	**T**	**P**	**C**
	Prerequisite: Nil	Ty	2	0	0	0

L:LectureT:Tutorial P:ProjectR:ResearchC:CreditsT/L:Theory/Lab

Objectives .Understand value of education and self- development, Imbibe good values in students. Let them should know about the importance of character

COURSEOUTCOMES(COs):At the end of this course the students would be able to

CO1	Knowledge of self-development
CO2	Learn the importance of Human values
CO3	Developing the overall personality

Mapping of Course Outcomes with Program Outcomes(POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**
CO1	1	1	1	1	1	3	1	1	1	1	1	1
CO2	1	1	1	1	1	3	1	1	1	1	1	1
CO3	1	1	1	1	1	3	1	1	1	1	1	1

H/M/L indicates Strength of Correlation 3-High,2-Medium,1-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
									√			

Subject Code: HMAC22I04	Subject Name VALUE EDUCATION	Ty/Lb	L	T	P	C
	Prerequisite: Nil	Ty	2	0	0	0
L:LectureT:Tutorial	P:ProjectR:ResearchC:CreditsT/L:Theory/Lab					

Course Objectives

Students will be able to

1. Understand value of education and self- development
2. Imbibe good values in students
3. Let the should know about the importance of character

Syllabus

Unit	*Content*	*Hours*
1	• Values and self-development –Social values and individualattitudes. Work ethics, Indian vision of humanism.	6
	• Moral and non- moral valuation. Standards and principles. • Value judgements	
2	• Importance of cultivation of values. • Sense of duty. Devotion, Self-reliance. Confidence,Concentration. Truthfulness, Cleanliness. • Honesty, Humanity. Power of faith, National Unity. • Patriotism.Love for nature,Discipline	8
3	• Personality and Behavior Development - Soul and Scientificattitude. Positive Thinking. Integrity and discipline. • Punctuality, Love and Kindness. • Avoid fault Thinking. • Free from anger, Dignity of labour. • Universal brotherhood and religious tolerance. • True friendship. • Happiness Vs suffering, love for truth. • Aware of self-destructive habits. • Association and Cooperation. • Doing best for saving nature	8
4	• Character and Competence –Holy books vs Blind faith. • Self-management and Good health. • Science of reincarnation. • Equality, Nonviolence,Humility, Role of Women. • All religions and same message. • Mind your Mind, Self-control. • Honesty, Studying effectively	8

Suggested reading

1. Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford UniversityPress, New Delhi

Course outcomes

Students will be able to

1. Knowledge of self-development
2. Learn the importance of Human values
3. Developing the overall personality

Subject Code: HMAC22I05	Subject Name: CONSTITUTION OF INDIA	Ty/Lb	L	T	P	C
	Prerequisite: Nil	Ty	2	0	0	0

L:LectureT:Tutorial P:ProjectR:ResearchC:CreditsT/L:Theory/Lab

Objectives Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism To address the role
Of socialism in
India afterthecommencementoftheBolshevikRevolutionin1917anditsimpactontheinitialdraftingoftheIndian Constitution.

COURSEOUTCOMES(COs):At the end of this course the students would be able to

CO1	Understand and explain the significance of Indian Constitution as the fundamental law of the land
CO2	Exercise his fundamental rights in proper sense at the same time identifies his responsibilities in national building.
CO3	Analyze the Indian political system, the powers and functions of the Union, State and Local Governments in detail
CO4	Understand Electoral Process, Emergency provisions and Amendment procedure.

Mapping of Course Outcomes with Program Outcomes(POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	3	1	1	1	1	1	1
CO2	1	1	1	1	1	3	1	1	1	1	1	1
CO3	1	1	1	1	1	3	1	1	1	1	1	1
CO4	1	1	1	1	1	3	1	1	1	1	1	1

H/M/L indicates Strength of Correlation 3-High,2-Medium, 1-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
									√			

Subject Code: HMAC22I05	Subject Name: CONSTITUTION OF INDIA	Ty/Lb	L	T	P	C
	Prerequisite: Nil	Ty	2	0	0	0
L:LectureT:Tutorial P:ProjectR:ResearchC:CreditsT/L:Theory/Lab						

Course Objectives:

Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Syllabus

Units	Content	Hours
1	**History of Making of the Indian Constitution: History, Drafting Committee, Composition & (Working)**	3
2	**Philosophy of the Indian Constitution: Preamble Salient Features**	3
3	**Contours of Constitutional Rights & Duties:** **Fundamental Rights** **Right to Equality** **Right to Freedom** **Right against Exploitation** **Right to Freedom of Religion** **Cultural and Educational Rights** **Right to Constitutional Remedies** **Directive Principles of State Policy** **Fundamental Duties.**	6
4	**Organs of Governance:** **Parliament** **Composition** **Qualifications and Disqualifications** **Powers and Functions** **Executive:** **President** **Governor** **Council of Ministers** **Judiciary, Appointment and Transfer of Judges, Qualifications** **Powers and Functions**	6
5	**Local Administration:** **District's Administration head: Role and Importance,** **Municipalities: Introduction, Mayor and role of Elected Representative CEO of Municipal Corporation.** **Pachayati raj: Introduction, PRI: ZilaPachayat.** **Elected officials and their roles, CEO Zila Pachayat: Position and role.**	6

	Block level: Organizational Hierarchy (Different departments), **Village level: Role of Elected and Appointed officials,** **Importance of grass root democracy**	
6	**Election Commission:** **Election Commission: Role and Functioning.** **Chief Election Commissioner and Election Commissioners.** **State Election Commission: Role and Functioning.** **Institute and Bodies for the welfare of SC/ST/OBC and women.**	**6**

Suggested reading

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015

Subject Code:	**Subject Name: PEDAGOGY STUDIES**	**Ty/Lb**	**L**	**T**	**P**	**C**
HMAC22I06	Prerequisite: Nil	Ty	2	0	0	0

L :Lecture T :Tutorial P:ProjectR:ResearchC:CreditsT/L:Theory/Lab

ObjectivesStudentswillbeableto:4.Reviewexistingevidenceonthereviewtopictoinformprogramme design and Policy making undertaken by the DfID, other agencies and researchers.5.Identify critical evidence gaps to guide the development.

COURSEOUTCOMES(COs):Attheendofthiscoursethestudentswouldbeabletoknow

CO1	What pedagogical practices are being used by teachers informal and informal classrooms in developing countries?
CO2	What is the evidence on the effectiveness of the seped agogical practices, in what conditions, And with what population of learners?
CO3	Howcanteachereducation(curriculumandpracticum)andtheschoolcurriculumand Guidance materials best support effective pedagogy?

Mapping of Course Outcomes with Program Outcomes(POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**
CO1	1	1	1	1	1	3	1	1	1	1	1	1
CO2	1	1	1	1	1	3	1	1	1	1	1	1
CO3	1	1	1	1	1	3	1	1	1	1	1	1

H/M/L indicates Strength of Correlation 3- High,2-Medium, 1-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
									√			

Subject Code: HMAC22I06	Subject Name: PEDAGOGY STUDIES Prerequisite: Nil	Ty/Lb Ty	L 2	T 0	P 0	C 0
L :Lecture T :Tutorial P:ProjectR:ResearchC:CreditsT/L:Theory/Lab						

Course Objectives:

Students will be able to:

1.Review existing evidence on the review topic to inform programme design and policymaking undertaken by the DfID, other agencies and researchers.

2.Identify critical evidence gaps to guide the development.

Syllabus

Units	Content	Hours
1	• **Introduction and Methodology:** • Aims and rationale, Policy background, Conceptual framework and terminology • Theories of learning, Curriculum, Teacher education. • Conceptual framework, Research questions. Overview of methodology and Searching.	6
2	• Thematic overview: Pedagogical practices are being used by teachersin formal and informal classrooms in developing countries. • Curriculum, Teacher education.	6
3	• Evidence on the effectiveness of pedagogical practices • Methodology for the in depth stage: quality assessment of includedstudies. • How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? • Theory of change. • Strength and nature of the body of evidence for effective pedagogical practices. • Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.	6
4	• Professional development: alignment with classroom practices andfollow-up support • Peer support • Support from the head teacher and the community. • Curriculum and assessment Barriers to learning: limited resources and large class sizes	6
5	• **Research gaps and future directions** • Research design • Contexts • Pedagogy • Teacher education • Curriculum and assessment • Dissemination and research impact.	6

Suggested reading

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

Subject Code : HMAC22I07	Subject Name : STRESS MANAGEMENT BY YOGA	Ty/Lb /ETL	L	T/ SLr	P/R	C
	Prerequisite : None	Ty	2	0	0	0

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :
To introduce health psychology and arrive at the introduction to the philosophy and practice of yoga.

COURSE OUTCOMES (Cos) : (3 – 5)
Students completing the course were able to

CO1	Compile the models of health and the psychological component of health
CO2	Classify healthy behavior and health compromising behavior
CO3	Deduce the impact of stress on health and apply effective stress management strategies
CO4	Extrapolate the role of yoga in health care

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO1	3	3						3	3			
CO2	3	3	2					3	3			
CO3	3	3	2				1	3	3			
CO4	3	3	2				1	3	3			

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others	
									√	

Subject Code : HMAC22I07	Subject Name : STRESS MANAGEMENT BY YOGA	Ty/Lb /ETL	L	T/ SLr	P/R	C
	Prerequisite : None	Ty	2	0	0	0
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab						

Unit 1 **6 HOURS**

Understanding Stress: Stress and lifestyle disorders: Meaning and definition, development of stress; nature of stressors: Frustration, pressure; Factors predisposing stress: life events and daily hassles; Burnout. Coping with stress: Problem oriented and emotion oriented. Stress management: Meaning and definition; Changing thoughts, behavior and physiological responses.

Unit 2 **10 HOURS**

Yoga Philosophy: Introduction to Yoga and Yogic Practices – Definition, History, Aim and Objectives, Four Paths of Yoga and Principles of Yoga, Hatha Yoga – Distinction between Yoga and Non Yogic Practices, Concept of Yogic diet, Purpose and Utility of Asanas in Hatha Yoga , Introduction to Patanjali,

Unit 3 **14 HOURS**

Yoga in Health Care: Yoga for specific lifestyle disorders: Asthma, Sleeplessness, Diabetes, Blood pressure and Heart Diseases. Research evidence on the impact of yoga intervention on lifestyle disorders. Halasana and Matsyasana for Thyroid, Dhanurasana and Bhujangasana for Polycystic Ovarian Syndrome Disease, Shishuasana and AdhoMukhaSvanasana for Arthritis, SuptaMatsyendrasana and Vrikshasana for Lower back pain, ArdhaMatsyendrasana and Chakrasana for Diabetes, Apanasana and Paschimottanasana for Indigestion and Stomach Disorder, Padmasana and Sirsasana for Migraine, BaddhaKonasana and Sukhasana for Depression, Balasana and Shavasana for Sleeplessness. Evaluation of the applications of psychological knowledge in the area of health and identification of gaps.

Total no. of Hrs : 30

REFERENCES

- Taylor, S.E (2006). Health Psychology. New Delhi: Tata McGraw Hill
- Serafini, E.P & Smith T.W. (2012). Health Psychology: Bio psychosocial Interventions. New Delhi: Wiley
- Hatha Yoga Pradipika by Swami Svatmarama.
- BKS Iyengar (2013). YOGA - The Path to Holistic Health

Subject Code: HMAC22I08	Subject Name PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS	Ty/Lb	L	T	P	C
	Pre requisite :Nil	Ty	2	0	0	0

L:LectureT:Tutorial P:ProjectR:ResearchC:CreditsT/L:Theory/Lab

Objectives To learn to achieve the highest goal happily, To become a person with stable mind, pleasing Personality and determination. To awaken wisdom in student

COURSEOUTCOMES(COs):Attheendofthiscoursethestudentswouldbeabletoknow

CO1	StudyofShrimad-Bhagwad-Geetawillhelpthestudentindevelopinghispersonalityandachieve The highest goal in life
CO2	The person who has studied Geeta will lead the nation and mankind to peace and prosperity
CO3	Study of Neetishatakam will help in developing versatile personality of students.

Mapping of Course Outcomes with Program Outcomes(POs)

Os/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	3	1	1	1	1	1	1
CO2	1	1	1	1	1	3	1	1	1	1	1	1
CO3	1	1	1	1	1	3	1	1	1	1	1	1

H/M/L indicates Strength of Correlation H-High ,M-Medium, L-Low

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others			
									√			

Subject Code: HMAC22I08	Subject Name PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS	Ty/Lb	L	T	P	C
	Pre requisite :Nil	Ty	2	0	0	0
L:LectureT:Tutorial P:ProjectR:ResearchC:CreditsT/L:Theory/Lab						

Course Objectives

1.To learn to achieve the highest goal happily

2.To become a person with stable mind, pleasing personality and determination

3.To awaken wisdom in students

Syllabus

Unit	Content	Hours
1	Neetisatakam-Holistic development of personality • Verses- 19,20,21,22 (wisdom) • Verses- 29,31,32 (pride & heroism) • Verses- 26,28,63,65 (virtue) • Verses- 52,53,59 (dont's) • Verses- 71,73,75,78 (do's)	10
2	• Approach to day to day work and duties. • Shrimad BhagwadGeeta : Chapter 2-Verses 41, 47,48, • Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35, • Chapter 18-Verses 45, 46, 48.	10
3	• Statements of basic knowledge. • Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68 • Chapter 12 -Verses 13, 14, 15, 16,17, 18 • Personality of Role model. Shrimad BhagwadGeeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, • Chapter 4-Verses 18, 38,39 • Chapter18 – Verses 37,38,63	10

Suggested reading

1."Srimad Bhagavad Gita" by Swami SwarupanandaAdvaita Ashram (Publication

2.Department), Kolkata

3.Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath,

4.Rashtriya Sanskrit Sansthanam, New Delhi.

Subject Code : HMAC22I09	Subject Name : LIFE SKILLS	Ty/Lb /ETL	L	T/ SLr	P/R	C
	Prerequisite : None	**Ty**	**2**	**0**	**0**	**0**

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

- Understand the positive effect of being open to experiences
- Be familiar with impulse control and pro social behaviour
- Describe emotional intelligence, social intelligence, and integrative thinking for effective Leadership
- Describe basic managerial skills. And self-management skills.

COURSE OUTCOMES (Cos) : (3 – 5)
Students completing the course were able to

CO1	Develop the tendency to accept self and others unconditionally
CO2	Regulate their emotional impulsivity and demonstrate pro social behaviour
CO3	Inculcate emotional and social intelligence and integrative thinking for effective Leadership.
CO4	Demonstrate a set of practical skills such as time management, self-management, handling conflicts, and team leadership.
CO5	Create and maintain an effective and motivated team to work for the society

Mapping of Course Outcomes with Program Outcomes (POs)

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO1			1		3	2	2					
CO2			1		3	2	1		1			
CO3		2	1		3	3	1		2			
CO4	2	2	1		3	3	2		3			
CO5	1	2	1		3	3	2		2			

Category	H&S	Program core	Program Elective	Open elective	Skill enhancing elective	Interdisciplinary/Allied	Skill component	Practical Project/ Internship	others	
									√	

Subject Code : HMAC22I09	Subject Name : LIFE SKILLS	Ty/Lb /ETL	L	T/ SLr	P/R	C
	Prerequisite : None	Ty	2	0	0	0
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab						

UNIT 1: **6 Hours**

Openness to experience: developing the tendency to accept and appreciate self and others, the Insights, ideas, values, feelings, and behaviors, cultivate willingness to try new things as well as engage in imaginative and intellectual activities, and creative thinking "thinking outside of the box." Skills.

UNIT 2: **6 Hours**

Conscientiousness- developing the ability to regulate their impulse control in order to engage in goal-directed behaviors, managing negative emotions such as anger, worry, and sadness and Developing organized and structured approach

Unit 3: **6 Hours**

Pro social behavior:developing trust, altruism, kindness, affection, empathetic understanding, Sharing, comforting and cooperating, Assertiveness, emotional expressiveness and social interaction.

Unit 4: **6 Hours**

Innovative leadership Understanding: Concept of emotional and social intelligence, the persona of a leader for deriving holistic inspiration, Drawing insights for leadership, leadership qualities essential to sail through difficult situations, Importance of ethics, Ethical decision-making, Personal and professional moral codes of conduct, Creating a harmonious life.

Unit 5: **6 Hours**

Management Skills : Basic Managerial Skills - Planning for Effective Management, Organize Teams, Delegation of Tasks, Time Management, Conflict and Stress Management. Self-management Skills -Understanding Self-concept, Developing Self-awareness, Self-examination, Self-reflection and introspection, Self-regulation.

Total hours:30 Hours

REFERENCES AND SUGGESTED READINGS

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