SRI MEENAKSHI GOVERNMENT ARTS COLLEGE FOR WOMEN

(An Autonomous Institution Affiliated to Madurai Kamaraj University) Re-Accredited with B^{++} Grade by NAAC (4^{th} Cycle)

Madurai 625002.

SYLLABUS

Programme:	Postgraduate
Programme Code:	
Name of the Programme:	**MCA**
Duration of the Programme:	**2 years** (4 semesters)
Year	**2024-2026**
Eligibility for Admission	Pursued BCA / B.Sc / B. Com / B.A degree with Mathematics / Business statistics as one of the subjects in graduation or +2 level

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1. PROFILE OF THE DEPARTMENT

DEPARTMENT OF COMPUTER APLICATIONS

PROFILE

Department of Computer Applications is offering BCA, MCA and M. Phil courses. There are four permanent and two temporary staff members in our department. Our staff have published various research papers in various journals and also being a research supervisor for the research scholars. Our MCA course was blossomed in the year 1998 itself as a professional course approved by AICTE. Since AY 2023 - 2024, TANSCHE syllabus has been followed for MCA. Apart from the MCA curriculum, the MCA students will be undergoing a Certificate based mini course - Data Science with the collaboration of IITM. BCA Course was started in the year 2018 with the in take of 40.

VISION

Enabling students to become enterprising academicians, young entrepreneurs and responsible citizens.

MISSION

Imparting quality knowledge and essential virtues treading towards holistic development.MEN

2. SCOPE OF THE PROGRAMME

Technical Knowledge:

This course provides you with in-depth knowledge of the technical aspects of computers.

Employment Opportunities:

There are many lucrative job options for MCA graduates in the ever-evolving IT sector, Medical Sciences, and Engineering. The MCA professionals can be a Software Developer, Computer System Specialist, project manager, Hardware Engineer, Software consultant, Web Developer, Data Scientist, Troubleshooter, Cloud Architect, Cyber Security Expert and Academicians based on their area of expertise.

3. PROGRAMME OUTCOMES

At the end of the Programme the students will be able to:

PO1: Problem-Solving Skill
Apply knowledge of management theories and Human Resource practices to solve business problems through research in a global context.

PO2: Decision Making Skill
Foster analytical and critical thinking abilities for data-based decision-making.

PO3: Ethical Value
Ability to incorporate quality, ethical and legal value-based perspectives to all organizational activities.

PO4: Communication Skill
Ability to develop communication, managerial and interpersonal skills.

PO5: Individual and Team Leadership Skills
Capability to lead themselves and the team to achieve organizational goals.

PO6: Employability Skills
Inculcate contemporary business practices to enhance employability skills in the competitive environment.

PO7: Entrepreneurial Skill
Equip with skills and competencies to become an entrepreneur.

PO8: Contribution to Society
Succeed in career endeavors and contribute significantly to society.

PO9 Multicultural competence
Possess knowledge of the values and beliefs of multiple cultures and a global perspective.

PO10: Moral and ethical awareness/reasoning

Ability to embrace moral/ethical values in conducting one's life.

4. **PROGRAMME SPECIFIC OUTCOMES**

After the completion of the programme Postgraduate students will be able to

PSO1 – Placement

To prepare the students who will demonstrate respectful engagement with others' ideas, behaviors, beliefs and apply diverse frames of reference to decisions and actions.

PSO 2 - Entrepreneur

To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations.

PSO3 – Research and Development

Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards growth and development.

PSO4 – Contribution to Business World

To produce employable, ethical and innovative professionals to sustain in the dynamic business world.

PSO 5 – Contribution to Society

To contribute to the development of society by collaborating with stakeholders for mutual benefit.

5. ABSTRACT OF PROGRAMME STRUCTURE

SEMESTER – I

Course Type	Sub Code	Title of the Course	Hrs/ Week	Credits	Exam Hrs	Marks		
						Int	Ext	Total
CC1-**Core – I** Theory	**P23CU1**	Discrete Mathematics	6	6	3	25	75	100
CC2-**Core – II** Theory	**P23CU2**	Linux and shell programming	6	6	3	25	75	100
CC3(P) -**Core – III** Theory	**P23CU3**	Python Programming	6	4	3	25	75	100
Elective I **DisciplineSpecific Elective 1 (DSEC1)**		Data Engineering and Management	6	3	3	25	75	100
		Data Engineering and Management Lab						
		Architecture and Frameworks						
		Architecture and Frameworks Lab						
Elective II GEC/DSEC2 - **GenericElective 1(GE1)**		Software Development Technologies	6	3	3	25	75	100
		Software Development Technologies Lab						
		Soft Computing						
		Soft Computing Lab						
Total			**30**	**22**				**500**

SEMESTER–II

Course Type	Sub Code	Title of the Course	Hrs / Week	Credits	Exam Hrs	Marks		
						Int	Ext	Total
CC4 - **Core - IV** Theory	**P23CU4**	Data Structures and Algorithms	6	5	3	25	75	100
CC5 - **Core – V** Theory	**P23CU5**	Big Data Analytics	6	5	3	25	75	100
CC6 (P) - **Core – VI LAB**	**P23CU6P**	Data Structures and Algorithms Lab	6	4	3	25	75	100
Elective III GEC/DSEC3 - **DisciplineSpecific Elective 2 (DSEC2)**		Internet of Things	5	3	3	25	75	100
		Internet of Things Lab						
		Computer Vision						
		Computer Vision Lab						
Elective IV GEC/DSEC4 **Generic Elective 2 (GE2)**		Network Security and Cryptography	5	3	3	25	75	100
		Cyber Security						
		Cyber Security Lab						
		Quantum Computing						
		Block Chain technologies Lab						
SEC1 - **Skill Enhancement Course [SEC] - I**	**P23SEU1**	Fundamentals of Human Rights	2	2	3	25	75	100
		Total	**30**	**22**				**600**

SUMMER INTERNSHIP
INDUSTRIAL TRAINING

SEMESTER–III

Course Type	Sub Code	Title of the Course	Hrs/ Week	Credits	Exam Hrs	Marks		
						Int	Ext	Total
CC7 - Core VII Theory	**P23CU7**	Advanced Java Programming	6	5	3	25	75	100
CC8 - Core VIII Theory	**P23CU8**	Web Technology	6	5	3	25	75	100
CC9(P) - Core IX (Industry Module) –Lab	**P23CU9P**	Advanced Java Programming lab	6	4	3	25	75	100
CC10 - Core X Theory	**P23CU10**	Advanced Machine Learning (AML)	5	3	3	25	75	100
Elective V GEC/DSEC5 - DisciplineSpecific Elective 3 (DSEC3)		Web Technologies Lab	5	3	3	25	75	100
SEC2 - Skill Enhancement Course - II LAB	**P23SEU2P**	Integrated Technology (AML) (Self-study course)	2	2	3	25	75	100
	P23SIU1	**Internship Industrial Activity**	-	2		--	--	100
		Total	**30**	**24**				**700**

SEMESTER–IV

Course Type	Sub Code	Title of the Course	Hrs/ Week	Credits	Exam Hrs	Marks		
						Int	Ext	Total
CC11 - Core - XI – Theory	**P23CU11**	Mobile Computing	6	5	3	25	75	100
CC12 - Core – XII - Theory	**P23CU12**	Software Project Management	6	5	3	25	75	100
CC13 – Project	**P23UPW**	Project with Viva-voce	10	7	-	60	40	100
Elective VI GEC/DSEC6 - Discipline Specific Elective (DSEC4) (Industry Entrepreneurship)		Social Networks	5	3	3	25	75	100
		Social Networks Lab						
		High Performance Computing						
		High Performance Computing Lab						
SEC3 Skill Enhancement Course III	**P23SEU3P**	SOFT SKILL DEVELOPMENT LAB	3	2	3	25	75	100
	P23EAU	**Extension Activity**	-	1	-	--	--	100
		Total	**30**	**23**				**600**

ELECTIVES

S.NO	SEMESTER	ELECTIVE NUMBER	SUB CODE	COURSE
1	**I**	**DESC1**	**P23DU01**	Data Engineering and Management
2	**I**	**DESC1**	**P23DU02P**	Data Engineering and Management Lab
3	**I**	**DESC1**	**P23DU03**	Architecture and Frameworks
4	**I**	**DESC1**	**P23DU04P**	Architecture and Frameworks Lab
5	**I**	**GE1**	**P23DU05**	Software Development Technologies
6	**I**	**GE1**	**P23DU06P**	Software Development Technologies Lab
7	**I**	**GE1**	**P23DU07**	Soft Computing
8	**I**	**GE1**	**P23DU08P**	Soft Computing Lab
9	**II**	**DSEC2**	**P23DU09**	Internet of Things
10	**II**	**DSEC2**	**P23DU10P**	Internet of Things Lab
11	**II**	**DSEC2**	**P23DU11**	Computer Vision
12	**II**	**DSEC2**	**P23DU12P**	Computer Vision Lab
13	**II**	**GE2**	**P23DU13**	Network Security and Cryptography
14	**II**	**GE2**	**P23DU14**	Cyber Security
15	**II**	**GE2**	**P23DU15P**	Cyber Security Lab
16	**II**	**GE2**	**P23DU16**	**Quantum Computing**
17	**II**	**GE2**	**P23DU17P**	Block chain Technologies Lab
18	**III**	**DSEC3**	**P23DU18P**	Web Technologies Lab
19	**IV**	**DSEC4**	**P23DU19**	Social Networks
20	**IV**	**DSEC4**	**P23DU20P**	Social Networks Lab
21	**IV**	**DSEC4**	**P23DU21**	High Performance Computing
22	**IV**	**DSEC4**	**P23DU22P**	High Performance Computing Lab

6. **CURRICULAR FRAMEWORK**

For MCA Programme

COURSES	TOTAL NO OF COURSES	HOURS	CREDITS	MARKS
Core Courses	12	71	57	1200
Core Project with Viva-voce	1	10	7	100
Discipline Specific / **Generic** Elective Courses	6	32	18	600
Skill Enhancement Courses	3	7	6	300
Internship/Industrial Activity	1	--	2	100
Extension Activity	1	--	1	100
Total	**24**	**120**	**91**	**2400**

7.SYLLABUS WITH LESSON PLAN

7. a CORE COURSES

7.b. GENERIC ELECTIVE (ALLIED) COURSES

Semester	Course Type	Sub Code	Title of the Course	Page Number
I	**Elective II** GEC/DSEC2 – **Generic Elective 1 (GE1)**	**P23DU05**	Software Development Technologies	59
		P23DU06P	Software Development Technologies Lab	63
		P23DU07	**Soft Computing**	65
		P23DU08P	Soft Computing Lab	70
II	**Elective IV** GEC/DSEC4 **Generic Elective 2 (GE2)**	**P23DU13**	Network Security and Cryptography	92
		P23DU14	Cyber Security	95
		P23DU15P	Cyber Security Lab	99
		P23DU16	Quantum Computing	101
		P23DU17P	Block chain Technologies Lab	104

7.c **DISCIPLINE SPECIFIC ELECTIVE COURSES**

Semester	Course Type	Sub Code	Title of the Course	Page Number
I	Elective I Discipline Specific Elective 1 (DSEC1)	**P23DU01**	Data Engineering and Management	47
		P23DU02P	Data Engineering and Management Lab	51
		P23DU03	Architecture and Frameworks	53
		P23DU04P	Architecture and Frameworks Lab	57
II	Elective III GEC/DSEC3 – Discipline Specific Elective 2 (DSEC2)	**P23DU09**	Internet of Things	81
		P23DU10P	Internet of Things Lab	85
		P23DU11	Computer Vision	87
		P23DU12P	Computer Vision Lab	90
III	Elective V GEC/DSEC5 - Discipline Specific Elective 3 (DSEC3)	**P23DU18P**	Web Technologies Lab	**125**
IV	Elective IV GEC/DSEC6 - Discipline Specific Elective (DSEC4) (Industry Entrepreneurship)	**P23DU19**	Social Networks	137
		P23DU20P	Social Networks Lab	141
		P23DU21	High Performance Computing	143
		P23DU22P	High Performance Computing Lab	147

7.d Skill Enhancement Courses

Semester	Course Type	Sub Code	Title of the Course	Page Number
II	SEC1 - Skill Enhancement Course [SEC] - I	**P23SEU1**	Fundamentals of Human Rights	106
III	SEC2 - Skill Enhancement Course - II	**P23SEU2P**	Integrated Technology (AML) (Self-study course)	127
IV	SEC3 Skill Enhancement Course-III	**P23SEU3P**	Soft Skill Development Lab	149

7.e Summer Internship

SUMMER INTERNSHIP / INDUSTRIAL TRAINING

SEMESTER–III

Course Type	Sub Code	Title of the Course	Hrs/ Week	Credits	Exam Hrs	Marks		
						Int	Ext	Total
CC7 - Core VII Theory	**P23CU7**	Advanced Java Programming	6	5	3	25	75	100
CC8 - Core VIII Theory	**P23CU8**	Web Technology	6	5	3	25	75	100
CC9(P) - Core IX (Industry Module) -Lab	**P23CU9P**	Advanced Java Programming lab	6	4	3	25	75	100
CC10 - Core X Theory	**P23CU10**	Advanced Machine Learning (AML)	5	3	3	25	75	100
Elective V GEC/DSEC5 - DisciplineSpecific Elective 3 (DSEC3)		Web Technologies Lab	5	3	3	25	75	100
SEC2 - Skill Enhancement Course - II LAB	**P23SEU2**	Integrated Technology (AML) (Self-study course)	2	2	3	25	75	100
		Internship Industrial Activity	**-**	**2**		**--**	**--**	**100**
		Total	30	24				700

7.f &7.g Extension Activity and Project

SEMESTER–IV

Course Type	Sub Code	Title of the Course	Hrs/ Week	Credits	Exam Hrs	Marks		
						Int	Ext	Total
CC11 - Core - XI - Theory	**P23CU11**	Mobile Computing	6	5	3	25	75	100
CC12 - Core – XII - Theory	**P23CU12**	Software Project Management	6	5	3	25	75	100
CC13 - Project	**P23UPW**	**Project with Viva- voce**	**10**	**7**	**-**	**60**	**40**	**100**
Elective VI GEC/DSEC6 - Discipline Specific Elective (DSEC4) (Industry Entrepreneurship)		Social Networks	5	3	3	25	75	100
		Social Networks Lab						
		High Performance Computing						
		High Performance Computing Lab						
SEC3 Skill Enhancement Course III	**P23SEU3**	SOFT SKILL DEVELOPMENT LAB	3	2	3	25	75	100
	P23EAU	**Extension Activity**	**-**	**1**	**-**	**--**	**--**	**100**
		Total	30	23				600

7.f. ASSESSMENT PATTERN FOR EXTENSION ACTIVITY

I. Extension Activity

1. Extension activities should be carried out after the class hours for a minimum of 15 hours.

2. Evaluation pattern for Extension Activity shall be as follows:

Attendance - 50 marks
Participation - 25 marks
Report - 25 marks

8. **SCHEME FOR INTERNAL**

- Average of two Internal Test Marks for 10 is T1.
- Convert the Model Exam Mark for 75 into 10 which is T2.
- Five Marks for Assignment is A
- **Internal Marks (25) = T1 (10) + T2 (10) + A(5)**

9. QUESTION PAPER PATTERN & BLUE PRINT & EXTERNAL ASSESSMENT

BLUEPRINT

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			Part-B
UNIT-I	**Part-A**	**2**	**2**
UNIT-II	**2**		**2**
UNIT-III	**2**		**2**
UNIT-IV	**2**		**2**
UNIT-V	**2**		**2**

PART -A --> 5 x 5= 25 (Internal choice - Either or Or)

PART -B --> 5 x 10 = 50 (Internal choice - Either or Or)

Total = 75

10. ASSESSMENT PATTERN FOR SUMMER INTERNSHIP & PROJECT

Evaluation Pattern

I. Internship

1. Students are expected to undergo Summer Internship/ Industrial training for a minimum of 30 hours in the semesters mentioned in the template.

2. Evaluation pattern for Internship shall be as follows:

Attendance (Mandatory)	- 40 marks
Field work and performance	- 40 marks
Report writing	- 20 marks

ATTENDANCE CERTIFICATE FOR INTERNSHIP

Ms._____Reg.No._____studying_____ _____ programme at Sri Meenakshi Government Arts College for Women(A), Madurai in semester II at the Department of _____has attended the Internship from_____to_____for_____hours. It is certified that she has completed the Internship at _____(Organization/Institution).

Signature with date:
Name and Designation of the Officer:
Seal of the Organization:

II. Project

Evaluation Pattern for Project shall be as follows:

The 60 marks for internals can be given for three reviews of 20 marks each.

Review - I

Problem Selection/ Choice of the Topic	Methodology/ Technology used	Effective content delivery	Interaction/ Answering questions	Total
5	5	5	5	20

Review - II

Work Progress	Development of ideas	Effective content delivery	Interaction/ Answering questions	Total
5	5	5	5	20

Review - II

Final outcome of the project	Implementation & execution	Effective content delivery	Interaction/ Answering questions	Total
5	5	5	5	20

Evaluation criteria for External (40 marks)

Organisation of ideas	Effective content delivery	Report	Total
10	10	20	40

11. Levels of mapping (Bloom's Taxonomy)

BLOOM'S TAXONOMY	INTERNAL	EXTERNAL
KNOWLEDGE	50%	50%
UNDERSTANDING	30%	30%
APPLY	20%	20%

12. APPENDIX

Course Code	Course Name	Course Outcomes	Page No.
P23CU1	Discrete Mathematics	To understand the concepts of relations and functions, distinguish among normal forms	34
		To analyze and evaluate the recurrence relations	
		To distinguish among various normal forms and predicate calculus	
		To solve and know various types of matrices	
		To evaluate and solve various types of graphs	
P23CU2	Linux and shell programming	To understand, apply and analyze the concepts and methodology of Linux shell programming	38
		To comprehend, impart and apply the fundamentals of control structure and script controls	
		To understand, analyse and evaluate the functions, graphical desktop interface and editors	
		To collaborate, apply and review the concepts and methodology of regular expression and advanced gawk	
		To comprehend, use and illustrate the advanced concepts such as alternate shell scripts, data connectivity and bash scripting using python	
P23CU3	Python Programming	Comprehend the programming skills in python and develop applications using conditional branches and loops	43
		Create python applications with strings and functions	
		Understand and implement the Object Oriented Programming paradigm with the concept of objects and classes, Inheritance and polymorphism	
		Evaluate the use of Python packages to perform numerical computations and data visualization	
		Design interactive web applications using Django	
P23DU01	Data Engineering and Management	Comprehend the Data Management concepts and analyse the relationship with the enterprise	47
		Analyze Data Modelling concepts and assess its quality	
		Understand and implement business modelling techniques	
		Evaluate the use of Artificial Intelligence and Machine Learning in CRM	
		Develop CRM applications in cloud	
P23DU02P	Data Engineering and Management Lab	Comprehend the scripting knowledge in MongoDB and perform basic operations in a shell prompt	51
		Implement, Create, Read, Update and Delete Operations on MongoDB database	
		Analyze MongoDB using DbVisualizer	
		Assess Zoho CRM features for managing customer relationships	
		Create a customized application in Zoho CRM	

12.a List of Courses Outcomes of all Courses

P23DU03	Architecture and Frameworks	Understand, analyze and evaluate the purpose of Software architecture and development methodologies with consideration of risk management	53
		Comprehend, apply and evaluate the domain knowledge for software development process and determine the impact of quality attributes.	
		Understand, track and examine the systematic approach for various software design models with effective document process	
		Illustrate and summarize the functions of orthogonal systems with complexity, design principles and design pattern for software architecture	
		Comprehend, analyze and evaluate the performance and security measures for Server, Web and Database applications in order to create the secure software systems for various domain applications	
P23DU04P	Architecture and Frameworks - Lab	Comprehend the programming skills of Software architecture tools and packages	57
		Understand and implement the user profiles and authentication with recovery mechanism.	
		Comprehend and evaluate the access control and content representation use of FTP server	
		Understand and implement reading and writing resources for various applications	
		Identify and examine the notifications, friends, and follower list of social application protocols.	
P23DU05	Software Development Technologies	To understand, apply and summarize the basic concepts of Micro services communication Microsoft Azure and Dev Ops for software development life cycle	59
		To illustrate, and implement Azure Kubernetes Service tools for software development life cycle	
		To recognize, analyse and summarize the functionalities of .NET Dev Ops for Azure applications	
		To understand, design and evaluate the principles and architecture service tools for software development life cycle.	
		To comprehend, implement and review the functionalities of API and API gateways for cloud and Azure applications	
P23DU06P	Software Development Technologies Lab	To Understand and analyse the importance of Jenkins to Build, Deploy and Test Software Applications	63
		To synthesis and summarize the importance of Software Configuration Management in DevOps	
		To identify, analyze and illustrate the Containerization of OS images and deployment of applications over Docker	
		To design, analyze and develop the Pull based Software Configuration Management	
		To design, analyze and develop Puppet Manifest	

P23DU07	Soft Computing	To provide an introduction to the basic principles, techniques, and applications of soft computing	65
		To get familiar with Neural network architectures and supervised learning algorithms	
		To understand the architectures and algorithms of Unsupervised Learning techniques	
		Develop the skills to gain a basic understanding of fuzzy logic theory and fuzzy inference systems	
		Ability to learn traditional optimization and search techniques and genetic programming	
P23DU08P	Soft Computing Lab	To apply supervised learning algorithms for real datasets	70
		To implement Unsupervised Learning techniques	
		To apply fuzzy based arithmetic and logical operations	
		To find solutions for problems using Genetic algorithm	
		To implement DeMorgan's Law	
II SEMESTER			
P23CU4	Data Structures and Algorithms	Understand various ADT concepts	73
		Familiar with implementation of ADT models with Python language and understand how to develop ADT for the various real-time problems	
		Apply with proper ADT models with problem understanding	
		Apply and Analyze right models based on the problem domain	
		Evaluate modern data structures with Python language	
P23CU5	Big Data Analytics	To understand, illustrate and evaluate the concepts and techniques of Data Science, Big Data Analytics and its tools	75
		To collaborate,apply and review the computing for big data in Hadoop, and NoSQL environment.	
		To comprehend, implement and review the concepts of data science and big data analytics projects using MapReduce, and MongoDB	
		To understand, use and analyze the concepts of big data analytics projects using HIVE database.	
		To illustrate, develop and review the concepts of PIG database in Hadoop environment.	
P23CU6P	Data Structures and Algorithms Lab	Strong understanding in various ADT concepts	79
		To become a familiar with implementation of ADT models	
		Apply sort and tree search algorithms	
		Evaluate the different data structure models	

		Learn how to develop ADT for the various real-time problems	
P23DU09	Internet of Things	Comprehend the IoT evolution with its architecture and sensors	81
		Understand the networking concepts for communication and underlying IoT protocols	
		Assess the embedded technologies and develop prototypes for the IoT	

		products	
		Evaluate the use of Application Programming Interface and design an API for IoT in realitime	
		Recognize the ethics of business models and perform security analysis	
P23DU10P	Internet of Things Lab	Implement IoT programs to turn ON/OFF LED	85
		Develop IoT programs for object detection	
		Create IoT programs for agricultural purpose	
		Implement web server program for local hosting	
		Design IoT application for health monitoring	
P23DU11	Computer Vision	To understand and recall computer vision and its application areas	87
		To develop build a computer vision system	
		To apply and analyze a design range of algorithms for image processing and computer vision	
		To develop incorporate machine learning techniques with computer vision system	
		To apply and analyze image segmentation and image registration	
P23DU12P	Computer Vision Lab	To develop and implement the image loading and exploring	90
		To Evaluate the image transforms	
		To apply and analyze for image processing denoising algorithms	
		To design and develop the Image Segmentation using Edge detection and Histograms	
		To apply and analyze image clustering and classification algorithms	
P23DU13	Network Security and Cryptography	Understand the process of the cryptographic algorithms	92
		Compareandapplydifferentencryptionanddecryptiontechniquestosolveproblems related to confidentiality and authentication	
		Applyandanalyzeappropriatesecuritytechniquestosolvenetworksecurity problem	
		Explore suitable cryptographic algorithm.	

		Analyzedifferentdigitalsignaturealgorithmstoachieveauthenticationand design secure applications	
P23DU14	Cyber Security	Understand, describe, analyze and examine the basics of Cyber security concepts and its implementation in India	95
		Comprehend and demonstrate the security tips in browsers, WLAN, social networks, Email security and Smart phone. Apply the investigations in post mortem and Forensics	
		Understand, apply and evaluate the various investigation roles and Wi Fi protecting mechanisms.	
		Understand, illustrate and evaluate the method of seize the digital	

		information and evidence forensics data and evaluate the forensics reports	
		Comprehend, apply and appraise the methods digital forensics with cybercrime prevention techniques	
P23DU15P	Cyber Security Lab	Comprehend the programming skills in Change the wireless device mode as monitor mode	99
		Understand and implement multiple vulnerabilities webserver	
		Evaluate the use of different wireless device modes	
		Design to Solve related to find the subdomains of webpage	
		Create and applyopen ports in the network	
P23DU16	Quantum Computing	Understand the basics of quantum computing	101
		Understand the background of Quantum computation	
		To explore quantum gates and circuits.	
		Analyze various quantum algorithms .	
		Understand quantum quantum cryptography	
P23DU17P	Blockchain Technologies Lab	Enable to setup your own private Blockchain and deploy smart contracts on Ethereum.	104
		Gains familiarity and implement with cryptography and Consensus algorithms.	
		Create and deploy projects using Web3j.	
		Recall and deploy the structure and mechanism of Bitcoin, Ethereum, Hyperledger	
		Implement Blockchain for various use cases	
P23SEU1	Fundamentals of Human Rights	Remember the concept of natural rights.	106
		Understand the historical growth of the idea of human rights.	
		Assess the importance of Human Rights and respect the rights of others.	
		Analyze the issues and challenges of Human Rights.	

		Evaluate the role of various organization in protection of Human Rights.	
III SEMESTER			
P23CU7	Advanced Java Programming	Understand the Object Oriented Program including classes and methods; inheritance and exception handling	110
		Complete comprehension of String functions and I/O Streams	
		Creation of graphical representation using Applet	
		Application of Servlets for designing Web based applications	
		Usage of JDBC connectivity and implementation of the concept to get desired results from database	
P23CU8	Web Technology	Design dynamic web pages using Javascript, Jquery and Angular Java scripts	114
		Develop Web pages using HTML, CSS and XML	

		Create web application using PHP and MySQL	
		To design dynamic web pages using Angular JavaScript	
		Develop interactive web pages using Jquery	
P23CU9P	Advanced Java Programming Lab	Understand the Object Oriented Program including classes and methods; inheritance and exception handling	118
		Complete comprehension of String functions and I/O Streams	
		Creation of graphical representation using Applet	
		Application of Servlets for designing Web based applications	
		Usage of JDBC connectivity and implementation of the concept to get desired results from database	
P23CU10	Advanced Machine Learning	To understand, impart and analyze the concepts and of Machine Learning Techniques and types of data	120
		To comprehend, apply and evaluate the classification techniques for realworld applications	
		To understand, use and perform evaluation of Regression methods	
		To recognize, implement and analyse the unsupervised techniques for realworld applications	
		To understand, identify, implement and review the deep learning techniques for real-time applications	
P23DU18P	Web Technologies Lab	Design dynamic web pages using JavaScript, Jquery and Angular Java script	125
		Develop Web pages using HTML, CSS and XML	
		Create web application using PHP and MySQL	
		Develop interactive web pages using Jquery	
		To design dynamic web pages using Angular javascript	
P23SEU2	Integrated	To understand and implement the mathematical and statistical prospective of machine learning algorithms through python programming	127

	Technology (AML) Lab	To recognize and develop the machine learning models through python in built functions	
		To understand, impart and develop the machine learning models for real-time dataset	
		To comprehend , impart and implement the deep learning models for real-time applications	
		To identify and evaluate the performance machine learning models for realtime dataset	
IV SEMESTER			
P23CU11	Mobile Computing	Understanding the basic concepts of Mobile and Wireless Communication	129
		Understanding the basic concepts of Spread Spectrum. Analyzing the concepts of Medium Access Control.	
		Analyzing the concepts of Global System for Mobile Communication and Satellite Communications. Understanding the basic concepts of Wireless LAN	
		Understanding the basic concepts of Wireless LAN. Evaluate the performance of Mobile Network Layer	
		Understanding the basic concepts of Wireless Application Protocol and create a MoileApp with real-time application. Analyzing the concepts of Routing	

		Protocols in MANET	
P23CU12	Software Project Management	Understand the fundamentals of Software Project Management	133
		Understand the ProjectEvaluation by Strategic, Technical and Cost analysis	
		Understand the fundamentals of Software effort estimations	
		Understand the Risk Management, risk analysis and monitoring.	
		Understanding the various types of contracts and the Organizational Behavior Background	
P23DU19	Social Networks	To understand, impart and summarize the concepts of Social media, Social networking and Webcasts	137
		To comprehend, design and develop a Word Press Powered Website	
		To understand, implement and perform evaluation of Social Networking and Micro-Blogging	
		To collaborate, implement and analyse the Widgets and Badges in social networking environment	
		To understand, illustrate and perform evaluation of web optimization for social networks	
P23DU20P	Social Networks Lab	To understand , implement and review the fundamental techniques and principles for social networks.	141
		To design and develop the programs using the tools required to develop and manage social network like Facebook, LinkedIn, Google+, GitHub	
		To create and explore the functionality of social networking tools such as GitHub	
		To understand , implement and review the fundamental principles for social network graphs.	

		To comprehend and critically analyse the existing API for social networks	
P23DU21	High Performance Computing	Understand of the HPC and ccNUMA concepts	143
		Design and develop a parallel programming with modern C, C++ and new version of FORTRAN	
		Apply with parallel computing	
		Develop an efficient OpenMP programming	
		Evaluate an efficient MPI programming	
P23DU22P	High Performance Computing Lab	Apply and Evaluate the HPC Programs	147
		Design and Develop a MPI Programs	
		Design and Develop a different programming concepts of OpenMP	
		Develop an efficient PB and Slurm programming	
		Evaluate an efficient CUDA programming	
P23SEU3	Soft Skill Development Lab	Reilience - learning to keep going when things don't go according to plan, coping with the unfamiliar, managing disappointment and dealing with conflict.	149
		Time and resource management, conflict resolution, teaching and mentoring others.	
		Teamwork – learning to connect and work with others to achieve a set task and group learning to increase the memory power.	
		Communication- demonstrating clear briefing and listening skills, not being afraid to ask for help and support when necessary.	
		Positive thinking and leadership – assessing the requirements of a task, identifying the strengths within the team, utilizing the diverse skills of the group to achieve the set objective, awareness of risk/safety.	

12. b List of Courses with Employability/ Entrepreneurship/ Skill Development

12.c List of New Courses introduced during this year

Semester	Course Code	Title of the Paper	Page Number
II	**P23DU16**	Quantum Computing	101

12. d. List of Courses related to Gender issues, Environment and Sustainability, Human Values, Professional Ethics, Research Ethics, etc.

Semester	Course Code	Title of the Paper	Page Number
II	**P23SEU1**	Fundamentals of Human Rights	106
III	**P23CU10**	Advanced Machine Learning (AML)	120
IV	**P23DU19**	Social Networks	137
	P23SEU3	Soft Skill Development Lab	149

12. e. List of Courses related to Soft Skills, Communication Skills, Life Skills (Yoga, Physical Fitness, Health and Hygiene, Disaster Management, etc.)

Semester	Course Code	Title of the Paper	Page Number
IV	**P23SEU3**	Soft Skill Development Lab	149

PROGRAMME: M.C.A					
SEMESTER: **I**	**Part: III Core Course**	COURSE CODE **: P23CU1**			
TITLE OF THE COURSE: **Discrete Mathematics**					
HOURS OF INSTRUCTION PER WEEK: 6 P/W 60 HrsP/S Each unit : 12 hours		CREDITS: 6	CIA: **25**	EXTERNAL MARKS: **75**	TOTAL:**100**

NATURE OF THE COURSE

Relevant to Global need	✓	Employability Oriented		Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented		Addresses Gender Sensitization	
Relevant to Regional need		Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To know the concepts of relations and functions
- To distinguish between different normal forms and quantifiers
- To solve recurrence relations and permutations & combinations
- To know and solve matrices , rank of matrixs & characteristic equations

UNIT	CONTENT	HRS
I	**Relations**- Binary relations-Operations on relations- properties of binary relations in a set – Equivalence relations— Representation of a relation by a matrix Representation of a relation by a digraph – **Functions**-Definition and examplesClassification of functions-Composition of functions-Inverse function.	**12**
II	**Mathematical Logic**-Logical connectives-**Well formed formulas** – Truth table of well formed formula –Algebra of propositions –Quine's method- **Normal forms of well formed formulas**- Disjunctive normal form-Principal Disjunctive normal form-Conjunctive normal form-Principal conjunctive normal form-**Rules of Inference for propositional calculus** – **Quantifiers**- Universal Quantifiers- Existential Quantifiers.	**12**
III	**Recurrence Relations**- Formulation -solving recurrence Relation by Iteration- solving Recurrence Relations- Solving Linear Homogeneous Recurrence Relations of Order Two- Solving Linear Non homogeneous Recurrence Relations. **Permutations**-Cyclic permutations- Permutations with repetitions- permutations of sets with indistinguishable objects- **Combinations**- Combinations with repetition.	**12**

IV	Matrices- special types of matrices-Determinants-Inverse of a square matrix-Cramer's rule for solving linear equations-Elementary operations-Rank of a matrix-solving a system of linear equations-characteristic roots and characteristic vectors-Cayley-Hamilton Theoremproblems.	**12**

V	**Graphs** -Connected Graphs -Euler Graphs- Euler line-Hamiltonian circuits and paths – planar graphs – Complete graph-Bipartite graph-Hyper cube graph-Matrix representation of graphs.	**12**

COURSE OUTCOMES:

CO1	To understand the concepts of relations and functions, distinguish among normal forms
CO2	To analyze and evaluate the recurrence relations
CO3	To distinguish among various normal forms and predicate calculus
CO4	To solve and know various types of matrices
CO5	To evaluate and solve various types of graphs

TEXTBOOK:

1. N.Chandrasekaran and M.Umaparvathi, Discrete mathematics, PHI Learning Private Limited, New Delhi, 2010.

REFERENCES:

1. Kimmo Eriksson &Hillevi Gavel, Discrete Mathematics & Discrete Models, Studentlitteratur AB, 2015.
2. Kenneth H. Rosen Discrete Mathematics and applications, Mc Graw Hill, 2012

E-LEARNING RESOURCES:

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	-	S	L	-	M	M	M
CO2	S	S	M	-	S	L	-	M	M	M
CO3	S	S	M	-	S	L	-	M	M	S
CO4	S	S	M	-	S	L	-	M	M	M
CO5	S	S	M	-	S	L	-	M	M	M
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5

CO1	L	L	S	L	M
CO2	M	L	S	L	M
CO3	M	L	S	L	S
CO4	S	M	S	M	S
CO5	S	M	S	M	S
Total Weightage					
Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low

TEMPLATE FOR LESSON PLAN

COURSE CODE: **P23CU1**	TITLE OF THE COURSE: **DISCRETE MATHEMATICS**							
Pedagogy	Total Hours	Lecture	Practical Experience	Peer Group Learning	Demo/ OER /Tutorial	GD / Seminar	ICT / Blended Learning	Field work / Internship
	60	40					20	
UNIT	**TOPIC**						**LECTURE HOURS**	**MODE OF TEACHING**
I	**Relations**- Binary relations-Operations on relations-properties of binary relations in a set.						4	Blackboard
	Equivalence relations— Representation of a relation by a matrix -Representation of a relation by a digraph.						4	PPT
	Functions-Definition and examples-Classification of functions-Composition of functions-Inverse function.						4	Blackboard
	Mathematical Logic-Logical connectives-**Well formed formulas** – Truth table of well formed formula –Algebra of proposition –Quine's method						4	Blackboard
	Normal forms of well formed formulas- Disjunctive normal form-Principal Disjunctive normal form-Conjunctive normal form-Principal conjunctive normal form.						4	Blackboard
	Rules of Inference for propositional calculus – **Quantifiers**- Universal Quantifiers- Existential Quantifiers.						4	PPT
	Recurrence Relations- Formulation -solving recurrence Relation by Iteration- solving Recurrence Relations- Solving Linear Homogeneous Recurrence Relations of Order Two-Solving Linear Non homogeneous Recurrence Relations.						4	Blackboard
	Permutations-Cyclic permutation- Permutations with repetitions- permutations of sets with indistinguishable objects.						4	Blackboard
	Combinations- Combinations with repetition.						4	PPT
	Matrices- **special types of matrices-Determinants-Inverse of a square matrix**						4	Blackboard
	Cramer's rule for solving linear equations-Elementary operations-Rank of a matrix-solving a system of linear equations						4	Blackboard
	characteristic roots and characteristic vectors-CayleyHamilton Theorem-problems.						4	Blackboard
	Graphs -Connected Graphs -Euler Graphs- Euler line-Hamiltonian circuits and paths						4	Blackboard

	planar graphs – Complete graph-Bipartite graph	4	PPT
	Hyper cube graph-Matrix representation of graphs	4	PPT

PROGRAMME: M.C.A					
SEMESTER: I	**Part: III Core II**	COURSE CODE **: P23CU2**			
TITLE OF THE COURSE: **Linux and Shell Programming**					
HOURS OF INSTRUCTION PER WEEK: 6 P/W 60 HrsP/S Each unit : 12 hours		CREDITS: 6	CIA: 25	EXTERNAL MARKS: 75	TOTAL: 100

NATURE OF THE COURSE					
Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented		Addresses Gender Sensitization	
Relevant to Regional need	✓	Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To teach principles of the operating system, including file handling utilities, Basic Linux commands, scripts and filters.
- To familiarize fundamentals of shell (bash), shell programming, pipes, control structures, arithmetic in shell interrupt processing, functions, debugging shell scripts.
- To impart fundamentals of file concepts, kernel support for file, File structure related system calls (file API's).
- To facilitate students in understanding Inter process communication, semaphore and shared memory.
- To explore real-time problem solution skills in Shell programming.

UNIT	CONTENT	HRS
I	**Basic bash Shell Commands:** Interacting with the shell-Traversing the file system-Listing files and directories-Managing files and directories-Viewing file contents. **Basic Script Building:**Using multiple commands-Creating a script file-Displaying messages-Using variables-Redirecting input and output-Pipes-Performing math-Exiting the script. **Using Structured Commands:**Working with the if-then statement-Nesting ifs-Understanding the test command-Testing compound conditions-Using double brackets and parenthesesLooking at case. (Book-1, Chapters: 3, 11, and 12)	**12**
II	**More Structured Commands:** Looping with for statement-Iterating with the until statement-Using the while statement-Combining loops-Redirecting loop output. **Handling User Input:** Passing parameters-Tracking parameters-Being shifty-Working with optionsStandardizing options-Getting user input. **Script Control:** Handling signals-Running scripts in the background-Forbidding hang-ups -Controlling a Job-Modifying script priority- Automating script execution. (Book-1, Chapters: 13, 14, and 16)	**12**

III	**Creating Functions:** Basic script functions-Returning a value-Using variables in functionsArray and variable functions-Function recursion-Creating a library-Using functions on the command line. **Writing Scripts for Graphical Desktops:** Creating text menus-Building text window widgets-Adding X Window graphics. **Introducing sed and gawk:** Learning about the sed Editor-Getting introduced to the gawk Editor-Exploring sed Editor basics. (Book-1, Chapters: 17, 18, and 19)	**12**
IV	**Regular Expressions:** Defining regular expressions-Looking at the basics-Extending our patterns-Creating expressions. **Advanced sed:** Using multiline commands-Understanding the hold space-Negating a command-Changing the flow-Replacing via a pattern-Using sed in scripts-Creating sed utilities. **Advanced gawk:** Reexamining gawk-Using variables in gawk-Using structured commands-Formatting the printing-Working with functions. (Book-1, Chapters: 20, 21, and 22)	**12**
V	**Working with Alternative Shells:** Understanding the dash shell-Programming in the dash shell-Introducing the zsh shell-Writing scripts for zsh.**Writing Simple Script Utilities:** Automating backups-Managing user accounts-Watching disk space. **Producing Scripts for Databases, Web, and E-Mail:** Writing database shell scripts-Using the Internet from your scripts-Emailing reports from scripts. **Using Python as a Bash Scripting Alternative:** Technical requirements-Python Language-Hello World the Python way-Pythonic arguments-Supplying arguments-Counting arguments-Significant white space-Reading user input-Using Python to write to files-String manipulation. (Book-1, Chapters: 23, 24, 25, and Book-2, Chapter: 14)	**12**

COURSE OUTCOMES:	
CO1	To understand, apply and analyze the concepts and methodology of Linux shell programming
CO2	To comprehend, impart and apply the fundamentals of control structure and script controls
CO3	To understand, analyse and evaluate the functions, graphical desktop interface and editors
CO4	To collaborate, apply and review the concepts and methodology of regular expression and advanced gawk
CO5	To comprehend, use and illustrate the advanced concepts such as alternate shell scripts, data connectivity and bash scripting using python

TEXTBOOK:

1. Richard Blum, Christine Bresnahan, "Linux Command Line and Shell Scripting BIBLE", Wiley Publishing, 3rd Edition, 2015.**Chapters:** 3, 11 to 14, 16 to 25.
2. Mokhtar Ebrahim, Andrew Mallett, "Mastering Linux Shell Scripting", Packt Publishing, 2nd Edition, 2018. **Chapter:** 14.

REFERENCES:

1. ClifFlynt,SarathLakshman,ShantanuTushar, "Linux Shell Scripting Cookbook ", Packt Publishing, 3rd Edition, 2017.
2. Stephen G.Kochan, Patrick Wood, "Shell Programming in Unix, Linux, and OS X", Addison Wesley Professional, 4th Edition, 2016.
3. Robert Love, "Linux System Programming", O'Reilly Media, Inc, 2013
4. W.R. Stevens, "Advanced Programming in the UNIX environment", 2nd Edition, Pearson Education, 2013
5. Graham Glass, King Ables, " UNIX for Programmers and Users", 3rd Edition, Pearson Education, 2003

E-LEARNING RESOURCES:

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	-	S	L	-	M	M	M
CO2	S	S	M	-	S	L	-	M	M	M
CO3	S	S	M	-	S	L	-	M	M	S
CO4	S	S	M	-	S	L	-	M	M	M
CO5	S	S	M	-	S	L	-	M	M	M
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	L	M
CO2	S	M	S	L	M
CO3	L	S	M	L	L
CO4	S	S	M	M	M
CO5	S	S	S	S	S
Total Weightage					
Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low

TEMPLATE FOR LESSON PLAN

COURSE CODE: P23CU2	TITLE OF THE COURSE: Linux and Shell Programming							
Pedagogy	Total Hours	Lecture	Practical Experience	Peer Group Learning	Demo/ OER /Tutorial	GD / Seminar	ICT / Blended Learning	Field work / Internship
	60	40					20	
UNIT	**TOPIC**						**LECTURE HOURS**	**MODE OF TEACHING**
I	**Basic bash Shell Commands:** Interacting with the shellTraversing the file system-Listing files and directoriesManaging files and directories-Viewing file contents.						4	Blackboard
	Basic Script Building: Using multiple commands-Creating a script file-Displaying messages-Using variables-Redirecting input and output-Pipes-Performing math-Exiting the script.						4	PPT
	Using Structured Commands: Working with the if-then statement-Nesting ifs-Understanding the test commandTesting compound conditions-Using double brackets and parentheses-Looking at case.						4	Blackboard
II	**More Structured Commands:** Looping with for statementIterating with the until statement-Using the while statementCombining loops-Redirecting loop output.						4	Blackboard
	Handling User Input: Passing parameters -Tracking parameters-Being shifty-Working with options-Standardizing options-Getting user input.						4	Blackboard
	Script Control: Handling signals-Running scripts in the background-Forbidding hang-ups -Controlling a JobModifying script priority-Automating script execution.						4	PPT
III	**Creating Functions:** Basic script functions-Returning a value-Using variables in functions-Array and variable functionsFunction recursion-Creating a library-Using functions on the command line.						4	Blackboard
	Writing Scripts for Graphical Desktops: Creating text menus-Building text window widgets-Adding X Window graphics.						4	Blackboard
	Introducing sed and gawk: Learning about the sed EditorGetting introduced to the gawk Editor-Exploring sed Editor basics.						4	PPT

IV	**Regular Expressions:** Defining regular expressions-Looking at the basics-Extending our patterns-Creating expressions.	4	Blackboard
	Advanced sed: Using multiline commands-Understanding the hold space-Negating a commandChanging the flow-Replacing via a pattern-Using sed in scripts-Creating sed utilities.	4	Blackboard
	Advanced gawk: Reexamining gawk-Using variables in gawk-Using structured commands-Formatting the printingWorking with functions.	4	Blackboard
V	**Working with Alternative Shells:** Understanding the dash shell-Programming in the dash shell-Introducing the zsh shell-Writing scripts for zsh.**Writing Simple Script Utilities:** Automating backups-Managing user accountsWatching disk space.	4	Blackboard
	Producing Scripts for Databases, Web, and E-Mail: Writing database shell scripts-Using the Internet from your scripts-Emailing reports from scripts.	4	PPT
	Using Python as a Bash Scripting Alternative: Technical requirements-Python Language-Hello World the Python way-Pythonic arguments-Supplying arguments-Counting arguments-Significant white space-Reading user inputUsing Python to write to files-String manipulation.	4	PPT

PROGRAMME: M.C.A					
SEMESTER: I	**Part: III Core III**	COURSE CODE : **P23CU3**			
TITLE OF THE COURSE: **Python Programming**					
HOURS OF INSTRUCTION PER WEEK: 6 P/W 60 HrsP/S Each unit : 12 hours	CREDITS: 4	CIA: 25	EXTERNAL MARKS: 75	TOTAL: 100	

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented	✓	Addresses Gender Sensitization	
Relevant to Regional need	✓	Skill Development Oriented		Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To acquire programming skills in core Python
- To learn Strings and function
- To develop object-oriented skills in Python
- To comprehend various Python Packages
- To develop web applications using Django

UNIT	CONTENT	HRS
I	Introduction : Fundamental ideas of Computer Science - Strings, Assignment, and Comments - Numeric Data types and Character sets – Expressions – Loops and Selection Statements: Definite iteration: the for Loop - selection: if and if-else statements - Conditional iteration: the while Loop.	12
II	Strings and Text Files: Accessing Characters and substrings in strings - Data encryptionStrings and Number systems- String methods – Text - Lists and Dictionaries: Lists – Dictionaries – Design with Functions: A Quick review - Problem Solving with top-Down Design - Design with recursive Functions - Managing a Program's namespace - HigherOrder Functions.	12
III	Design with Classes: Getting inside Objects and Classes – Data-Modeling Examples – Building a New Data Structure – The Two – Dimensional Grid - Structuring Classes with Inheritance and Polymorphism - GraphicalUser Interfaces - The Behavior of terminal-Based programs and GUI-Based programs - Coding Simple GUI-Based programs - Windows and Window Components - Command Buttons and responding to events.	12

IV	Working with Python Packages: NumPy Library-Ndarray – Basic Operations – Indexing, Slicing and Iteration – Array manipulation - Pandas –The Series – The DataFrame - The Index Objects – Data Vizualization with Matplotlib – The Matplotlib Architecture – pyplot – The Plotting Window – Adding Elements to the Chart – Line Charts – Bar Charts – Pie charts.	**12**
V	Django: Installing Django – Building an Application – Project Creation – Designing the Data Schema - Creating an administration site for models - Working with QuerySets and Managers – Retrieving Objects – Building List and Detail Views.	**12**

COURSE OUTCOMES:

CO1	Comprehend the programming skills in python and develop applications using conditional branches and loops
CO2	Create python applications with strings and functions
CO3	Understand and implement the Object Oriented Programming paradigm with the concept of objects and classes, Inheritance and polymorphism
CO4	Evaluate the use of Python packages to perform numerical computations and data visualization
CO5	Design interactive web applications using Django

TEXTBOOK:

1. K.A. Lambert, " Fundamentals of Python: first programs", Second Edition, Cengage Learning, 2018 **(Unit - I, II and III)**
2. Fabio Nelli, "Python Data Analytic s: With Pandas, NumPy, and Matplotlib", Second Edition, Kindle Edition, 2018 **(Unit - IV)**
3. Antonio Mele, "Django 3 By Example", Third Edition, 2020 **(Unit - V)**

REFERENCES:

1. ClifFlynt,SarathLakshman,ShantanuTushar, "Linux Shell Scripting Cookbook ", Packt Publishing, 3rd Edition, 2017.
2. Stephen G.Kochan, Patrick Wood, "Shell Programming in Unix, Linux, and OS X", Addison Wesley Professional, 4th Edition, 2016. 3. Robert Love, "Linux System Programming", O'Reilly Media, Inc, 2013
4. W.R. Stevens, "Advanced Programming in the UNIX environment", 2nd Edition, Pearson Education, 2013
5. Graham Glass, King Ables, " UNIX for Programmers and Users", 3rd Edition, Pearson Education, 2003.

E-LEARNING RESOURCES:

MAPPING WITH PROGRAMME OUTCOMES										
CO / PO	**PO1**	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1 0**
CO1	S	S	M	S	M	S	S	S	S	M
CO2	S	S	S	M	S	S	S	S	S	S
CO3	S	M	S	S	M	S	M	S	S	M
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	S	S	M
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES					
CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	S	S	M	M	S
CO2	M	L	S	L	M
CO3	S	M	M	L	L
CO4	S	M	M	L	M
CO5	S	S	S	L	M
Total Weightage					
Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low

TEMPLATE FOR LESSON PLAN

COURSE CODE: **P23CU3**	TITLE OF THE COURSE: **Python Programming**							
Pedagogy	Total Hours	Lecture	Practical Experience	Peer Group Learning	Demo/ OER /Tutorial	GD / Seminar	ICT / Blended Learning	Field work / Internship
	75	40					20	
UNIT	**TOPIC**						**LECTURE HOURS**	**MODE OF TEACHING**
I	Introduction : Fundamental ideas of Computer Science **-** Strings, Assignment, and Comments - Numeric Data types and character sets.						4	Blackboard
	Expressions – Loops and Selection Statements: Definite iteration: the for Loop						4	PPT
	selection: if and if-else statements - Conditional iteration: the while Loop.						4	Blackboard
II	Strings and Text Files: Accessing Characters and substrings in strings - Data encryption-Strings and Number systems.						4	Blackboard
	String methods – Text - Lists and Dictionaries: Lists – Dictionaries – Design with Functions						4	Blackboard
	A Quick review - Problem Solving with top-Down Design - Design with recursive Functions - Managing a Program's namespace - Higher-Order Functions.						4	PPT
III	Design with Classes: Getting inside Objects and Classes – DataModeling Examples – Building a New Data Structure.						4	Blackboard
	The Two – Dimensional Grid - Structuring Classes with Inheritance and Polymorphism - GraphicalUser Interfaces - The Behavior of terminal						4	Blackboard
	Based programs and GUI-Based programs - Coding Simple GUIBased programs - Windows and Window Components - Command Buttons and responding to events.						4	PPT
IV	Working with Python Packages: NumPy Library-Ndarray – Basic Operations – Indexing, Slicing and Iteration						4	Blackboard

	Array manipulation - Pandas –The Series – The DataFrame - The Index Objects – Data Vizualization with Matplotlib	4	Blackboard
	The Matplotlib Architecture – pyplot – The Plotting Window – Adding Elements to the Chart – Line Charts – Bar Charts – Pie charts.	4	Blackboard
V	Django: Installing Django – Building an Application – Project Creation	4	Blackboard
	Designing the Data Schema - Creating an administration site for models	4	PPT
	Working with QuerySets and Managers – Retrieving Objects – Building List and Detail Views.	4	PPT

PROGRAMME: M.C.A					
SEMESTER: I	**Part: ELECTIVE I**	COURSE CODE : P23DU01			
TITLE OF THE COURSE: **Data Engineering and Management**					
HOURS OF INSTRUCTION PER WEEK: 6 P/W 60 HrsP/S Each unit : 12 hours	CREDITS: 3	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100	

NATURE OF THE COURSE					
Relevant to Global need	✓	Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented		Addresses Gender Sensitization	
Relevant to Regional need		Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To understand Data Management concepts
- To get brief knowledge on Data Modeling
- To analyse the techniques used in Distributed Databases
- To assess Distributed database and Business Modelling
- To get familiar with CRM tools

UNIT	CONTENT	HRS
I	DATABASE DEVELOPMENT: Database architecture of an information system-Overview of the database development process-Conceptual data modeling-Relational data analysisRoles of a data model-Physical database design. DATA MANAGEMENT: Problems encountered without data management-Data management responsibilities-Data management activities-Roles within data management-Benefits of data managementRelationship between data management and enterprise.	12
II	CORPORATE DATA MODELLING: Need for a corporate data model-Nature of a corporate data model- Develop a corporate data model - Corporate data model principles. DATA DEFINITION AND NAMING: Elements of a data definition-Data naming conventions. DATA QUALITY: Issues associated with poor data quality-Causes of poor data quality-Dimensions of data quality-Data model quality-Improving data quality. DATA ACCESSIBILITY: Data security-Data integrity-Data recovery.	12
III	USE OF PACKAGED APPLICATION SOFTWARE: Application software packagesImpact on data management. DISTRIBUTED DATA AND DATABASES: Rationale for distributing data-Perfect distributed database system-Top down fragmentation and partitioning. Bottom up integration-The management of replication. BUSINESS INTELLIGENCE: Data warehousing-Multidimensional model of data-Standard reporting tools-Online analytical processing OLAP-Relational schema for a data warehouse.	12

IV	CRM: Three main pillars of CRM. GETTING TO KNOW YOUR CUSTOMER: 360degree client view. UTILIZING ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN YOUR CRM STRATEGY: Evolution of AI-Current state of AI-Teaming	**12**
	up AI with people-Applying AI to your CRM solution-ethical aspects of AI-An example of AI in CRM processes.	
V	CLOUD VERSUS ON PREMISE VERSUS HYBRID: Factors influencing vendor selection-Hybrid deployment-what are your options. CRM DIFFERENTIATORS: It's not about the feature list; it's about the ecosystem-Fourth industrial revolution and CRM-AI and smart cloud-To cloud or not to cloud-Leveraging smart cloud into CRM-Big data-Social selling and advertising-Implementation tools-Sustainable CRM platform.	**12**

COURSE OUTCOMES:

CO1	Comprehend the Data Management concepts and analyse the relationship with the enterprise
CO2	Analyze Data Modelling concepts and assess its quality
CO3	Understand and implement business modelling techniques
CO4	Evaluate the use of Artificial Intelligence and Machine Learning in CRM
CO5	Develop CRM applications in cloud

TEXTBOOK:

1. Keith Gordon, "Principles of Data Management Facilitating Information Sharing", BCS Learning, 2013. (Chapters:1-5, 7,8,12,13,14)
2. Max Fatouretchi, "The Art of CRM", Packt Publishing, 2019.(Chapters: 1,2,5,8,9)

REFERENCES:

1. Peter Ghavami, "Big Data Management_ Data Governance Principles for Big Data Analytics", De Gruyter, 2020.
2. Francis Buttle, Stan Maklan, Customer Relationship Management Concepts and Technologies, Routledge, 2019.

E-LEARNING RESOURCES:

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0
CO1	S	S	M	S	M	S	S	S	S	M
CO2	S	S	S	M	S	S	S	S	S	S
CO3	S	M	S	S	M	S	M	S	S	M
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	S	S	M
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES					
CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	L	S	M	M	L
CO2	L	M	M	M	S
CO3	L	S	M	S	M
CO4	M	S	L	M	S
CO5	M	S	L	M	S
Total Weightage					
Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low

TEMPLATE FOR LESSON PLAN

COURSE CODE: P23DU01	TITLE OF THE COURSE: **Data Engineering and Management**

Pedagogy	Total Hours	Lecture	Practical Experience	Peer Group Learning	Demo/ OER /Tutorial	GD / Seminar	ICT / Blended Learning	Field work / Internship
	60	40	25					
UNIT	**TOPIC**						**LECTURE HOURS**	**MODE OF TEACHING**
I	DATABASE DEVELOPMENT: Database architecture of an information system-Overview of the database development process-Conceptual data modeling-Relational data analysisRoles of a data model-Physical database design.						4	Blackboard
	DATA MANAGEMENT: Problems encountered without data management-Data management responsibilities-Data management activities-Roles within data management.						4	PPT
	Benefits of data management-Relationship between data management and enterprise						4	Blackboard
II	CORPORATE DATA MODELLING: Need for a corporate data model-Nature of a corporate data model- Develop a corporate data model - Corporate data model principles. DATA DEFINITION AND NAMING: Elements of a data definitionData naming conventions.						4	Blackboard
	DATA QUALITY: Issues associated with poor data qualityCauses of poor data quality-Dimensions of data quality-Data model quality-Improving data quality.						4	Blackboard
	DATA ACCESSIBILITY: Data security-Data integrity-Data recovery.						4	PPT
III	USE OF PACKAGED APPLICATION SOFTWARE: Application software packages-Impact on data management.						4	Blackboard
	DISTRIBUTED DATA AND DATABASES: Rationale for distributing data-Perfect distributed database system-Top down fragmentation and partitioning. Bottom up integration-The management of replication.						4	Blackboard
	BUSINESS INTELLIGENCE: Data warehousing-Multidimensional model of data-Standard reporting toolsOnline analytical processing OLAP-Relational schema for a data warehouse.						4	PPT
IV	CRM: Three main pillars of CRM. GETTING TO KNOW YOUR CUSTOMER: 360-degree client view.						4	Blackboard
	UTILIZING ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN YOUR CRM STRATEGY:						4	Blackboard

	Evolution of AI-Current state of AI-Teaming up AI with people-Applying AI to your CRM solution-ethical aspects of AI-An example of AI in CRM processes.	4	Blackboard
V	CLOUD VERSUS ON PREMISE VERSUS HYBRID: Factors influencing vendor selection-Hybrid deployment-what are your options.	4	Blackboard
	CRM DIFFERENTIATORS: It's not about the feature list; it's about the ecosystem-Fourth industrial revolution and CRM-AI and smart cloud-To cloud or not to cloudLeveraging smart cloud into CRM-Big data	4	PPT
	Social selling and advertising-Implementation toolsSustainable CRM platform.	4	PPT

PROGRAMME: M.C.A		
	II	

SEMESTER: I	**Part: ELECTIVE- I**	COURSE CODE : P23DU02P

TITLE OF THE COURSE: **Data Engineering and Management Lab**

HOURS OF INSTRUCTION PER WEEK: 6 P/W	CREDITS: 3	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented	✓	Addresses Gender Sensitization	
Relevant to Regional need		Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need	✓			Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To acquire basic scripting knowledge in MongoDB
- To learn CRUD Operation on the MongoDB database
- To comprehend MongoDB using DbVisualizer
- To be familiar with Zoho CRM features
- To customize your application using Zoho CRM

CONTENT

1. Write a script to create a MongoDB database and perform insert operation
2. Write a MongoDB script to perform query operations
3. Write a MongoDB Script to perform update operations
4. Write a MongoDB Script to update documents with an aggregation pipeline
5. Write a MongoDB script to delete single and multiple documents
6. Write a MongoDB script to perform string aggregation operations
7. Design a Data Model for MongoDB using DbVisualizer
8. Perform CRUD operations using DbVisualizer
9. Create a Zoho CRM account and organize your Tasks, Meetings and Deals
10. Create and maintain a project using Zoho CRM features

COURSE OUTCOMES:	
CO1	Comprehend the scripting knowledge in MongoDB and perform basic operations in a shell prompt
CO2	Implement, Create, Read, Update and Delete Operations on MongoDB database
CO3	Analyze MongoDB using DbVisualizer
CO4	Assess Zoho CRM features for managing customer relationships
CO5	Create a customized application in Zoho CRM

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	**PO1**	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1 0**

CO1	S	S	S	S	S	M	S	S	S	M
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	M	S	S	M	S	M	S	S	S
CO4	S	S	S	M	S	S	S	L	S	S
CO5	S	S	S	S	M	S	S	S	S	S
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	L	S	M	M	L
CO2	L	M	M	M	S
CO3	L	S	M	S	M
CO4	M	S	L	M	S
CO5	M	S	L	M	S
Total Weightage					
Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low

PROGRAMME: M.C.A

SEMESTER: I	**Part: III ELECTIVE - I**	COURSE CODE : P23DU03

TITLE OF THE COURSE: **Architecture and Frameworks**

HOURS OF INSTRUCTION PER WEEK: 6 P/W 60 HrsP/S Each unit : 12 hours	CREDITS: 3	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need	✓	Entrepreneurship Oriented		Addresses Gender Sensitization	
Relevant to Regional need		Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To understand the basics, benefits and purpose of software architecture
- Understand the quality attributes to fulfil the software requirements and relates the software with an organization
- Explore the design patterns, best practice and paradigms of efficient software development
- Understand the performance and security measures of software architecture
- Enable the developers to advance their carrier in software domain

UNIT	CONTENT	HRS
I	Software architecture introduction – Importance of Software architecture –Software architecture consumers – Architect role - software architecture in an organization – Types of software architects – Software development methodologies – Project management – Office politics – Software risk management – Configuration management – Software product lines.	**12**
II	Domain Knowledge – Developing business acumen – Domain-driven design – requirement engineering – requirement elicitation –Software Quality attributes: Maintainability – Usability –Availability – Portability – Interoperability - Testability.	**12**
III	Software Architectures design – Importance - Top-down Versus bottom-up design approaches – Architectural drivers – Documenting the Software architecture design – Systematic approach - Attribute-driven design – Microsoft's technique for architecture and design –Architecture-centric design method – Architecture development method – Tracking the progress of the software architecture's design.	**12**
IV	Designing orthogonal software systems – Minimizing complexity – SOLID design principles – Software architecture patterns – layered – Event-driven architecture – ModelView patterns – Service-oriented architecture.	**12**
V	Architecting Modern Applications.- Importance of Performance – Performance improvement - Server side caching – Web application performance – Database performance -Securing software systems – Threat modelling – Secure by design.	**12**

COURSE OUTCOMES:	
CO1	Understand, analyze and evaluate the purpose of Software architecture and development methodologies with consideration of risk management
CO2	Comprehend, apply and evaluate the domain knowledge for software development process and determine the impact of quality attributes.
CO3	Understand, track and examine the systematic approach for various software design models with effective document process
CO4	Illustrate and summarize the functions of orthogonal systems with complexity, design principles and design pattern for software architecture
CO5	Comprehend, analyze and evaluate the performance and security measures for Server, Web and Database applications in order to create the secure software systems for various domain applications

TEXTBOOK:

Joseph Ingeno, "Software Architect's Handbook" Packt Publishing 2018.

REFERENCES:

1. Oliver Vogel, Indo Arnold, ArifChughtaiandTImoKehrer, "Software Architecture" Springer-Verlag, 2011.
2. Ian Gorton, "Essential Software architecture", Second Edition, Springer, 2011
3. Len Bass, Paul Clements and Rick Kazman, "Software architecture in practice", Third edition, Addison-Wesley, 2013

E-LEARNING RESOURCES:

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0
CO1	M	S	-	L	M	S	M	M	L	S
CO2	M	S	-	M	M	L	S	S	M	M
CO3	S	M	-	S	S	M	S	M	M	S
CO4	S	M	L	S	M	L	S	L	S	M
CO5	M	S	M	L	S	L	M	S	L	S
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	M	L	M
CO2	M	S	M	L	L
CO3	L	L	M	S	M
CO4	L	L	M	L	L

CO5	S	M	M	S	L
Total Weightage					
Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low

TEMPLATE FOR LESSON PLAN

COURSE CODE: P23DU03	TITLE OF THE COURSE: **Architecture and Frameworks**

Pedagogy	Total Hours	Lecture	Practical Experience	Peer Group Learning	Demo/ OER /Tutorial	GD / Seminar	ICT / Blended Learning	Field work / Internship
	75	40					20	
UNIT	**TOPIC**						**LECTURE HOURS**	**MODE OF TEACHING**
I	Software architecture introduction – Importance of Software architecture –Software architecture consumers – Architect role.						4	Blackboard
	Software architecture in an organization – Types of software architects – Software development methodologies – Project management.						4	PPT
	Office politics – Software risk management – Configuration management – Software product lines						4	Blackboard
II	Domain Knowledge – Developing business acumen – Domain-driven design – requirement engineering – requirement elicitation						4	Blackboard
	Software Quality Attributes: Maintainability						4	Blackboard
	Usability –Availability – Portability – Interoperability - Testability.						4	PPT
III	Software Architectures design – Importance - Top-down Versus bottom-up design approaches – Architectural drivers – Documenting the Software architecture design						4	Blackboard
	Systematic approach - Attribute-driven design – Microsoft's technique for architecture and design – Architecture-centric design method						4	Blackboard
	Architecture development method – Tracking the progress of the software architecture's design.						4	PPT
IV	Designing orthogonal software systems – Minimizing complexity – SOLID design principles						4	Blackboard
	Software architecture patterns – layered – Event-driven architecture						4	Blackboard
	Model-View patterns – Service-oriented architecture.						4	Blackboard
V	Architecting Modern Applications.- Importance of Performance – Performance improvement - Server side caching						4	Blackboard
	Web application performance – Database performance						4	PPT
	Securing software systems – Threat modelling – Secure by design.						4	PPT

PROGRAMME: M.C.A					
SEMESTER: I	**Part: III ELECTIVE - I**	COURSE CODE : P23DU04P			
TITLE OF THE COURSE: **Architecture and Frameworks - Lab**					
HOURS OF INSTRUCTION PER WEEK: 6 P/W		CREDITS: 3	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need	✓	Entrepreneurship Oriented	✓	Addresses Gender Sensitization	
Relevant to Regional need		Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To understand and implement the basic concepts of Software architecture and its functions.
- To acquire programming skills to develop Implement various technologies and services associated with network protocols along with the challenges of data transfer.
- Implement the importance and functioning of Routing Protocols over communication service.
- To acquire skills to connect two routers and any two switches.
- To comprehend related to SSH protocols and accessing the remote device.

CONTENT

1. Find the WebID profile document and display the necessary attributes
2. Set and access the primary authentications with account recovery mechanisms
3. Set and access the secondary authentications with account recovery mechanisms
4. Design authorization and web access control
5. Find the content representation
6. Reading resources from HTTP REST API and WebSockets API
7. Writing resources from HTTP REST API and WebSockets API
8. Data notification using Social Web App protocol
9. Managing subscriptions and friends list using Social Web App protocol

   Managing list of followers and following list using Social Web App protocol

COURSE OUTCOMES:	
CO1	Comprehend the programming skills of Software architecture tools and packages
CO2	Understand and implement the user profiles and authentication with recovery mechanism.
CO3	Comprehend and evaluate the access control and content representation use of FTP server
CO4	Understand and implement reading and writing resources for various applications
CO5	Identify and examine the notifications, friends, and follower list of social application protocols.

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0
CO1	S	S	M	L	M	S	-	-	-	-
CO2	S	M	S	S	S	M	-	-	-	-
CO3	S	M	S	M	S	M	-	-	-	-
CO4	S	M	L	S	M	L	-	-	-	-
CO5	M	S	M	L	S	L	-	-	-	-
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	S	M	M	L
CO2	L	M	M	M	S
CO3	L	S	M	S	M
CO4	M	S	L	M	S
CO5	M	S	L	M	S
Total Weightage					
Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low

PROGRAMME: M.C.A		
	Part: ELECTIVE -II	COURSE CODE : P23DU05

SEMESTER: I		

TITLE OF THE COURSE: **Software Development Technologies**

HOURS OF INSTRUCTION PER WEEK: 6 P/W 60 HrsP/S Each unit : 12 hours	CREDITS: 3	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented	✓	Addresses Gender Sensitization	
Relevant to Regional need	✓	Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To learn and Implementing Micro services
- To analysing the Azure Kubernetes Service
- To learn and anlyse .NET DevOps for Azure and its applications
- To building code for .NET core applications
- To get familiarized with Azure pipelines

UNIT	CONTENT	HRS
I	**Implementing Microservices:** Client to microservices communication, Interservice communication, data considerations, security, monitoring, microservices hosting platform options. Azure Service Fabric: Introduction, core concepts, supported programming models, service fabric clusters, develop and deploy applications of service fabric. Monitoring Azure Service Fabric Clusters: Azure application, resource manager template, Adding Application Monitoring to a Stateless Service Using Application Insights, Cluster monitoring, Infrastructure monitoring.	**12**
II	**Azure Kubernetes Service (AKS):** Introduction to kubernetes and AKS, AKS development tools, Deploy applications on AKS. Monitoring AKS: Monitoring, Azure monitor and analytics, monitoring AKS clusters, native kubernetes dashboard, Prometheus and Grafana. Securing Microservices: Authentication in microservices, Implenting security using API gateway pattern, Creating application using Ocrlot and securing APIs with Azure AD. Database Design for Microservices: Data stores, monolithic approach, Microservices approach, harnessing cloud computing, database options on MS Azure, overcoming application development challenges. Building Microservices on Azure Stack: Azure stack, Offering IaaS, PaaS on-premises simplified, SaaS on Azure stack.	**12**
III	**NET DevOps for Azure:** DevOps introduction, Problem and solution. Professional Grade DevOps Environment: The state of DevOps, professional grade DevOps vision, DevOps architecture, tools for professional DevOps environment, DevOps centered application. Tracking work: Process template, Types of work items, Customizing the process, Working	**12**

	with the process. Tracking code: Number of repositories, Git repository, structure, branching pattern, Azure repos configuration, Git and Azure.	
IV	**Building the code:** Structure of build, using builds with .NET core and Azure pipelines, Validating the code: Strategy for defect detection, Implementing defect detection. Release candidate creation: Designing release candidate architecture, Azure artifacts workflow for release candidates, Deploying the release: Designing deployment pipeline, Implementing deployment in Azure pipelines. Operating and monitoring release: Principles, Architectures for observability, Jumpstarting observability.	**12**
V	**Introduction to APIs:** Introduction, API economy, APIs in public sector. API Strategy and Architecture: API Strategy, API value chain, API architecture, API management. API Development: Considerations, Standards, kick-start API development, team orientation. API Gateways: API Gateways in public cloud, Azure API management, AWS API gateway. API Security: Request-based security, Authentication and authorization.	**12**

COURSE OUTCOMES:	
CO1	To understand, apply and summarize the basic concepts of Micro services communication Microsoft Azure and Dev Ops for software development life cycle
CO2	To illustrate, and implement Azure Kubernetes Service tools for software development life cycle
CO3	To recognize, analyse and summarize the functionalities of .NET Dev Ops for Azure applications
CO4	To understand, design and evaluate the principles and architecture service tools for software development life cycle.
CO5	To comprehend, implement and review the functionalities of API and API gateways for cloud and Azure applications

TEXTBOOK:

1. Harsh Chawla and Hemant Kathuria, Building Microservices Applications on Microsoft AzureDesigning, Developing, Deploying, and Monitoring, Apress, 2019.
2. Jeffrey Palermo , NET DevOps for Azure A Developer's Guide to DevOps Architecture the Right Way, Apress, 2019.
3. Thurupathan and Vijayakumar, Practical API Architecture and Development with Azure and AWS - Design and Implementation of APIs for the Cloud, Apress, 2018.

REFERENCES:

1. Karl Matthias and Sean P. Kane, Docker: Up and Running, O'Reilly Publication, Second Edition 2018.
2. Len Bass,IngoWeber,LimingZhu,"DevOps, A Software Architects Perspective", AddisonWesleyPearson Publication, First Ediiton 2015.
3. John Ferguson Smart,"Jenkins, The Definitive Guide", O'Reilly Publication, First Ediiton 2011

E-LEARNING RESOURCES:

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	PO1	PO	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1

		2								**0**
CO1	S	S	M	-	M	-	-	-	S	-
CO2	S	S	M	-	M	-	-	-	S	-
CO3	S	S	S	-	S	-	-	-	S	S
CO4	S	S	M	-	M	-	-	-	S	-
CO5	S	S	M	-	M	-	-	-	S	-
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	S	S	M	L	L
CO2	S	S	M	L	L
CO3	M	S	M	M	M
CO4	S	S	M	S	M
CO5	S	S	M	S	M
Total Weightage					
Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low

TEMPLATE FOR LESSON PLAN

COURSE CODE: P23DU05	TITLE OF THE COURSE: **Software Development Technologies**							
Pedagogy	Total Hours	Lecture	Practical Experience	Peer Group Learning	Demo/ OER /Tutorial	GD / Seminar	ICT / Blended Learning	Field work / Internship
	60	40					20	
UNIT	**TOPIC**						**LECTURE HOURS**	**MODE OF TEACHING**
I	**Implementing Microservices:** Client to microservices communication, Interservice communication, data considerations, security, monitoring, microservices hosting platform options.						4	Blackboard
	Azure Service Fabric: Introduction, core concepts, supported programming models, service fabric clusters, develop and deploy						4	PPT
	applications of service fabric.							
	Monitoring Azure Service Fabric Clusters: Azure application, resource manager template, Adding Application Monitoring to a Stateless Service Using Application Insights, Cluster monitoring, Infrastructure monitoring.						4	Blackboard
II	**Azure Kubernetes Service (AKS):** Introduction to kubernetes and AKS, AKS development tools, Deploy applications on AKS. Monitoring AKS: Monitoring, Azure monitor and analytics, monitoring						4	Blackboard
	AKS clusters, native kubernetes dashboard, Prometheus and Grafana. Securing Microservices: Authentication in microservices, Implenting security using API gateway pattern, Creating application using Ocrlot and securing APIs with Azure AD.						4	Blackboard
	Database Design for Microservices: Data stores, monolithic approach, Microservices approach, harnessing cloud computing, database options on MS Azure, overcoming application development challenges. Building Microservices on Azure Stack: Azure stack, Offering IaaS, PaaS on-premises simplified, SaaS on Azure stack.						4	PPT
III	**.NET DevOps for Azure:** DevOps introduction, Problem and solution. Professional Grade DevOps Environment: The state of DevOps, professional grade DevOps vision, DevOps architecture, tools for professional						4	Blackboard
	DevOps environment, DevOps centered application. Tracking work: Process template, Types of work items, Customizing the process, Working with the process.						4	Blackboard
	Tracking code: Number of repositories, Git repository, structure, branching pattern, Azure repos configuration, Git and Azure.						4	PPT

IV	**Building the code:** Structure of build, using builds with .NET core and Azure pipelines, Validating the code: Strategy for defect detection, Implementing defect detection.	4	Blackboard
	Release candidate creation: Designing release candidate architecture, Azure artifacts workflow for release candidates, Deploying the release: Designing deployment pipeline	4	Blackboard
	Implementing deployment in Azure pipelines. Operating and monitoring release: Principles, Architectures for observability, Jumpstarting observability.	4	Blackboard
V	**Introduction to APIs:** Introduction, API economy, APIs in public sector. API Strategy and Architecture: API Strategy, API value chain	4	Blackboard
	API architecture, API management. API Development: Considerations, Standards, kick-start API development, team orientation.	4	PPT
	API Gateways: API Gateways in public cloud, Azure API management, AWS API gateway. API Security: Request-based security, Authentication and authorization.	4	PPT

PROGRAMME: M.C.A		
SEMESTER: I	**Part: III ELECTIVE - II**	COURSE CODE : P23DU06P
TITLE OF THE COURSE: **Software Development Technologies Lab**		

HOURS OF INSTRUCTION PER WEEK: 6 P/w	CREDITS: 3	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented	✓	Addresses Gender Sensitization	
Relevant to Regional need	✓	Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To understand the concept of DevOps with associated technologies and methodologies. ● To be familiarized with Jenkins, which is used to build & test software Applications ● To understand Continuous integration in Devops environment.
- To understand Docker to build, ship and run containerized images
- To use Docker to deploy and manage Software applications running on Container.

CONTENT

1. Deploy Version Control System / Source Code Management, install git and create a GitHub account.
2. Perform various GIT operations on local and Remote repositories using GIT Cheat-Sheet
3. Continuous Integration: install and configure Jenkins with Maven/Ant/Gradle to setup a build Job.
4. Build the pipeline of jobs using Maven / Gradle / Ant in Jenkins, create a pipeline script to Test and deploy an application over the tomcat server.
5. Implement Jenkins Master-Slave Architecture and scale your Jenkins standalone implementation by implementing slave nodes.
6. Setup and Run Selenium Tests in Jenkins Using Maven.
7. Implement Docker Architecture and Container Life Cycle, install Docker and execute docker commands to manage images and interact with containers.
8. Implement Dockerfile instructions, build an image for a sample web application using Dockerfile.
9. Install and Configure Pull based Software Configuration Management and provisioning tools using Puppet.
10. Implement LAMP/MEAN Stack using Puppet Manifest.

COURSE OUTCOMES:	
CO1	To Understand and analyse the importance of Jenkins to Build, Deploy and Test Software Applications
CO2	To synthesis and summarize the importance of Software Configuration Management in DevOps
CO3	To identify, analyze and illustrate the Containerization of OS images and deployment of applications over Docker
CO4	To design, analyze and develop the Pull based Software Configuration Management
CO5	To design, analyze and develop Puppet Manifest

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0
CO1	S	S	M	-	M	-	-	-	S	S
CO2	S	S	M	-	M	-	-	-	S	S
CO3	S	S	M	-	M	-	-	-	S	S
CO4	S	S	M	-	M	-	-	-	S	S
CO5	S	S	M	-	M	-	-	-	S	S
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	S	M	M	L
CO2	L	M	M	M	S
CO3	L	S	M	S	M
CO4	M	S	L	M	S
CO5	M	S	L	M	S
Total Weightage					
Weighted % of Course Contribution to PSOs					

S- **Strong; M-Medium; L-Low**

PROGRAMME: M.C.A

SEMESTER: I	**Part: III ELECTIVE - II**	COURSE CODE : P23DU07

TITLE OF THE COURSE: **Soft Computing**

HOURS OF INSTRUCTION PER WEEK: 6 P/W 60 HrsP/S Each unit : 12 hours	CREDITS: 3	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented		Addresses Gender Sensitization	
Relevant to Regional need	✓	Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.
- To understand supervised and unsupervised learning algorithms
- To enable the students to gain a basic understanding of neural networks.
- To know about fuzzy logic, fuzzy inference systems, and their functions. ● To impart basic knowledge on Genetic algorithms and their applications.

UNIT	CONTENT	HRS
I	**INTRODUCTION TO SOFT COMPUTING:** Artificial Neural Networks- Biological Neurons- Basic Models of Artificial Neural Networks-Connections-Learning-Activation Functions- Important Terminologies of ANNs- Muculloch and Pitts Neuron-Linear Separability- Hebb Network-Flowchart of Training Process-Training Algorithm.	12
II	**SUPERVISED LEARNING NETWORK** : Perceptron Networks–Perceptron Learning Rule-Architecture-Flowchart for Training Process-Perceptron Training Algorithms for Single Output Classes-Perceptron Training Algorithm for Multiple Output ClassesPerceptron Network Testing Algorithm - Adaptive Linear Neuron-Delta Rule for Single Output Unit-Flowchart for training algorithm-Training Algorithm – Testing Algorithm - Multiple Adaptive Linear Neurons-Architecture-Flowchart of Training Process-Training Algorithm-Back Propagation Network-Architecture-Flowchart for Training ProcessTraining Algorithm-Learning Factors of Back-Propagation Network-Radial Basis Function Network- Architecture-Flowchart for Training Process-Training Algorithm.	12
III	**UNSUPERVISED LEARNING NETWORK:** Associative Memory Networks - Auto Associative Memory Network-Architecture-Flowchart for Training Process-Training Algorithm-Testing Algorithm- Bidirectional Associative Memory- Architecture-Discrete Bidirectional Associative Memory-Iterative Auto Associative Memory Networks - Linear AutoAssociative Memory-Kohonen Self-Organizing Feature Map- Architecture-Flowchart for Training Process-Training Algorithm.	12

IV	**INTRODUCTION TO FUZZY LOGIC:** Classical Sets –Operations on Classical SetsFuzzy sets - Fuzzy Sets- Properties of Fuzzy Sets- Fuzzy Relations –Membership Functions: Fuzzification- Methods of Membership Value Assignments – Defuzzification – LambdaCuts for Fuzzy sets and Fuzzy Relations – Defuzzification Methods–Max-Membership Principle-Centroid Method-Weighted Average Method-Mean Max Membership-Center of Sums-Center of Largest Area-First of Maxima - Fuzzy Set Theory - Fuzzy Arithmetic And Fuzzy Measures: Fuzzy Measures – Belief and Plausibility Measures-Probability MeasuresPossibility and Necessity Measures- Formation of Rules –Fuzzy Inference Systems (FIS) – Fuzzy Decision Making – Fuzzy Logic Control Systems.	**12**
V	**GENETIC ALGORITHM**: Introduction - Biological Background - Traditional Optimization and Search Techniques -Gradient Based Local Optimization Method-Random Search-Stochastic Hill Climbing-Simulated Annealing-Symbolic Artificial IntelligenceOperators in Genetic Algorithm -Encoding-Selection-Crossover-Mutation - Stopping Conditions for Genetic Algorithm Flow-Genetic Programming-Working of Genetic Programming-Characteristics of Genetic Programming-Data Representation.	**12**

COURSE OUTCOMES:	
CO1	To provide an introduction to the basic principles, techniques, and applications of soft computing
CO2	To get familiar with Neural network architectures and supervised learning algorithms
CO3	To understand the architectures and algorithms of Unsupervised Learning techniques
CO4	Develop the skills to gain a basic understanding of fuzzy logic theory and fuzzy inference systems
CO5	Ability to learn traditional optimization and search techniques and genetic programming

TEXTBOOK: 1. Principles of Soft Computing, S.N. Sivanandam, S.N.Deepa, Wiley, Third Edition, 2019.

UNIT I: Chapter 1: 2.1,2.3,2.4,2.5,2.6,2.7
UNIT II: Chapter 2: 3.2,3.3,3.4,3.5,3.6
UNIT III: Chapter 3: 4.3,4.4,4.7,5.3
UNIT IV: Chapter 4: 7.2,7.3,8.4,9.3,9.4,10,10.2,10.3,10.4,11.4,12.8,14
UNIT V: Chapter 5: 15,15.2,15.3,15.4,15.9,15.10

REFERENCES:

1. Das, A. (2018). Artificial Intelligence and Soft Computing for Beginners.
2. Amit, K. (2018). Artificial intelligence and soft computing: behavioral and cognitive modeling of the human brain. CRC press.
3. Rajasekaran, S., &Pai, G. V. (2011). Neural networks, fuzzy logic and genetic algorithm: synthesis and applications (with cd). PHI Learning Pvt. Ltd.
4. Jang, J. S. R., Sun, C. T., &Mizutani, E. (2004). Neuro-fuzzy and soft computing-a computational approach to learning and machine intelligence [Book Review]. IEEE Transactions on automatic control, 42(10), 1482-1484.
5. Gupta, M. M. (2004). Soft computing and intelligent systems: theory and applications. Elsevier.
6. Jang, J. S. R., Sun, C. T., &Mizutani, E. (1997). Neuro-fuzzy and soft computing-a computational approach to learning and machine intelligence [Book Review]. IEEE Transactions on automatic control, 42(10), 1482-1484.

E-LEARNING RESOURCES:										
MAPPING WITH PROGRAMME OUTCOMES										
CO / PO	**PO1**	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1 0**
CO1	S	M	S	M	S	S	S	M	S	M
CO2	M	S	M	S	M	M	M	S	M	S
CO3	M	M	S	S	S	M	M	S	S	S
CO4	S	S	M	M	M	S	S	S	S	M
CO5	S	S	S	S	S	M	S	M	M	S
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES					
CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	L	M	S	L	L
CO2	M	S	M	L	L
CO3	L	M	M	M	L
CO4	S	S	M	S	S
CO5	S	S	M	L	L
Total Weightage					
Weighted % of Course Contribution to PSOs					

T- Strong; M-Medium; L-Low

TEMPLATE FOR LESSON PLAN

COURSE CODE: P23DU07	TITLE OF THE COURSE: **Soft Computing**							
Pedagogy	Total Hours	Lecture	Practical Experience	Peer Group Learning	Demo/ OER /Tutorial	GD / Seminar	ICT / Blended Learning	Field work / Internship
	60	40					20	
UNIT	**TOPIC**						**LECTURE HOURS**	**MODE OF TEACHING**
I	**INTRODUCTION TO SOFT COMPUTING:** Artificial Neural Networks- Biological Neurons- Basic Models of Artificial Neural Networks						4	Blackboard
	Connections-Learning-Activation Functions - Important Terminologies of ANNs- Muculloch and Pitts Neuron-						4	PPT
	Linear Separability- Hebb Network-Flowchart of Training Process-Training Algorithm.						4	Blackboard
II	**SUPERVISED LEARNING NETWORK** : Perceptron Networks–Perceptron Learning Rule-Architecture-Flowchart for Training Process-Perceptron Training Algorithms for Single Output Classes-Perceptron Training Algorithm for Multiple Output Classes						4	Blackboard
	Perceptron Network Testing Algorithm - Adaptive Linear Neuron-Delta Rule for Single Output Unit-Flowchart for training algorithm-Training Algorithm – Testing Algorithm - Multiple Adaptive Linear Neurons-Architecture-Flowchart of Training Process-Training Algorithm.						4	Blackboard
	Back Propagation Network-Architecture-Flowchart for Training Process-Training Algorithm-Learning Factors of Back-Propagation Network-Radial Basis Function Network-Architecture-Flowchart for Training Process-Training Algorithm.						4	PPT
III	**UNSUPERVISED LEARNING NETWORK:** Associative Memory Networks - Auto Associative Memory NetworkArchitecture-Flowchart for Training Process-Training Algorithm-Testing Algorith						4	Blackboard
	Bidirectional Associative Memory- Architecture-Discrete Bidirectional Associative Memory-Iterative Auto Associative Memory Networks						4	Blackboard
	Linear AutoAssociative Memory-Kohonen Self-Organizing Feature Map- Architecture-Flowchart for Training ProcessTraining Algorithm.						4	PPT

IV	**INTRODUCTION TO FUZZY LOGIC:** Classical Sets – Operations on Classical Sets-Fuzzy sets - Fuzzy Sets-Properties of Fuzzy Sets- Fuzzy Relations –Membership Functions: Fuzzification- Methods of Membership Value Assignments	4	Blackboard
	Defuzzification – Lambda-Cuts for Fuzzy sets and Fuzzy Relations – Defuzzification Methods–Max-Membership Principle-Centroid Method-Weighted Average Method-Mean Max Membership-Center of Sums-Center of Largest AreaFirst of Maxima	4	Blackboard
	Fuzzy Set Theory - Fuzzy Arithmetic And Fuzzy Measures: Fuzzy Measures – Belief and Plausibility MeasuresProbability Measures-Possibility and Necessity Measures- Formation of Rules –Fuzzy Inference Systems (FIS) – Fuzzy Decision Making – Fuzzy Logic Control Systems.	4	Blackboard
V	**GENETIC ALGORITHM**: Introduction - Biological Background - Traditional Optimization and Search Techniques -Gradient Based Local Optimization Method-	4	Blackboard
	Random Search-Stochastic Hill Climbing-Simulated	4	PPT
	Annealing-Symbolic Artificial Intelligence-Operators in Genetic Algorithm -Encoding-Selection-Crossover-Mutation		
	Stopping Conditions for Genetic Algorithm Flow-Genetic Programming-Working of Genetic Programming-Characteristics of Genetic Programming-Data Representation.	4	PPT

PROGRAMME: M.C.A		
SEMESTER: I	**Part: III ELECTIVE - II**	COURSE CODE : P23DU08P
TITLE OF THE COURSE: **Soft Computing Lab**		

HOURS OF INSTRUCTION PER WEEK: 6 P/W	CREDITS: 3	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented	✓	Addresses Gender Sensitization	
Relevant to Regional need	✓	Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To implement various Supervised Neural Network-based approaches
- To apply the fuzzy-based logical operations and arithmetic operations
- To implement unsupervised neural network approaches ● To solve a problem using a simple genetic algorithm ● To implement logic gates.

CONTENT

1. **Implementation of Logic gates using Artificial Neural Network.**
2. Implementation of Perception Algorithm.
3. Implementation of Back Propagation Algorithm.
4. Implementation of Self Organizing Maps.
5. Implementation of Radial Basis Function Network.
6. Implementation of De-Morgan's Law.
7. Implementation of McCulloch Pits Artificial Neuron model
8. Implementation of Simple genetic algorithm
9. Implementation of fuzzy based Logical operations

   Implementation of fuzzy based arithmetic operations

COURSE OUTCOMES:	
CO1	To apply supervised learning algorithms for real datasets
CO2	To implement Unsupervised Learning techniques
CO3	To apply fuzzy based arithmetic and logical operations
CO4	To find solutions for problems using Genetic algorithm
CO5	To implement DeMorgan's Law

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	**PO1**	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1 0**

CO1	M	M	S	M	S	S	S	M	S	M
CO2	M	S	M	M	M	M	M	S	M	S
CO3	M	M	S	S	S	M	M	S	S	S
CO4	S	S	S	M	M	S	S	M	S	S
CO5	S	S	S	S	S	M	M	M	M	S
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	L	S	M	M	L
CO2	L	M	M	M	S
CO3	L	S	M	S	M
CO4	M	S	L	M	S
CO5	M	S	L	M	S
Total Weightage					
Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low

SEMESTER -II

PROGRAMME: M.C.A					
SEMESTER: II	**Part: III Core IV**	COURSE CODE :P23CU4			
TITLE OF THE COURSE: **Data Structures and Algorithms**					
HOURS OF INSTRUCTION PER WEEK: 6 P/W 60 HrsP/S Each unit : 12 hours		CREDITS: 5	CIA : 25	EXTERNAL MARKS:75	TOTAL: 100

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented		Addresses Gender Sensitization	
Relevant to Regional need	✓	Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To get a clear understanding of various ADT structures.
- To understand how to implement different ADT structures with real-time scenarios.
- To analyze the various data structures with their different implementations.
- To get an idea of applying right models based on the problem domain.
- To realize, and understand how and where to implement modern data structures with Python language.

UNIT	CONTENT	HRS
I	**Abstract Data Types:** Introduction-Date Abstract Data Type-Bags-Iterators. **Arrays**: Array Structure-Python List-Two Dimensional Arrays-Matrix Abstract Data Type. **Sets, Maps:** Sets-Maps- Multi-Dimensional Arrays.	**12**
II	**Algorithm Analysis:** Experimental Studies-Seven Functions-Asymptotic Analysis. **Recursion:** Illustrative Examples-Analyzing Recursive Algorithms-Linear Recursion-Binary Recursion-Multiple Recursion.	**12**
III	**Stacks, Queues, and Deques:** Stacks- Queues- Double-Ended Queues Linked. **Lists:** Singly Linked Lists-Circularly Linked Lists-Doubly Linked Lists. **Trees:** General TreesBinary Trees-Implementing Trees-Tree Traversal Algorithms.	**12**
IV	**Priority Queues:** Priority Queue Abstract Data Type- Implementing a Priority Queue-Heaps-Sorting with a Priority Queue. **Maps, Hash Tables, and Skip Lists:** Maps and Dictionaries-Hash Tables- Sorted Maps-Skip Lists-Sets, Multisets, and Multimaps.	**12**

V	**Search Trees:** Binary Search Trees-Balanced Search Trees-AVL Trees-Splay Trees. **Sorting and Selection:** Merge sort-Quick sort-Sorting through an Algorithmic Lens-Comparing Sorting Algorithms-Selection. **Graph Algorithms:** Graphs-Data Structures for Graphs-Graph Traversals-Shortest Paths-Minimum Spanning Trees.	**12**

COURSE OUTCOMES:

CO1	Understand various ADT concepts
CO2	Familiar with implementation of ADT models with Python language and understand how to develop ADT for the various real-time problems
CO3	Apply with proper ADT models with problem understanding
CO4	Apply and Analyze right models based on the problem domain
CO5	Evaluate modern data structures with Python language

TEXTBOOK:

1. Rance D. Necaise, "Data Structures and Algorithms Using Python", John Wiley & Sons, 2011. (Unit – 1)**Chapters:** 1, 2, 3.
2. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, "Data Structures and Algorithms in Python", John Wiley & Sons, 2013. (Unit – 2, 3, 4, and 5)**Chapters:** 3 to 12, and 14.

REFERENCES:

1. Dr. Basant Agarwal; Benjamin Baka, "Hands-On Data Structures and Algorithms with Python: Write complex and powerful code using the latest features of Python 3.7", Packt Publishing, 2018.
2. Magnus Lie Hetland, "Python Algorithms: Mastering Basic Algorithms in the Python Language", Apress, 2014.

E-LEARNING RESOURCES:

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	L	L	L	L	S	S	S	L
CO2	S	M	S	M	M	L	L	L	L	L
CO3	S	S	S	L	L	L	M	M	M	M
CO4	S	S	S	L	L	L	M	M	M	L
CO5	S	S	S	L	M	M	S	S	S	S
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	S	S	M	M

CO2	S	S	S	M	M
CO3	L	M	M	S	S
CO4	S	S	M	L	L
CO5	M	S	S	M	L
Total Weightage					
Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low

TEMPLATE FOR LESSON PLAN

COURSE CODE: P23CU4	TITLE OF THE COURSE: **Data Structures and Algorithms**							
Pedagogy	Total Hours	Lecture	Practical Experience	Peer Group Learning	Demo/ OER /Tutorial	GD / Seminar	ICT / Blended Learning	Field work / Internship
	60	40					20	
UNIT	**TOPIC**						**LECTURE HOURS**	**MODE OF TEACHING**
I	**Abstract Data Types:** Introduction-Date Abstract Data Type-Bags-Iterators.						4	Blackboard
	Arrays: Array Structure-Python List-Two Dimensional Arrays-Matrix Abstract Data Type.						4	PPT
	Sets, Maps: Sets-Maps- Multi-Dimensional Arrays.						4	Blackboard
II	**Algorithm Analysis:** Experimental Studies-Seven FunctionsAsymptotic Analysis.						4	Blackboard
	Recursion: Illustrative Examples-Analyzing Recursive Algorithms-Linear Recursion						4	Blackboard
	Binary Recursion-Multiple Recursion.						4	PPT
III	**Stacks, Queues, and Deques:** Stacks- Queues- DoubleEnded Queues Linked.						4	Blackboard
	Lists: Singly Linked Lists-Circularly Linked Lists-Doubly Linked Lists.						4	Blackboard
	Trees: General Trees-Binary Trees-Implementing Trees-Tree Traversal Algorithms.						4	PPT
IV	**Priority Queues:** Priority Queue Abstract Data Type-Implementing a Priority Queue- Heaps-Sorting with a Priority Queue.						4	Blackboard
	Maps, Hash Tables, and Skip Lists: Maps and Dictionaries-Hash Tables						4	Blackboard
	Sorted Maps-Skip Lists-Sets, Multisets, and Multimaps.						4	Blackboard
V	**Search Trees:** Binary Search Trees-Balanced Search TreesAVL Trees-Splay Trees.						4	Blackboard
	Sorting and Selection: Merge sort-Quick sort-Sorting through an Algorithmic Lens- Comparing Sorting Algorithms-Selection.						4	PPT
	Graph Algorithms: Graphs-Data Structures for Graphs-Graph Traversals-Shortest Paths-Minimum Spanning Trees.						4	PPT

PROGRAMME: M.C.A		
	Part: III Core V	COURSE CODE : P23CU5

SEMESTER: II		

TITLE OF THE COURSE: **Big Data Analytics**

HOURS OF INSTRUCTION PER WEEK: 6 P/W 60 HrsP/S Each unit : 12 hours	CREDITS: 5	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented	✓	Addresses Gender Sensitization	
Relevant to Regional need	✓	Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To introduce big data tools & Information Standard formats.
- To understand the basic concepts of big data.
- To learn Hadoop, HDFS and MapReduceconcepts.
- To teach the importance of NoSQL.
- To explore the big data tools such as Hive, HBase and Pig.

UNIT	CONTENT	HRS
I	**Big Data and Analytics:** Classification of Digital Data: Structured Data- Semi Structured Data and Unstructured Data. Introduction to Big Data: Characteristics – Evolution – Definition - Challenges with Big Data - Other Characteristics of Data - Big Data - Traditional Business Intelligence versus Big Data - Data Warehouse and Hadoop. Environment Big Data Analytics: Classification of Analytics – Challenges - Big Data Analytics important - Data Science - Data Scientist - Terminologies used in Big Data Environments – Basically Available Soft State Eventual Consistency - Top Analytics Tools.	12
II	**Technology Landscape:**NoSQL, Comparison of SQL and NoSQL, Hadoop -RDBMS Versus Hadoop - Distributed Computing Challenges – Hadoop Overview - Hadoop Distributed File System - Processing Data with Hadoop - Managing Resources and Applications with Hadoop YARN - Interacting with Hadoop Ecosystem.	12
III	**Mongodb and Mapreduce Programming:** MongoDB: Mongo DB - Terms used in RDBMS and Mongo DB - Data Types - MongoDB Query Language. MapReduce: Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression.	12
IV	**Hive:** Introduction – Architecture - Data Types - File Formats - Hive Query Language Statements – Partitions – Bucketing – Views - Sub- Query – Joins – Aggregations - Group by and Having – RCFile - Implementation - Hive User Defined Function - Serialization and Deserialization.	12

V	**Pig:** Introduction - Anatomy – Features – Philosophy - Use Case for Pig - Pig Latin Overview - Pig Primitive Data Types - Running Pig - Execution Modes of Pig - HDFS Commands - Relational Operators - Eval Function - Complex Data Types - Piggy Bank - User-Defined Functions - Parameter Substitution – Diagnostic Operator - Word Count Example using Pig - Pig at Yahoo! - Pig Versus Hive.	**12**

COURSE OUTCOMES:	
CO1	To understand, illustrate and evaluate the concepts and techniques of Data Science, Big Data Analytics and its tools
CO2	To collaborate,apply and review the computing for big data in Hadoop, and NoSQL environment.
CO3	To comprehend, implement and review the concepts of data science and big data analytics projects using MapReduce, and MongoDB
CO4	To understand, use and analyze the concepts of big data analytics projects using HIVE database.
CO5	To illustrate, develop and review the concepts of PIG database in Hadoop environment.

TEXTBOOK:

1. Seema Acharya, SubhashiniChellappan, “Big Data and Analytics”, Wiley Publications, First Edition,2015

REFERENCES:

1. Judith Huruwitz, Alan Nugent, Fern Halper, Marcia Kaufman, “Big data for dummies”, John Wiley & Sons, Inc. (2013)
2. Tom White, “Hadoop The Definitive Guide”, O’Reilly Publications, Fourth Edition, 2015
3. Dirk Deroos, Paul C.Zikopoulos, Roman B.Melnky, Bruce Brown, Rafael Coss, “Hadoop For Dummies”, Wiley Publications, 2014
4. Robert D.Schneider, “Hadoop For Dummies”, John Wiley & Sons, Inc. (2012)
5. Paul Zikopoulos, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, McGraw Hill, 2012 Chuck Lam, “Hadoop In Action”, Dreamtech Publications, 2010

E-LEARNING RESOURCES:

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	**PO1**	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1 0**
CO1	S	-	-	-	-	L	-	-	-	-
CO2	S	-	M	-	M	L	-	-	-	-
CO3	S	-	S	-	S	L	-	-	-	S
CO4	S	-	S	-	S	L	-	-	-	S
CO5	S	-	S	-	S	L	-	-	-	S
Weightage										

Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES					
CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	L	S	M	M	L
CO2	L	M	M	M	S
CO3	L	S	M	S	M
CO4	M	S	L	M	S
CO5	M	S	L	M	S
Total Weightage					
Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low

TEMPLATE FOR LESSON PLAN

COURSE CODE: P23CU5	TITLE OF THE COURSE: **Big Data Analytics**

Pedagogy	Total Hours	Lecture	Practical Experience	Peer Group Learning	Demo/ OER /Tutorial	GD / Seminar	ICT / Blended Learning	Field work / Internship
	60	40					20	

UNIT	TOPIC	LECTURE HOURS	MODE OF TEACHING
I	**Big Data and Analytics:** Classification of Digital Data: Structured Data- Semi Structured Data and Unstructured Data.	4	Blackboard
	Introduction to Big Data: Characteristics – Evolution – Definition - Challenges with Big Data - Other Characteristics of Data - Big Data - Traditional Business Intelligence versus Big Data - Data Warehouse and Hadoop	4	PPT
	Environment Big Data Analytics: Classification of Analytics – Challenges - Big Data Analytics important - Data Science - Data Scientist - Terminologies used in Big Data Environments – Basically Available Soft State Eventual Consistency - Top Analytics Tools.	4	Blackboard
II	**Technology Landscape:**NoSQL, Comparison of SQL and NoSQL, Hadoop -RDBMS Versus Hadoop - Distributed Computing Challenges	4	Blackboard
	Hadoop Overview - Hadoop Distributed File System - Processing Data with Hadoop	4	Blackboard
	Managing Resources and Applications with Hadoop YARN - Interacting with Hadoop Ecosystem.	4	PPT
III	**Mongodb and MapreduceProgramming :**MongoDB: Mongo DB - Terms used in RDBMS and Mongo DB.	4	Blackboard
	Data Types - MongoDB Query Language. MapReduce: Mapper – Reducer – Combiner	4	Blackboard
	Partitioner – Searching – Sorting – Compression.	4	PPT
IV	**Hive:** Introduction – Architecture - Data Types - File Formats - Hive Query Language Statements – Partitions	4	Blackboard
	Bucketing – Views - Sub- Query – Joins – Aggregations - Group by and Having – RCFile - Implementation	4	Blackboard
	Hive User Defined Function - Serialization and Deserialization.	4	Blackboard
V	**Pig:** Introduction - Anatomy – Features – Philosophy - Use Case for Pig - Pig Latin Overview - Pig Primitive Data Types - Running Pig - Execution Modes of Pig	4	Blackboard

	HDFS Commands - Relational Operators - Eval Function - Complex Data Types - Piggy Bank - User-Defined Functions - Parameter Substitution	4	PPT
	Diagnostic Operator - Word Count Example using Pig - Pig at Yahoo! - Pig Versus Hive.	4	PPT

PROGRAMME: M.C.A		
SEMESTER: I	**Part: III Core VI**	COURSE CODE : P23CU6P

TITLE OF THE COURSE: **Data Structures and Algorithms Lab**				
HOURS OF INSTRUCTION PER WEEK: 6 P/W	CREDITS: 4	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented	✓	Addresses Gender Sensitization	
Relevant to Regional need	✓	Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To understand Stack , Queue and Doubly Linked ADT structures.
- To implement different ADT structures with real-time scenarios.
- To analyze the recursion concepts.
- To apply different sorting and tree techniques.
- To implement modern data structures with Python language.

CONTENT

1. Recursion concepts.
   i) Linear recursion ii) Binary recursion.
2. Stack ADT.
3. Queue ADT.
4. Doubly Linked List ADT.
5. Heaps using Priority Queues.
6. Merge sort.
7. Quick sort.
8. Binary Search Tree.
9. Minimum Spanning Tree.
10. Depth First Search Tree traversal.

COURSE OUTCOMES:	
CO1	Strong understanding in various ADT concepts
CO2	To become a familiar with implementation of ADT models
CO3	Apply sort and tree search algorithms
CO4	Evaluate the different data structure models
CO5	Learn how to develop ADT for the various real-time problems

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	**PO1**	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1 0**
CO1	S	M	L	L	L	L	S	S	M	M
CO2	S	M	S	M	M	L	S	M	S	L

CO3	S	S	S	L	L	L	M	M	M	M
CO4	S	S	S	M	M	S	M	M	S	S
CO5	S	S	S	S	L	M	S	M	M	M
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	L	S	S	M	M
CO2	S	S	S	M	M
CO3	L	M	M	S	S
CO4	S	S	M	L	L
CO5	M	S	S	M	L
Total Weightage					
Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low

PROGRAMME: M.C.A		
SEMESTER: I	**Part: III ELECTIVE III**	COURSE CODE : P23DU09
TITLE OF THE COURSE: **Internet of Things**		

HOURS OF INSTRUCTION PER WEEK: 5 P/W 50HrsP/S Each unit : 10 hours	CREDITS: 3	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need	✓	Entrepreneurship Oriented	✓	Addresses Gender Sensitization	
Relevant to Regional need		Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

Objectives:

- To get familiar with the evolution of IOT with its design principles
- To outline the functionalities and protocols of internet communication
- To analyze the hardware and software components needed to construct IOT applications
- To identify the appropriate protocol for API construction and writing embedded code
- To realize various business models and ethics in Internet of Things

UNIT	CONTENT	HRS
I	Evolution of Internet of Things – Enabling Technologies – IOT Architectures: oneM2M, IOT World Forum (IOTWF) and Alternative IOT models – Simplified IOT Architecture and Core IOT Functional Stack -– Fog, Edge and Cloud in IOT – Functional blocks of an IOT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects.	10
II	802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IOT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT. IOT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g,	10
III	Prototyping Embedded Devices: Electronics - Embedded Computing Basics – Arduino - Raspberry Pi - Beagle Bone Black - Electric Imp. Prototyping the Physical Design: Non digital Methods - Laser Cutting - 3D printing - CNC Milling - Repurposing/Recycling.	10
IV	Prototyping Online Components: Getting started with an API - Writing a New API - RealTime Reactions - Other Protocols. Techniques for Writing Embedded Code: Memory Management - Performance and Battery Life – Libraries - Debugging.	10
V	Business Models: History of Business Models – Model – Internet of Starting up – Lean Startups. Moving to Manufacture: Designing Kits - Designing Printed circuit boards – Certification – Costs - Scaling Up Software. Ethics: Privacy – Control – Environment – Solutions.	10

COURSE OUTCOMES:	
CO1	Comprehend the IoT evolution with its architecture and sensors
CO2	Understand the networking concepts for communication and underlying IoT protocols
CO3	Assess the embedded technologies and develop prototypes for the IoT products
CO4	Evaluate the use of Application Programming Interface and design an API for IoT in realitime
CO5	Recognize the ethics of business models and perform security analysis

TEXTBOOK:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, ―IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017 (UNIT I and II)
2. Adrian McEwen and Hakim Cassimally, "Designing the Internet of Things", Wiley, 2014. (UNIT III, IV and V)

REFERENCES:

1. OvidiuVermesan and Peter Friess, "Internet of Things – From Research and Innovation to Market Deployement" , River Publishers, 2014.
2. Peter Waher, "Learning Internet of Things" ,Packt Publishing, 2015.
3. Donald Norris, "The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBoneBlack",McGraw Hill, 2015.

E-LEARNING RESOURCES:

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0
CO1	S	S	M	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	M	S	S	S	S	M	S	S	M
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	M	S	S	S	S	M
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	S

CO2	S	S	M	L	M
CO3	M	S	M	S	M
CO4	S	S	S	S	S
CO5	L	M	M	S	S
Total Weightage					
Weighted % of Course Contribution to PSOs					

S-Strong; M-Medium; L-Low

TEMPLATE FOR LESSON PLAN

COURSE CODE: P23DU09	TITLE OF THE COURSE: **Internet of Things**							
Pedagogy	Total Hours	Lecture	Practical Experience	Peer Group Learning	Demo/ OER /Tutorial	GD / Seminar	ICT / Blended Learning	Field work / Internship

	50	36					14	
UNIT	**TOPIC**						**LECTURE HOURS**	**MODE OF TEACHING**
I	Evolution of Internet of Things – Enabling Technologies – IOT Architectures: oneM2M, IOT World Forum (IOTWF)						4	Blackboard
	and Alternative IOT models – Simplified IOT Architecture and Core IOT Functional Stack –– Fog, Edge and Cloud in IOT						2	PPT
	Functional blocks of an IOT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects.						4	Blackboard
II	IOT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN						4	Blackboard
	Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IOT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy						4	Blackboard
	Networks							
	Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT.						2	PPT
III	Prototyping Embedded Devices: Electronics - Embedded Computing Basics – Arduino - Raspberry Pi - Beagle Bone Black - Electric Imp.						4	Blackboard
	Prototyping the Physical Design: Non digital Methods -						4	Blackboard
	Laser Cutting - 3D printing - CNC Milling - Repurposing/Recycling.						2	PPT
IV	Prototyping Online Components: Getting started with an API - Writing a New API - Real-Time Reactions - Other Protocols.						4	Blackboard
	Techniques for Writing Embedded Code: Memory Management						4	Blackboard
	Performance and Battery Life – Libraries - Debugging.						2	Blackboard
V	Business Models: History of Business Models – Model – Internet of Starting up – Lean Startups. Moving to Manufacture: Designing Kits						2	Blackboard
	Designing Printed circuit boards – Certification – Costs - Scaling Up Software.						4	PPT
	Ethics: Privacy – Control – Environment – Solutions.						4	PPT

PROGRAMME: M.C.A					
SEMESTER: II	**Part:**Elective III	COURSE CODE : P23DU10P			
TITLE OF THE COURSE: **Internet of Things Lab**					
HOURS OF INSTRUCTION PER WEEK: 5 P/W		CREDITS: 3	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented	✓	Addresses Gender Sensitization	
Relevant to Regional need	✓	Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To create IoT program to turn ON/OFF LED
- To implement IoT program for object detection
- To develop IoT programs for agricultural purpose
- To create web server program for local hosting
- To design IoT application for health monitoring

CONTENT

1. To develop an IoT program to turn ON/OFF LED light (3.3V)
2. To develop an IoT program using IR sensor (Smart Garbage Monitoring, Detecting Parking Availability, etc.)
3. To develop an IoT program using Humidity and Temperature Monitoring (Forest fire Detection, Weather Monitoring)
4. To develop an IoT web server program for local hosting
5. To develop an IoT program using Soil Moisture Sensor
6. To develop an IoT program using Ultrasonic Sensor (Distance Measurement, etc.)
7. To develop an real-time IoT program using Relay Module (Smart Home Automation with 230V)
8. To develop an IoT program for Fire Detection (Home, Industry,etc.)
9. To develop an IoT program for Gas Leakage detection (Home, Industry, etc.)
10. To develop an IoMT program using Heartbeat Sensor

COURSE OUTCOMES:	
CO1	Implement IoT programs to turn ON/OFF LED
CO2	Develop IoT programs for object detection
CO3	Create IoT programs for agricultural purpose
CO4	Implement web server program for local hosting
CO5	Design IoT application for health monitoring

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	**PO1**	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1 0**
CO1	S	S	M	S	S	S	M	S	S	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	M	S	S	S	S	M	S	S	M
CO4	S	S	S	S	S	S	S	S	S	L

CO5	S	S	S	S	M	S	L	S	S	M
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	S	S	M	S	S
CO2	S	S	M	L	M
CO3	M	S	M	S	M
CO4	S	S	S	S	S
CO5	L	M	M	S	S
Total Weightage					
Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low

PROGRAMME: M.C.A		
SEMESTER: II	**Part:** Elective III	COURSE CODE : P23DU11
TITLE OF THE COURSE: **Computer Vision**		

HOURS OF INSTRUCTION PER WEEK: 5 P/W 50 HrsP/S Each unit : 10 hours	CREDITS: 3	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented	✓	Addresses Gender Sensitization	
Relevant to Regional need	✓	Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To get understanding about Computer vision techniques behind a wide variety of real- world applications.
- To get familiar with various Computer Vision fundamental algorithms and how to implement and apply.
- To get an idea of how to build a computer vision application with Python language.
- To understand various machine learning techniques that are used in computer vision tasks.
- To incorporate machine learning techniques with computer vision systems.

UNIT	CONTENT	HRS
I	**Basic Image Handling and Processing:** PIL – the Python Imaging Library-MatplotlibNumPy-SciPy-Advanced example: Image de-noising. **Local Image Descriptors:** Harris corner detector-SIFT - Scale-Invariant Feature Transform-Matching Geotagged Images.	**10**
II	**Unit-II** **Image to Image Mappings:**Homographies-Warping images-Creating Panoramas. **Camera Models and Augmented Reality:** The Pin-hole Camera Model-Camera Calibration-Pose Estimation from Planes and Markers-Augmented Reality.	**10**
III	**Multiple View Geometry:**Epipolar Geometry-Computing with Cameras and 3D StructureMultiple View Reconstruction-Stereo Images. **Clustering Images:** K-means ClusteringHierarchical Clustering-Spectral Clustering.	**10**
IV	**Searching Images:** Content based Image Retrieval-Visual Words-Indexing Images-Searching the Database for Images-Ranking Results using Geometry-Building Demos and Web Applications. **Classifying Image Content:** K-Nearest Neighbors-Bayes ClassifierSupport Vector Machines-Optical Character Recognition.	**10**
V	**Image Segmentation:** Graph Cuts-Segmentation using Clustering-Variational Methods. **OpenCV:** Python Interface-OpenCV Basics-Processing Video-Tracking.	**10**

COURSE OUTCOMES:

CO1	To understand and recall computer vision and its application areas
CO2	To develop build a computer vision system
CO3	To apply and analyze a design range of algorithms for image processing and computer vision
CO4	To develop incorporate machine learning techniques with computer vision system
CO5	To apply and analyze image segmentation and image registration

TEXTBOOK:

REFERENCES:

E-LEARNING RESOURCES:

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0
CO1	S	L	M	L	L	L	M	M	M	S
CO2	S	M	L	M	M	L	S	L	S	L
CO3	S	S	S	M	M	L	M	L	M	L
CO4	S	S	S	M	M	L	M	L	M	L
CO5	S	S	S	M	M	L	S	L	S	L
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					
CO4					
CO5					
Total Weightage					
Weighted % of Course Contribution to PSOs					

S-Strong; M-Medium; L-Low

TEMPLATE FOR LESSON PLAN

COURSE CODE: P23DU11	TITLE OF THE COURSE: **Computer Vision**							
Pedagogy	Total Hours	Lecture	Practical Experience	Peer Group Learning	Demo/ OER /Tutorial	GD / Seminar	ICT / Blended Learning	Field work / Internship
	50	36					14	
TOPIC							**LECTURE HOURS**	**MODE OF TEACHING**
	Basic Image Handling and Processing: PIL – the Python Imaging Library-Matplotlib-NumPy-SciPy-Advanced example: Image de-noising.						4	Blackboard
	Local Image Descriptors: Harris corner detector-SIFT						2	PPT
	Scale-Invariant Feature Transform-Matching Geotagged Images.						4	Blackboard
II	**Image to Image Mappings:**Homographies-Warping images-Creating Panoramas.						4	Blackboard
	Camera Models and Augmented Reality: The Pin-hole Camera Model-Camera Calibration						4	Blackboard
	Pose Estimation from Planes and MarkersAugmented Reality.						2	PPT
III	**Multiple View Geometry:**Epipolar Geometry-Computing with Cameras and 3D Structure-Multiple View Reconstruction-Stereo Images.						4	Blackboard
	Clustering Images: K-means Clustering						4	Blackboard
	Hierarchical Clustering-Spectral Clustering.						2	PPT
IV	**Searching Images:** Content based Image Retrieval-Visual Words-Indexing Images- Searching the Database for ImagesRanking Results using Geometry-Building Demos and Web Applications.						4	Blackboard
	Classifying Image Content: K-Nearest Neighbors						4	Blackboard
	Bayes Classifier-Support Vector Machines-Optical Character Recognition.						2	Blackboard
V	**Image Segmentation:** Graph Cuts-Segmentation using Clustering-Variational Methods.						2	Blackboard
	OpenCV: Python Interface-OpenCV Basics						4	PPT
	Processing Video-Tracking.						4	PPT

PROGRAMME: M.C.A					
SEMESTER: II	**Part:**Elective III	COURSE CODE : P23DU12P			
TITLE OF THE COURSE: **Computer Vision Lab**					
HOURS OF INSTRUCTION PER WEEK: 5 P/W		CREDITS: 3	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented	✓	Addresses Gender Sensitization	
Relevant to Regional need	✓	Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To get an idea of how to build a computer vision application with Python language.
- To learn the basic image handling and processing
- To get familiar with various Computer Vision fundamental algorithms and how to implement and apply.
- To get an idea of how to implement the image transforms.
- To understand various image segmentation algorithms.

CONTENT

1. Image Loading, Exploring, and displaying an Image.
2. Access and Manipulate of Image Pixels.
3. Image Transformations.
   i) Resizing ii) Rotation
4. Addition operation of Two Images.
5. Image filtering operations
   i) Mean Filtering ii) Gaussian Filtering
6. Image Binarization Using Simple Thresholding method.
7. Edge Detection operation using Sobel and Scharr Gradients.
8. Find Grayscale and RGB Histograms of an Image.
9. Segment an Image using K-means Clustering algorithm.
   Write a program to classify an Image using KNN Classification algorithm.

COURSE OUTCOMES:	
CO1	To develop and implement the image loading and exploring
CO2	To Evaluate the image transforms
CO3	To apply and analyze for image processing denoising algorithms

CO4	To design and develop the Image Segmentation using Edge detection and Histograms
CO5	To apply and analyze image clustering and classification algorithms

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	**PO1**	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1 0**
CO1	S	L	M	L	L	L	M	M	M	S
CO2	S	M	L	M	M	L	S	L	S	L
CO3	S	S	S	M	M	L	M	L	M	L
CO4	S	S	S	M	M	L	M	L	M	L
CO5	S	S	S	M	M	L	S	L	S	L
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	L	L	M	M	M
CO2	S	S	M	S	S
CO3	S	S	S	M	M
CO4	S	S	S	S	S
CO5	L	L	S	M	M
Total Weightage					
Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low

PROGRAMME: M.C.A

SEMESTER: II	**Part:**Elective IV	COURSE CODE : P23DU13

TITLE OF THE COURSE: **Network Security and Cryptography**

HOURS OF INSTRUCTION PER WEEK: 5 P/W 50 HrsP/S Each unit : 10 hours	CREDITS: 3	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented	✓	Addresses Gender Sensitization	
Relevant to Regional need	✓	Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

Themain objectives of this course are to:

1. Enable students to learn the Introduction to Cryptography, Web Security and Case studies in Cryptography.
2. Togainknowledgeonclassicalencryptiontechniquesandconceptsofmodulararithmeticand number theory.
3. To explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms.
4. To explore the design issues and working principles of various authentication Applications and various secure communication standards including Kerberos, IPsec, and SSL/TLS and email.

UNIT	CONTENT	HRS
I	Introduction to Cryptography – Security Attacks – Security Services –Security Algorithm-Stream cipher and Block cipher - Symmetric and Asymmetric-key Cryptosystem Symmetric Key Algorithms: Introduction – DES – Triple DES – AES – IDEA – Blowfish – RC5.	**10**
II	Public-keyCryptosystem:IntroductiontoNumberTheory-RSAAlgorithm–KeyManagement -Diffie-HellmanKeyexchange–EllipticCurveCryptographyMessageAuthenticationand Hash functions – Hash and Mac Algorithm – Digital Signatures and Authentication Protocol.	**10**
III	NetworkSecurityPractice:AuthenticationApplications–Kerberos–X.509Authentication services and Encryption Techniques. E-mail Security – PGP – S / MIME – IP Security.	**10**
IV	WebSecurity-SecureSocketLayer–SecureElectronicTransaction.SystemSecurity-Intruders and Viruses – Firewalls– Password Security.	**10**

V	CaseStudy: ImplementationofCryptographicAlgorithms–RSA–DSA–ECC(C/JAVA Programming). Network Forensic – Security Audit - Other Security Mechanism: Introduction to: Stenography –Quantum Cryptography – Water Marking - DNA Cryptography	**10**

COURSE OUTCOMES:

CO1	Understandtheprocessofthecryptographicalgorithms
CO2	Compareandapplydifferentencryptionanddecryptiontechniquestosolveproblems related to confidentiality and authentication
CO3	Applyandanalyzeappropriatesecuritytechniquestosolvenetworksecurity problem
CO4	Exploresuitablecryptographicalgorithms
CO5	Analyzedifferentdigitalsignaturealgorithmstoachieveauthenticationand design secure applications

TEXTBOOK:

1. WilliamStallings,"CryptographyandNetworkSecurity", PHI/PearsonEducation.
2. BruceSchneir,"AppliedCryptography",CRC Press.

REFERENCES:

A.Menezes, P Van Oorschot and S.Vanstone, "Hand Book ofApplied Cryptography", CRC Press, 1997

AnkitFadia,"NetworkSecurity",MacMillan.

Dr. V. Hema, Ms.P.R.SukanyaSridevi, Dr. M. GanagaDurga, "Security and Privacy in Cloud", Leilani Katie Publications & Press, 2023

E-LEARNING RESOURCES:

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0
CO1	S	M	S	M	L	S	M	S	M	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	S	M	M
CO2	S	S	S	M	M

CO3	L	L	S	L	M
CO4	L	L	L	L	L
CO5	M	M	M	L	
Total Weightage					
Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low

TEMPLATE FOR LESSON PLAN

COURSE CODE: P23DU13	TITLE OF THE COURSE: **Network Security and Cryptography**							
Pedagogy	Total Hours	Lecture	Practical Experience	Peer Group Learning	Demo/ OER /Tutorial	GD / Seminar	ICT / Blended Learning	Field work / Internship
	50	36					14	
UNIT	**TOPIC**						**LECTURE HOURS**	**MODE OF TEACHING**
I	Introduction to Cryptography – Security Attacks – Security Services –Security Algorithm						4	Blackboard
	Stream cipher and Block cipher - Symmetric and Asymmetric-key Cryptosystem Symmetric Key Algorithms:						2	PPT
	Introduction – DES – Triple DES – AES – IDEA – Blowfish – RC5.						4	Blackboard
II	**CRYPTOSYSTEM:** Public-key Cryptosystem: Introduction to Number Theory - RSA Algorithm						4	Blackboard
	KeyManagement-Diffie- Hellman Key exchange –Elliptic CurveCryptography Message Authentication and Hash functions						4	Blackboard
	Hash and Mac Algorithm – Digital Signatures and Authentication Protocol.						2	PPT
III	**NETWORK SCURITY:** Network Security Practice: Authentication Applications						4	Blackboard
	Kerberos–X.509Authentication services and Encryption Techniques.						4	Blackboard
	E-mail Security – PGP – S / MIME – IP Security.						2	PPT
IV	**WEB SECURITY:** Web Security- Secure Socket Layer						4	Blackboard
	Secure Electronic Transactions. System Security						4	Blackboard
	Intruders and Viruses – Firewalls– Password Security.						2	Blackboard
V	Case Study: Implementation of Cryptographic Algorithms– RSA–DSA–ECC(C/JAVA Programming).						2	Blackboard
	Network Forensic – Security Audit - Other Security Mechanism						4	PPT
	Introduction to: Stenography –Quantum Cryptography – Water Marking - DNA Cryptography						4	PPT

PROGRAMME: M.C.A					
SEMESTER: II	**Part:** Elective IV	COURSE CODE : P23DU14			
TITLE OF THE COURSE: **Cyber Security**					
HOURS OF INSTRUCTION PER WEEK: 5 P/W 50 HrsP/S Each unit : 10 hours	CREDITS: 3	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100	

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented	✓	Addresses Gender Sensitization	
Relevant to Regional need	✓	Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To understand the basics of Cybercrime and Computer forensics with protecting mechanism
- To explore the working principles of WLAN, Email and Smartphone along with security mechanisms and guidelines
- To gain the ability to understand the importance of cyber investigations with its functioning role and learn the basics of Wi Fi and its security measures
- To understand and learn the method of seize digital evidence
- To learn and analyze the concepts of digital forensics with cybercrime prevention techniques

UNIT	CONTENT	HRS
I	Introduction to cybercrime: Classification of cybercrimes – reasons for commission of cybercrime – malware and its type – kinds of cybercrime – authentication – encryption – digital signatures – antivirus – firewall – steganography – computer forensics – why should we report cybercrime – introduction counter cyber security initiatives in India – generating secure password – using password manager-enabling two-step verification – security computer using free antivirus.	**10**
II	Tips for buying online: Clearing cache for browsers – wireless LAN-major issues with WLAN-safe browsing guidelines for social networking sites – email security tips – introduction-smartphone security guidelines – purses, wallets, smart phones – platforms, setup and installation-communicating securely with a smartphone.	**10**

III	Cyber investigation roles**:** Introduction – role as a cybercrime investigator – the role of law enforcement officers – the role of the prosecuting attorney – incident response: introduction-post mortem versus live forensics – computer analysis for the hacker defender program-network analysis – legal issues of intercepting Wi-Fi transmission – Wi-Fi technology – Wi-Fi RF-scanning RF – eavesdropping on Wi-Fi – fourth amendment expectation of privacy in WLAN.	**10**
IV	Seizure of digital information: introduction – defining digital evidence – digital evidence seizure methodology – factors limiting the wholesale seizure of hardware – other options for seizing digital evidence – common threads within digital evidence seizure – determining the most appropriate seizure method– conducting cyber investigations–demystifying computer/cyber crime – IP addresses – the explosion of networking – interpersonal communication.	**10**
V	Digital forensics and analyzing data: introduction – the evolution of computer forensics– phases of digital forensics-collection – examination-analysis – reporting – Cyber crime prevention: Introduction – crime targeted at a government agency.	**10**

COURSE OUTCOMES:	
CO1	Understand, describe, analyze and examine the basics of Cyber security concepts and its implementation in India
CO2	Comprehend and demonstrate the security tips in browsers, WLAN, social networks, Email security and Smart phone. Apply the investigations in post mortem and Forensics
CO3	Understand, apply and evaluate the various investigation roles and Wi Fi protecting mechanisms.
CO4	Understand, illustrate and evaluate the method of seize the digital information and evidence forensics data and evaluate the forensics reports
CO5	Comprehend, apply and appraise the methods digital forensics with cybercrime prevention techniques

TEXTBOOK:

1. Dr.JeetendraPande, **"**Introduction to Cyber Security" Published by Uttarakhand Open University, 2017.(Chapter: 1.2-6.4,9.3-12.2)
2. Anthony reyes, Kevin o'shea, Jim steele, Jon R. Hansen, Captain Benjamin R. Jean Thomas Ralph, "Cyber-crime investigations" - bridging the gaps between security professionals, law enforcement, and prosecutors, 2007.(Chapter: 4, 5, 6, 7, 8, 9,10)

REFERENCES:

1. Sebastian Klipper, "Cyber Security" EinEinblickfurWirtschaftswissenschaftlerFachmedien Wiesbaden,2015
2. John G.Voller Black and Veatch, "Cyber Security" Published by John Wiley & Sons, Inc., Hoboken, New Jersey Published simultaneously in Canada ©2014.

E-LEARNING RESOURCES:

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0
CO1	S	L	-	L	M	L	M	M	-	M
CO2	M	S	-	L	M	L	M	M	-	M
CO3	M	S	L	L	M	L	M	M	-	M
CO4	S	M	L	S	M	L	S	M	-	M
CO5	M	S	M	L	S	L	M	S	-	S
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	L	L
CO2	S	S	S	M	M
CO3	S	S	S	M	M
CO4	L	L	M	M	M
CO5	S	S	S	M	M
Total Weightage					
Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low

TEMPLATE FOR LESSON PLAN

COURSE CODE: P23DU14	TITLE OF THE COURSE: **Cyber Security**							
Pedagogy	Total Hours	Lecture	Practical Experience	Peer Group Learning	Demo/ OER /Tutorial	GD / Seminar	ICT / Blended Learning	Field work / Internship
	50	36					14	
UNIT	**TOPIC**						**LECTURE HOURS**	**MODE OF TEACHING**
I	Introduction to cybercrime: Classification of cybercrimes – reasons for commission of cybercrime – malware and its type – kinds of cybercrime – authentication – encryption						4	Black board
	digital signatures – antivirus – firewall – steganography – computer forensics – why should we report cybercrime – introduction counter cyber security initiatives in India						2	PPT
	generating secure password – using password manager-enabling two-step verification – security computer using free antivirus.						4	Black board
II	Tips for buying online: Clearing cache for browsers – wireless						4	Black board
	LAN-major issues with WLAN							
	safe browsing guidelines for social networking sites – email security tips – introduction-smartphone security guidelines						4	Black board
	purses, wallets, smart phones – platforms, setup and installation-communicating securely with a smartphone.						2	PPT
III	Cyber investigation roles**:** Introduction – role as a cybercrime investigator – the role of law enforcement officers – the role of the prosecuting attorney						4	Black board
	incident response: introduction-post mortem versus live forensics – computer analysis for the hacker defender program-network analysis						4	Black board
	legal issues of intercepting Wi-Fi transmission – Wi-Fi technology – Wi-Fi RF-scanning RF – eavesdropping on WiFi – fourth amendment expectation of privacy in WLAN.						2	PPT
IV	Seizure of digital information: introduction – defining digital evidence – digital evidence seizure methodology – factors limiting the wholesale seizure of hardware						4	Black board
	other options for seizing digital evidence – common threads within digital evidence seizure – determining the most appropriate seizure method						4	Black board

	conducting cyber investigations–demystifying computer/cyber crime – IP addresses – the explosion of networking – interpersonal communication.	2	Black board
V	Digital forensics and analyzing data: introduction – the evolution of computer forensics	2	Black board
	phases of digital forensics-collection – examination-analysis – reporting	4	PPT
	Cyber crime prevention: Introduction – crime targeted at a government agency.	4	PPT

PROGRAMME: M.C.A					
SEMESTER: II	**Part:** Elective IV	COURSE CODE : P23DU15P			
TITLE OF THE COURSE: **Cyber Security Lab**					
HOURS OF INSTRUCTION PER WEEK: 5 P/W	CREDITS: 3	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100	

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented	✓	Addresses Gender Sensitization	
Relevant to Regional need	✓	Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To learn and implement to Change the wireless device mode as monitor mode
- To develop in multiple vulnerabilities webserver
- To understand and implement the open ports in the network
- To acquire programming skills in Implement various wireless device modes
- To comprehend related to find the sub domains of webpage

CONTENT

1. Install virtual box (kali Linux)
2. Generate a secure password using keepass
3. Change the wireless device mode as monitor mode
4. Find the known and open vulnerabilities of system using metaspolit
5. Identify the multiple vulnerabilities webserver using nikto tool
6. Identify the open ports in the network using nmap tools
7. List all the network around us and display the information about the networks
8. Sniff and capture the packet sent over HTTP requests
9. Find the owners of internet resources using Whois Lookup tool 10. Find the subdomains of webpage using knock tool

COURSE OUTCOMES:	
CO1	Comprehend the programming skills in Change the wireless device mode as monitor mode
CO2	Understand and implement multiple vulnerabilities webserver
CO3	Evaluate the use of different wireless device modes
CO4	Design to Solve related to find the subdomains of webpage

CO5	Create and applyopen ports in the network									
MAPPING WITH PROGRAMME OUTCOMES										
CO / PO	**PO1**	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1 0**
CO1	S	-	-	-	-	L	-	-	-	-
CO2	S	-	M	-	M	L	-	-	-	-
CO3	S	-	S	-	S	L	-	-	-	S
CO4	S	-	S	-	S	L	-	-	-	S
CO5	S	-	S	-	S	L	-	-	-	S
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES					
CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	L	L	L	L	L
CO2	S	S	S	M	M
CO3	S	S	S	M	M
CO4	L	L	M	M	M
CO5	S	S	S	M	M
Total Weightage	L	L	L	L	L
Weighted % of Course Contribution to PSOs					

S-Strong; M-Medium; L-Low

PROGRAMME: M.C.A					
SEMESTER: II	**Part:** Elective IV	COURSE CODE : P23DU16			
TITLE OF THE COURSE: **Quantum Computing**					
HOURS OF INSTRUCTION PER WEEK: 5 P/W 50 HrsP/S Each unit 10hrs	CREDITS: 3	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100	

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need	✓	Entrepreneurship Oriented	✓	Addresses Gender Sensitization	
Relevant to Regional need		Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To know the background of classical computing and quantum computing.
- To learn the fundamental concepts behind quantum computation.
- To study the details of quantum gates.
- To gain knowledge on quantum algorithms.
- To learn the basics of quantum cryptography.

UNIT	CONTENT	HRS
I	Complex Numbers - Vectors Space and Dirac Notation - Basics of Quantum Mechanics.	**10**
II	Matrices and Operators – Boolean Algebra - Logic Gates and Quantum Information processing.	**10**
III	Quantum Gates and circuits - Tensor Products, Super Position and Quantum Entanglement.	**10**
IV	Quantum algorithms: Deutsch's Algorithm – Deutsch-Jozsa Algorithm – Grover's Search Algorithm.	**10**
V	Quantum Cryptography: Principles of Information Security – One-Time Pad - Public Key Cryptography - RSA Coding Scheme - Quantum Cryptography.	**10**

COURSE OUTCOMES:	
CO1	Understand the basics of quantum computing
CO2	Understand the background of Quantum computation
CO3	To explore quantum gates and circuits.
CO4	Analyze various quantum algorithms .
CO5	Understand quantum quantum cryptography.

TEXTBOOK:

1. Parag K Lala, Mc Graw Hill Education, "Quantum Computing, A Beginners Introduction", (Reprint 2020).

REFERENCES:

1. Scott Aaronson, "Quantum Computing Since Democritus", Cambridge University Press, 2013.
2. N. David Mermin, "Quantum Computer Science: An Introduction", Cambridge University Press, 2007.

E-LEARNING RESOURCES:

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0
CO1	S	M	M	M	-	-	-	-	M	-
CO2	S	M	M	M	-	-	-	-	M	-
CO3	S	S	S	S	M	-	-	-	S	-
CO4	S	S	S	S	S	-	-	-	S	-
CO5	S	S	M	S	-	-	-	-	M	-
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M
CO2	S	S	L	M	M
CO3	L	S	S	L	M
CO4	M	S	S	M	M
CO5	S	S	s	M	M
Total Weightage					
Weighted % of Course Contribution to PSOs					

S-Strong; M-Medium; L-Low

TEMPLATE FOR LESSON PLAN

COURSE CODE: P23DU16	TITLE OF THE COURSE: **Quantum Computing**							
Pedagogy	Total Hours	Lecture	Practical Experience	Peer Group Learning	Demo/ OER /Tutorial	GD / Seminar	ICT / Blended Learning	Field work / Internship
	50	36				14		
UNIT	**TOPIC**						**LECTURE HOURS**	**MODE OF TEACHING**
I	Complex Numbers - Linear Algebra - Matrices and Operators						4	Black board
	Global Perspectives Postulates of Quantum Mechanics –						2	PPT
	Quantum Bits - Representations of Qubits - Superpositions						4	Black board
II	Universal logic gates - Basic single qubit gates						4	Black board
	Multiple qubit gates - Circuit development						4	Black board
	Quantum error correction						2	PPT
III	Quantum parallelism - Deutsch's algorithm - The Deutsch						4	Black board
	Jozsa algorithm - Quantum Fourier transform and its applications						4	Black board
	Quantum Search Algorithms: Grover's Algorithm						2	PPT
IV	Data compression - Shannon's noiseless channel coding theorem						4	Black board
	Schumacher's quantum noiseless channel coding theorem						4	Black board
	Classical information over noisy quantum channels						2	Black board
V	Classical cryptography basic concepts - Private key cryptography						4	Black board
	Shor's Factoring Algorithm - Quantum Key DTRistribution						2	PPT
	BB84 - Ekart 91						4	PPT

PROGRAMME: M.C.A					
SEMESTER: II	**Part:** Elective IV	COURSE CODE : P23DU17P			
TITLE OF THE COURSE: **Blockchain Technologies Lab**					
HOURS OF INSTRUCTION PER WEEK: 5 P/W	CREDITS: 3	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100	

NATURE OF THE COURSE					
Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented	✓	Addresses Gender Sensitization	
Relevant to Regional need	✓	Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To learn the basics of Blockchain and apply cryptographic algorithms To design, build, and deploy smart contracts and distributed applications, To deploy Private Blockchain and smart contracts on Ethereum.
- To understand and deploy cryptocurrencies and their functions in applications To implement Blockchain for various use cases.

CONTENT

1. Create a Public Ledger and Private Ledger with the various attributes like Access, Network Actors, Native token, Security, Speed and examples.
2. Building and Deploying MultiChain private Blockchain
3. Write Hello World smart contract in a higher programming language (Solidity)
4. Construct the Naïve block chain
5. Construct and deploy your contract (Use deploy method)
6. Set up a Regtest environment
7. Build a payment request URI
8. Hashcash implementation
9. Develop a toy application using Blockchain

Create simple wallet transaction from one account to another account using Metamask.

COURSE OUTCOMES:	
CO1	Enable to setup your own private Blockchain and deploy smart contracts on Ethereum.
CO2	Gains familiarity and implement with cryptography and Consensus algorithms.
CO3	Create and deploy projects using Web3j.
CO4	Recall and deploy the structure and mechanism of Bitcoin, Ethereum, Hyperledger
CO5	Implement Blockchain for various use cases

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0
CO1	S	S	M	L	M	S	-	-	-	-
CO2	S	M	S	S	S	M	-	-	-	-
CO3	S	S	S	S	S	S	-	-	-	-
CO4	S	M	L	S	M	L	-	-	-	-
CO5	M	S	M	L	S	L	-	-	-	-

Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES					
CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	L	L	L	M	M
CO2	S	S	L	M	M
CO3	L	S	S	L	M
CO4	M	S	S	M	M
CO5	S	S	s	M	M
Total Weightage					
Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low

PROGRAMME: M.C.A

SEMESTER: II	Part : Skill Enhancement course I	COURSE CODE : P23SEU1

TITLE OF THE COURSE: **Fundamentals of Human Rights**

HOURS OF INSTRUCTION PER WEEK: 2 P/W	CREDITS: 2	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented		Addresses Professional Ethics	✓
Relevant to National need	✓	Entrepreneurship Oriented		Addresses Gender Sensitization	✓
Relevant to Regional need		Skill Development Oriented		Addresses Environment and Sustainability	✓
Relevant to Local need				Addresses Human Values	✓

LEARNING OBJECTIVES: To enable the students to:

1. To acquaint the students about the concept of human rights and its importance.
2. To learn the importance of human rights and self respect.
3. To understand the principles of liberty, equality and social justice.

UNIT	CONTENT	HRS
I	Meaning and Definitions of Human Rights – Characteristics and Importance of Human Rights – Evolution of Human Rights – Formation, Structure and Functions of the UNO - Universal Declaration of Human Rights – International Covenants – Violations of Human Rights in the Contemporary Era.	15
II	Development of Human Rights in India – Constituent Assembly and Indian Constitution – Fundamental Rights and its Classification – Directive Principles of State Policy – Fundamental Duties.	15
III	Rights of Women – Rights of Children – Rights of Differently Abled – Rights of Elderly - Rights of Scheduled Castes – Rights of Scheduled Tribes – Rights of Minorities – – Rights of Prisoners – Rights of Persons Living with HIVAIDS – Rights of LGBT.	15
IV	**Human Rights Movements**: Peasant Movements (Tebhaga and Telangana) – Scheduled Caste Movements (Mahar and Ad-Dharmi) – Scheduled Tribes Movements (Santhal and Munda) – Environmental Movements (Chipko and Narmada BachaoAndolan) – Social Reform Movements (Vaikom and Self Respect).	15
V	**Redressal Mechanisms**: Protection of Human Rights Act, 1993 (Amendment 2019) – Structure and Functions of National and State Human Rights Commissions – National Commission for SCs – National Commission for STs – National Commission for Women – National Commission for Minorities – Characteristics and Objectives of Human Rights Education.	15

COURSE OUTCOMES:	
CO1	Remember the concept of natural rights.
CO2	Understand the historical growth of the idea of human rights.
CO3	Assess the importance of Human Rights and respect the rights of others.

CO4	Analyze the issues and challenges of Human Rights.
CO5	Evaluate the role of various organization in protection of Human Rights.

TEXTBOOK:

REFERENCES:

1. SudarshanamGankidi, Human Rights in India: Prospective and Retrospective, Rawat Publications, Jaipur, 2019.
2. SatvinderJuss, Human Rights in India, Routledge, New Delhi, 2020.
3. Namita Gupta, Social Justice and Human Rights in India, Rawat Publications, Jaipur, 2021.
4. Mark Frezo, The Sociology of Human Rights, John Willy & Sons, U.K. 2014.
5. Chiranjivi J. Nirmal, Human Rights in India: Historical, Social and Political Perspectives, Oxford University Press, New York, 2000.
6. Dr. S. Mehartaj Begum, Human Rights in India: Issues and perspectives, APH Publishing Corporation, New Delhi, 2010.
7. Asha Kiran, The History of Human Rights, Mangalam Publications, Delhi, 2011.
8. Bani Borgohain, Human Rights, Kanishka Publishers & Distributors, New Delhi-2, 2007.
9. Jayant Chudhary, A Textbook of Human Rights, Wisdom Press, New Delhi, 2011.

E-LEARNING RESOURCES:

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	M	S	S	M	S	S
CO2	S	S	S	S	M	S	S	L	S	S
CO3	S	S	M	M	M	S	S	L	M	S
CO4	S	S	M	M	M	M	M	L	S	S
CO5	S	S	M	M	M	M	S	L	S	S
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M
CO2	L	L	L	M	M
CO3	S	S	S	M	M
CO4	L	S	S	M	M
CO5	L	S	S	M	M
Total Weightage					

Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low

TEMPLATE FOR LESSON PLAN

COURSE CODE: P23SEU1	TITLE OF THE COURSE: **Fundamentals of Human Rights**							
Pedagogy	Total Hours	Lecture	Practical Experience	Peer Group Learning	Demo/ OER /Tutorial	GD / Seminar	ICT / Blended Learning	Field work / Internship
		15						
UNIT	**TOPIC**						**LECTURE HOURS**	**MODE OF TEACHING**

I	Meaning and Definitions of Human Rights – Characteristics and Importance of Human Rights – Evolution of Human Rights –	1	Black board
	Formation, Structure and Functions of the UNO - Universal Declaration of Human Rights International Covenants – Violations of Human Rights in the Contemporary Era.	1	Black board
	Development of Human Rights in India – Constituent Assembly and Indian Constitution	1	Black board
II	Fundamental Rights and its Classification - Directive Principles of State Policy – Fundamental Duties.	1	Black board
	Rights of Marginalized and other Disadvantaged People: Rights of Women – Rights of Children – Rights of Differently Abled.	1	Black board
	Rights of Elderly - Rights of Scheduled Castes – Rights of Scheduled Tribes – Rights of Minorities- Rights of Prisoners – Rights of Persons Living with HIVAIDS – Rights of LGBT.	1	Black board
III	**Human Rights Movements**: Peasant Movements (Tebhaga and Telangana)	1	Black board
	Scheduled Caste Movements (Mahar and Ad-Dharmi) – Scheduled Tribes Movements (Santhal and Munda)- Environmental Movements (Chipko and Narmada BachaoAndolan) – Social Reform Movements (Vaikom and Self Respect).	1	Black board
	Redressal Mechanisms: Protection of Human Rights Act, 1993 (Amendment 2019) – Structure and Functions of National and State Human Rights Commissions	1	Black board
IV	National Commission for SCs – National Commission for STs – National Commission for Women- National Commission for Minorities – Characteristics and Objectives of Human Rights Education.	1	Black board
	Meaning and Definitions of Human Rights – Characteristics and Importance of Human Rights – Evolution of Human	1	Black board
	Rights.		
	Formation, Structure and Functions of the UNO - Universal Declaration of Human Rights International Covenants – Violations of Human Rights in the Contemporary Era.	1	Black board
V	Development of Human Rights in India – Constituent Assembly and Indian Constitution	1	Black board
	Fundamental Rights and its Classification - Directive Principles of State Policy – Fundamental Duties.	1	Black board
	Rights of Marginalized and other Disadvantaged People: Rights of Women – Rights of Children – Rights of Differently Abled.	1	Black board

PROGRAMME: M.C.A					
SEMESTER: III	Part : Core VII	COURSE CODE : P23CU7			
TITLE OF THE COURSE: **Advanced Java Programming**					
HOURS OF INSTRUCTION PER WEEK: 6 P/W 60 HrsP/S Each unit : 12 hours		CREDITS: 5	CIA : 25	EXTERNAL MARKS:75	TOTAL: 100

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented	✓	Addresses Gender Sensitization	
Relevant to Regional need	✓	Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To gain knowledge of Object Oriented Programming Concept in Java
- To understand usages of String functions in Java
- To familiarize with the applet and swing
- To grasp the concepts on Java Beans
- To comprehend the connection between Relational Database and Java.

UNIT	CONTENT	HRS
I	An Overview of Java: Object Oriented Programming- Data Types, Variables, and Arrays: Primitive Types-Literals Variables - Type Conversion and Casting- Arrays-Operators: Control Statements-Classes and Methods – Inheritance- Exception Handling.	12
II	String Handling: The String Constructors - String Length - Special String Operations - Character Extraction - String Comparison - Searching Strings - Modifying a String - Input/Output: The I/O Classes and Interfaces – File - Byte Streams - Character Streams	12
III	The Applet Class: Basic Architecture - Applet Skeleton - Display methods - Status Window – Passing Parameters. Introducing GUI Programming with Swing– Introducing Swing - Swing Is Built on the AWT- Two Key Swing Features - The MVC Connection - Components and Containers - The Swing Packages - A Simple Swing Application - Exploring Swing.	12
IV	Java Beans: Introduction - Advantages of Beans – Introspection - The JavaBeans API - A Bean Example. Servlets: Life Cycle Simple Servlet-Servlet API-Packages-Cookies session tracking.	12

V	Network Programming: Working with URLs- Working with Sockets - Remote Method Invocation. Introduction to Database Management Systems - Tables, Rows, and Columns - Introduction to the SQL SELECT Statement - Inserting Rows - Updating and Deleting	**12**
	Existing Rows - Creating and Deleting Tables - Creating a New Database with JDBC - Scrollable Result Sets.	

COURSE OUTCOMES:

CO1	Understand the Object Oriented Program including classes and methods; inheritance and exception handling
CO2	Complete comprehension of String functions and I/O Streams
CO3	Creation of graphical representation using Applet
CO4	Application of Servlets for designing Web based applications
CO5	Usage of JDBC connectivity and implementation of the concept to get desired results from database

TEXTBOOK:

1. Herbert Schildt, "Java the Complete Reference", 10th edition, McGraw Hill Publishing Company Ltd, New Delhi, 2017.
2. Tony Goddis, "Starting out with Java from Control Structures Through Objects" 6th Edition, Pearson Education Limited, 2016

REFERENCES:

1. Herbert Schildt, Dale Skrien, "Java Fundamentals – A Comprehensive Introduction", TMGH Publishing Company Ltd, New Delhi, 2013
2. John Dean, Raymond Dean, "Introduction to Programming with JAVA – A Problem Solving Approach", TMGH Publishing Company Ltd, New Delhi,2012.

E-LEARNING RESOURCES:

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0
CO1	S	S	S	-	M	S	-	-	-	S
CO2	S	S	S	-	M	S	-	-	-	L
CO3	S	S	M	-	L	S	-	-	-	M
CO4	M	S	M	-	S	S	-	-	-	M
CO5	S	M	M	-	M	L	-	-	-	M
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES					
CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	M	L	S	M	L
CO2	M	L	S	M	L
CO3	M	S	M	M	S
CO4	S	S	S	M	M
CO5	S	S	S	M	M
Total Weightage					
Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low

TEMPLATE FOR LESSON PLAN

COURSE CODE: P23CU7	TITLE OF THE COURSE: **Advanced Java Programming**							
Pedagogy	Total Hours	Lecture	Practical Experience	Peer Group Learning	Demo/ OER /Tutorial	GD / Seminar	ICT / Blended Learning	Field work / Internship
	60	40					20	

UNIT	TOPIC	LECTURE HOURS	MODE OF TEACHING
I	An Overview of Java: Object Oriented Programming- Data Types, Variables, and Arrays	4	Black board
	Primitive Types-Literal Variables - Type Conversion and Casting- Arrays-Operators	4	PPT
	Control Statements-Classes and Methods – Inheritance-Exception Handling.	4	Black board
II	String Handling: The String Constructors - String Length - Special String Operations	4	Black board
	Character Extraction - String Comparison - Searching Strings - Modifying a String - Input/Output	4	Black board
	The I/O Classes and Interfaces – File - Byte Streams - Character Streams.	4	PPT
III	The Applet Class: Basic Architecture - Applet Skeleton - Display methods - Status Window – Passing Parameters.	4	Black board
	Introducing GUI Programming with Swing– Introducing Swing - Swing Is Built on the AWT- Two Key Swing Features	4	Black board
	The MVC Connection - Components and Containers - The Swing Packages - A Simple Swing Application - Exploring Swing.	4	PPT
IV	Java Beans: Introduction - Advantages of Beans – Introspection - The JavaBeans API	4	Black board
	A Bean Example. Servlets: Life Cycle Simple Servlet	4	Black board
	Servlet API-Packages-Cookies session tracking.	4	Black board
V	Network Programming: Working with URLs- Working with Sockets - Remote Method Invocation. Introduction to Database Management Systems	4	Black board

	Tables, Rows, and Columns - Introduction to the SQL SELECT Statement - Inserting Rows - Updating and Deleting Existing Rows	4	PPT
	Creating and Deleting Tables - Creating a New Database with JDBC- Scrollable Result Sets.	4	PPT

PROGRAMME: M.C.A					
SEMESTER: III	Part : Core VIII	COURSE CODE : P23CU8			
TITLE OF THE COURSE: **Web Technology**					
HOURS OF INSTRUCTION PER WEEK: 6 P/W 60 HrsP/S Each unit : 12 hours		CREDITS: 5	CIA : 25	EXTERNAL MARKS:75	TOTAL: 100

NATURE OF THE COURSE

Relevant to Global need	✓	Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented	✓	Addresses Gender Sensitization	
Relevant to Regional need		Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- Understand the fundamentals of the web and thereby develop web applications using various development languages and tools.
- Enrich knowledge about XHTML control and Cascading Style Sheets.
- Provide in- depth knowledge about Javascript.
- To enhance knowledge of XML documents with presentations using CSS and XSLT.
- Deliver depth knowledge about PHP, Angular JS, Jquery.

UNIT	CONTENT	HRS
I	**WEB FUNDAMENTALS AND HTML:** A Brief Introduction to the Internet - The World Wide Web - Web Browsers - Web Servers -URLs, MIME, HTTP, Security- Introduction to HTML- Origins and Evolution of HTML and HTML - Basic Syntax - Standard HTML Document Structure - Basic Text Markup - Images- Hypertext Links - Lists, Tables, Forms, The Audio Element, The Video Element - Organization Elements, The Time Element.	12
II	**INTRODUCTION TO XHTML AND CSS:** Basic syntax, Standard structure, Basic textmarkup, Images, Hypertext Links. Lists, Tables, Forms, Frames, syntactic differences between HTML and XHTML-Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The box model, Background images, The and tags, Conflict resolution.	12
III	THE BASICS OF JAVASCRIPT: Overview of JavaScript, Object orientation and JavaScript, general Syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions, Errors in scripts. **JAVASCRIPT AND XHTML DOCUMENTS**: The JavaScript Execution Environment, The Document Object Model, Elements Access in Java Script, Events and Event Handling, Handling Events from Body Elements, Handling Events from Text Box and password Elements, The DOM2 Model.	12

IV	DYNAMIC DOCUMENTS WITH JAVASCRIPT AND XML: Introduction, Positioning Elements, Moving Elements, Element Visibility, Changing Color and Fonts, Dynamic Content, Stacking Elements, Locating the Mouse Cursor, Reacting to a Mouse Click, Slow Movement of Elements, Dragging and Dropping Elements. Introduction to XML, Syntax of XML, XML Document Structure, Document type definitions, Namespaces, XML schemas, displaying raw XML documents, Displaying XML documents with CSS, XSLT Style Sheets, Web services.	**12**
V	**PHP, ANGULAR JS AND JQUERY:** Introduction to PHP: Overview of PHP -General Syntactic Characteristics - Primitives, Operations, and Expressions - Output - Control Statements - Arrays -Functions - Pattern Matching - Form Handling - Cookies - Session Tracking - Introduction to JQuery, Syntax, selectors, events, JQuery HTML, JQuery Effects, JQuery CSS. Introduction to Angular JS, Directives, Expressions, Controllers, Filters, Services, Events, Forms, Validations, Examples.	**12**

COURSE OUTCOMES:

CO1	Design dynamic web pages using Javascript, Jquery and Angular Java scripts
CO2	Develop Web pages using HTML, CSS and XML
CO3	Create web application using PHP and MySQL
CO4	To design dynamic web pages using Angular JavaScript
CO5	Develop interactive web pages using Jquery

TEXTBOOK:

1. Robert W. Sebesta: Programming the World Wide Web, Eighth Edition, Pearson education, 2015. **UNITS:** 1,2,3,4
2. Dayley Brad, Dayley Brendan ,"AngularJS, JavaScript, and jQuery All in One", Sams Teach Yourself 1st Edition, Kindle Edition, 2015.**UNIT**: 5

REFERENCES:

1. M. Srinivasan: Web Programming Building Internet Applications, 3rdEdition, Wiley India, 2009.
2. Jeffrey C. Jackson: Web Technologies-A Computer Science Perspective, Pearson Education, 7thImpression,2012.
3. Chris Bates: Web Technology Theory and Practice, Pearson Education, 2012.
4. Raj Kamal: Internet and Web Technologies, McGraw Hill Education.

E-LEARNING RESOURCES:

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0
CO1	M	S	S	S	S	M	M	S	M	M
CO2	S	S	M	S	S	S	M	S	S	S
CO3	S	S	S	M	S	S	M	M	S	M
CO4	S	S	S	M	S	M	M	S	S	M

CO5	S	S	S	M	S	S	M	S	M	S
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	M
CO2	S	S	M	L	L
CO3	M	M	M	L	L
CO4	S	S	M	M	L
CO5	S	S	S	M	M
Total Weightage					
Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low

TEMPLATE FOR LESSON PLAN

COURSE CODE: P23CU8	TITLE OF THE COURSE: **Web Technology**							
Pedagogy	Total Hours	Lecture	Practical Experience	Peer Group Learning	Demo/ OER /Tutorial	GD / Seminar	ICT / Blended Learning	Field work / Internship
	60	40					20	

UNIT	TOPIC	LECTURE HOURS	MODE OF TEACHING
I	**WEB FUNDAMENTALS AND HTML:** A Brief Introduction to the Internet - The World Wide Web - Web Browsers - Web Servers -URLs, MIME, HTTP, Security	4	Black board

	Introduction to HTML- Origins and Evolution of HTML and HTML - Basic Syntax - Standard HTML Document Structure - Basic Text Markup	4	PPT
	Images- Hypertext Links - Lists, Tables, Forms, The Audio Element, The Video Element - Organization Elements, The Time Element	4	Black board
II	**INTRODUCTION TO XHTML AND CSS:** Basic syntax, Standard structure, Basic text-markup, Images, Hypertext Links. Lists, Tables, Forms, Frames	4	Black board
	Syntactic differences between HTML and XHTML- Introduction, levels of style sheets, Style specification	4	Black board
	formats, Selector forms, Property value forms, Font properties		
	List properties, color, alignment of text, the box model, background images, The and tags, Conflict resolution.	4	PPT
III	THE BASICS OF JAVASCRIPT: Overview of JavaScript, Object orientation and JavaScript, general Syntactic characteristics, Primitives, operations and expressions, screen output and keyboard input.	4	Black board
	Control statements, Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions, errors in scripts.	4	Black board
	JAVASCRIPT AND XHTML DOCUMENTS: The JavaScript Execution Environment, The Document Object Model, Elements Access in Java Script, Events and Event Handling, Handling Events from Body Elements, Handling Events from Text Box and password Elements, The DOM2 Model.	4	PPT
IV	DYNAMIC DOCUMENTS WITH JAVASCRIPT AND XML: Introduction, Positioning Elements, Moving Elements, Element Visibility, Changing Color and Fonts, Dynamic Content, Stacking Elements, Locating the Mouse Cursor.	4	Black board
	Reacting to a Mouse Click, Slow Movement of Elements, Dragging and Dropping Elements. Introduction to XML, Syntax of XML, XML Document Structure	4	Black board
	Document type definitions, Namespaces, XML schemas, displaying raw XML documents, Displaying XML documents with CSS, XSLT Style Sheets, Web services.	4	Black board
V	**PHP, ANGULAR JS AND JQUERY:** Introduction to PHP: Overview of PHP -General Syntactic Characteristics - Primitives, Operations, and Expressions - Output - Control Statements	4	Black board
	Arrays - Functions - Pattern Matching - Form Handling - Cookies - Session Tracking - Introduction to JQuery, Syntax, selectors, events, JQuery HTML, JQuery Effects, JQuery CSS.	4	PPT

	Introduction to Angular JS, Directives, Expressions, Controllers, Filters, Services, Events, Forms, Validations, Examples.	4	PPT

PROGRAMME: M.C.A					
SEMESTER: III	Part : Core IX	COURSE CODE : P23CU9P			
TITLE OF THE COURSE: **Advanced Java Programming Lab**					
HOURS OF INSTRUCTION PER WEEK: 6 P/W		CREDITS:4	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented	✓	Addresses Gender Sensitization	
Relevant to Regional need	✓	Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To implement object oriented concepts in JAVA
- Develop the program using concepts Network programme ● Learn how to create a program in java beans. ● Learn how to connect relational database to Java ● Develop the program using concepts Applet.

CONTENT

1. Implementation of and Exception handling concepts with different type of Exception.
2. Build a Swing application to implement metric conversion.
3. Use Grid Layout to design a calculator and simulate the functions of a simple calculator.
4. Create a Color palette with a matrix of buttons using Applet.
5. To invoke a servlet from HTML forms.
6. To invoke servlet from Applets.
7. To invoke servlet from JSP.
8. Implement message communication using Network Programming.
9. Write a program to connect databases using JDBC.
10. Implementation of Java Beans.

COURSE OUTCOMES:	
CO1	Understand the Object Oriented Program including classes and methods; inheritance and exception handling
CO2	Complete comprehension of String functions and I/O Streams
CO3	Creation of graphical representation using Applet
CO4	Application of Servlets for designing Web based applications
CO5	Usage of JDBC connectivity and implementation of the concept to get desired results from database

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	**PO1**	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1 0**
CO1	S	S	S	-	M	S	-	-	-	S
CO2	S	S	S	-	M	S	-	-	-	L
CO3	S	S	M	-	L	S	-	-	-	M
CO4	M	S	M	-	S	S	-	-	-	M
CO5	S	M	M	-	M	L	-	-	-	M
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	M	L	S	M	L
CO2	M	L	S	M	L
CO3	M	S	M	M	S
CO4	S	S	S	M	M
CO5	S	S	S	M	M
Total Weightage					

Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low

PROGRAMME: M.C.A					
SEMESTER: III	Part : Core X	COURSE CODE : P23CU10			
TITLE OF THE COURSE: **Advanced Machine Learning**					
HOURS OF INSTRUCTION PER WEEK: 5 P/W 50 HrsP/S Each unit : 10 hours		CREDITS: 3	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100

NATURE OF THE COURSE

Relevant to Global need	✓	Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented		Addresses Gender Sensitization	
Relevant to Regional need		Skill Development Oriented	✓	Addresses Environment and Sustainability	✓
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To understand the concepts of Machine Learning.
- To understand the theoretical and practical aspects of types of machine learning
- To teach and get familiarized with supervised learning and their applications.
- To teach and get familiarized with the concepts and algorithms of unsupervised learning.
- To appreciate the concepts and algorithms of deep learning.

UNIT	CONTENT	HRS

I	**Introducing Machine Learning**:The Origins of Machine Learning, Uses and Abuses of Machine Learning _ Basics of Machine Learning Algorithm Model Works - Steps to apply Machine Learning - Choosing a Machine Learning Algorithm - Using Machine Learning concepts. **Managing and Understanding Data:** Data Structures, Vectors And Factors: Lists, Data frames, Matrixes and arrays - Managing Data - Exploring and Understanding Data: Exploring the Structure of Data, Exploring Numeric variables - Exploring Categorical Variables- Exploring Relationships between Variables.	**10**
II	Lazy Learning – C**lassification Using Nearest Neighbors:**The kNN Algorithm- Diagnosing Breast Cancer with the kNN Algorithm- Probabilistic Learning – Classification Using Naive Bayes: Basic concepts of Bayesian Methods- The Naïve Bayes Algorithm- Example – filtering Mobile Phone Spam with the Naive Bayes Algorithm. Divide and Conquer – **Classification Using Decision Trees and Rules:** Understanding Decision Trees- Example – Identifying Risky Bank Loans using C5.0 Decision Trees- Understanding Classification Rules- Example – Identifying Poisonous Mushrooms with Rule Learners.	**10**
III	Forecasting Numeric Data – **Regression Methods:**Understanding Regression- Example – Predicting Medical Expenses using Linear Regression- Understanding Regression Trees	**10**
	and Model Trees- Example – Estimating the Quality of Wines with Regression Trees and Model Trees. Black Box Methods Neural Networks and Support Vector Machines: Understanding Neural Networks, from Biological to Artificial Neurons, Activation Functions, Network Topology, Training Neural Networks with Backpropagation - Modeling the Strength of Concrete with ANNs- Understanding Support Vector Machines- Performing OCR with SVMs- Finding Patterns – Market Basket Analysis Using Association Rules: Understanding Association Rules- Example – Identifying Frequently Purchased Groceries with Association Rules.	
IV	Finding Groups of Data – **Clustering with K-Means:** Understanding Clustering- The kmeans Algorithm for clustering- Finding teen market segments using k-means Clustering- Evaluating Model Performance: Measuring Performance for Classification- Beyond Accuracy – other Measures of Performance, Visualizing Performance Tradeoffs. Improving Model Performance: Tuning Stock Models for Better Performance-Using Caret for Automated Parameter Tuning- Creating a simple Tuned Model- Customizing the Tuning Process- Improving Model Performance with meta-learning- Understanding Ensembles- Bagging- Boosting- Random forests.	**10**

V	**Introduction to Deep Learning:** Introduction to Deep Learning, Single Layer Perceptron Model (SLP), Multilayer Perceptron Model (MLP), Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), Restricted Boltzmann Machines (RBMs). **Convolutional Neural Networks (CNNs):** Structure and Properties of CNNs - Components of CNN Architectures- Convolutional Layer, Pooling Layer, Rectified Linear Units (ReLU) Layer, Fully Connected (FC) Layer, Loss Layer - Tuning Parameters ,Notable CNN Architectures, Regularization- Recurrent Neural Networks (RNNs): Fully Recurrent Networks, Training RNNs with Back-Propagation Through Time (BPPT)- Elman Neural Networks, Neural History Compressor, Long Short-Term Memory (LSTM), Traditional and Training LSTMs - Structural Damping Within RNNs, Tuning Parameter Update Algorithm.	**10**

COURSE OUTCOMES:

CO1	To understand, impart and analyze the concepts and of Machine Learning Techniques and types of data
CO2	To comprehend, apply and evaluate the classification techniques for real-world applications
CO3	To understand, use and perform evaluation of Regression methods
CO4	To recognize, implement and analyse the unsupervised techniques for real-world applications
CO5	To understand, identify, implement and review the deep learning techniques for real-time applications

TEXTBOOK:

1. Brett Lantz, “Machine Learning with R”, Addison-Wesley Packt Publishing, 2013.
2. TawehBeysolow, “Introduction to Deep Learning Using R: A Step-by-Step Guide to Learning and Implementing Deep Learning Models Using R”, San Francisco, California, USA, 2017.

REFERENCES:

1. Daniel T. Larose, Chantal D. Larose, “Data mining and Predictive analytics”, Second Ed., Wiley Publication, 2015.
2. Bertt Lantz, “Machine Learning with R: Expert techniques for predictive modeling”, 3rd Edition, April 15,2019,
3. Jason Bell, “Machine Learning: Hands-On for Developers and Technical Professionals”, Wiley Publication,2015.

E-LEARNING RESOURCES:

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0
CO1	S	S	-	-	S	L	-	S	-	-
CO2	S	S	M	-	S	L	-	S	-	-

CO3	S	S	S	-	S	L	-	S	-	S
CO4	S	S	M	-	S	L	-	S	-	-
CO5	S	S	S	-	S	L	-	S	-	S
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	M	M	S	L	L
CO2	M	S	S	M	S
CO3	L	L	S	M	L
CO4	L	L	S	M	L
CO5	S	S	S	M	M
Total Weightage					
Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low **TEMPLATE FOR LESSON PLAN**

COURSE CODE: P23CU10	TITLE OF THE COURSE: **Advanced Machine Learning**							
Pedagogy	Total Hours	Lecture	Practical Experience	Peer Group Learning	Demo/ OER /Tutorial	GD / Seminar	ICT / Blended Learning	Field work / Internship
	50	36					14	
UNIT	**TOPIC**						**LECTURE HOURS**	**MODE OF TEACHING**
I	**Introducing Machine Learning**:The Origins of Machine Learning, Uses and Abuses of Machine Learning						4	Black board
	Basics of Machine Learning Algorithm Model Works - Steps to apply Machine Learning						2	PPT
	Choosing a Machine Learning Algorithm - Using Machine Learning concepts.						4	Black board

II	Lazy Learning – **Classification Using Nearest Neighbors:**The kNN Algorithm- Diagnosing Breast Cancer with the kNN Algorithm- Probabilistic Learning – Classification Using Naive Bayes.	4	Black board
	Basic concepts of Bayesian Methods- The Naïve Bayes Algorithm- Example – filtering Mobile Phone Spam with the Naive Bayes Algorithm. Divide and Conquer.	4	Black board
	Classification Using Decision Trees and Rules: Understanding Decision Trees- Example – Identifying Risky Bank Loans using C5.0 Decision Trees- Understanding Classification Rules- Example – Identifying Poisonous Mushrooms with Rule Learners.	2	PPT
III	Forecasting Numeric Data – **Regression Methods:**Understanding Regression- Example – Predicting Medical Expenses using Linear Regression- Understanding Regression Trees and Model Trees- Example – Estimating the Quality of Wines with Regression Trees and Model Trees.	4	Black board
	Black Box Methods Neural Networks and Support Vector Machines: Understanding Neural Networks, from Biological to Artificial Neurons, Activation Functions, Network Topology, Training Neural Networks with Backpropagation - Modeling the Strength of Concrete with ANNs	4	Black board
	Understanding Support Vector Machines- Performing OCR with SVMs- Finding Patterns – Market Basket Analysis Using Association Rules: Understanding Association Rules- Example – Identifying Frequently Purchased Groceries with Association Rules.	2	PPT
IV	Finding Groups of Data – **Clustering with K-Means:** Understanding Clustering- The k-means Algorithm for clustering- Finding teen market segments using k-means Clustering	4	Black board
	Evaluating Model Performance: Measuring Performance for Classification- Beyond Accuracy – other Measures of Performance, Visualizing Performance Tradeoffs.	4	Black board
	Improving Model Performance: Tuning Stock Models for Better Performance-Using Caret for Automated Parameter Tuning- Creating a simple Tuned Model- Customizing the Tuning Process- Improving Model Performance with metalearning- Understanding Ensembles- Bagging- Boosting- Random forests.	2	Black board
V	**Introduction to Deep Learning:** Introduction to Deep Learning, Single Layer Perceptron Model (SLP), Multilayer Perceptron Model (MLP), Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), Restricted Boltzmann Machines (RBMs).	4	Black board

	Convolutional Neural Networks (CNNs): Structure and Properties of CNNs - Components of CNN Architectures- Convolutional Layer, Pooling Layer, Rectified Linear Units (ReLU) Layer, Fully Connected (FC) Layer, Loss Layer - Tuning Parameters ,Notable CNN Architectures, Regularization	4	PPT
	Recurrent Neural Networks (RNNs): Fully Recurrent Networks, Training RNNs with Back-Propagation Through Time (BPPT)- Elman Neural Networks, Neural History Compressor, Long Short-Term Memory (LSTM), Traditional and Training LSTMs - Structural Damping Within RNNs, Tuning Parameter Update Algorithm.	2	PPT

PROGRAMME: M.C.A					
SEMESTER: III	Part : Elective V	COURSE CODE : P23DU18P			
TITLE OF THE COURSE: **Web Technologies Lab**					
HOURS OF INSTRUCTION PER WEEK: 5 P/W		CREDITS: 3	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100
NATURE OF THE COURSE					
Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented	✓	Addresses Gender Sensitization	
Relevant to Regional need	✓	Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- Learn how to create web pages using HTML, CSS and Javascript.
- Implement dynamic web pages using Javascript, Jquery and Angular Java script
- To create web applications using PHP and MySQL ● Create web pages using XML and Cascading Style Sheets ● Create XML documents and Schemas.

CONTENT

1. Develop a web page to display your education details in a tabular format.
2. Develop a web page to display your CV on a web page.
3. Design a Homepage having three links: About Us, Our Services and Contact Us. Create separate web pages for the three links.
4. Design a web page to demonstrate the usage of inline CSS, internal CSS and external CSS.
5. Design an XML document and create a style sheet in CSS & display the document in the browser.
6.Develop a web page to Create image maps.
7. Design a web page to perform input validation using Angular Javascript.
8. Develop a web page in PHP to fetch details from the database.
9. Design a web page to hide paragraph using JQuery
10. Create a web page and add Javascript to handle mouse events and form events

COURSE OUTCOMES:	
CO1	Design dynamic web pages using JavaScript, Jquery and Angular Java script
CO2	Develop Web pages using HTML, CSS and XML
CO3	Create web application using PHP and MySQL
CO4	Develop interactive web pages using Jquery
CO5	To design dynamic web pages using Angular javascript

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	**PO1**	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1 0**
CO1	M	S	S	S	S	M	M	S	M	M
CO2	S	S	M	S	S	S	M	S	S	S
CO3	S	S	S	M	M	S	M	M	S	M
CO4	S	M	S	M	S	M	M	S	S	M
CO5	M	M	S	M	S	S	M	S	M	M
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	S	S	S	M	M
CO2	S	S	M	L	L
CO3	M	M	M	L	L
CO4	S	S	M	M	L
CO5	S	S	S	M	M
Total Weightage					

Weighted % of Course Contribution to PSOs					

PROGRAMME: M.C.A					
SEMESTER: III	Part : Skill enhancement course-II (self study course) - lab	COURSE CODE : P23SEU2			
TITLE OF THE COURSE: **Integrated Technology (AML) Lab**					
HOURS OF INSTRUCTION PER WEEK: 2 P/W		CREDITS: 2	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented	✓	Addresses Gender Sensitization	
Relevant to Regional need	✓	Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To formulate machine learning problems corresponding to different applications.
- To understand a range of machine learning algorithms along with their strengths and weaknesses.
- To apply machine learning algorithms to solve problems of moderate complexity.
- To apply CNN to solve problems of moderate complexity.
- To apply LSTM and RNN to solve problems.

CONTENT

Write a python program to compute the Central Tendency Measures: Mean, Median, Mode, Measure of Dispersion: Variance, Standard Deviation

1. Implement a Linear Regression and Multiple Linear Regression with a Real Dataset **2.** Implementation of Logistic Regression using sklearn

3. Implement a binary classification model.

4. Classification with Nearest Neighbours and NavieBaye Algorithm

5. Implementation Decision tree for classification using sklearn and its parameter tuning

6. Implement the k-means algorithm.

7. Implement an Image Classifier using CNN in TensorFlow/Keras.

8. Implement an Autoencoder in TensorFlow/Keras.

9. Implement a SimpleLSTM using TensorFlow/Keras.

COURSE OUTCOMES:	
CO1	To understand and implement the mathematical and statistical prospective of machine learning algorithms through python programming
CO2	To recognize and develop the machine learning models through python in built functions
CO3	To understand, impart and develop the machine learning models for real-time dataset
CO4	To comprehend , impart and implement the deep learning models for real-time applications
CO5	To identify and evaluate the performance machine learning models for real-time dataset

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	**PO1**	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1 0**
CO1	S	S	S	-	S	-	-	-	M	-
CO2	S	S	S	-	S	-	-	-	M	-
CO3	S	S	S	-	S	-	-	-	M	S
CO4	S	S	S	-	S	-	-	-	M	-

CO5	S	S	S	-	S	-	-	-	M	S
Weightage	S	S	S	-	S	-	-	-	M	-
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	M	L	L
CO2	S	L	M	L	L
CO3	S	S	M	M	L
CO4	S	S	M	M	L
CO5	S	S	M	M	L
Total Weightage					
Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low

PROGRAMME: M.C.A					
SEMESTER: IV	Part : Core XI	COURSE CODE : P23CU11			
TITLE OF THE COURSE: **Mobile Computing**					
HOURS OF INSTRUCTION PER WEEK: 6 P/W 60 HrsP/S Each unit : 12 hours		CREDITS: 5	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented	✓	Addresses Gender Sensitization	
Relevant to Regional need		Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need	✓			Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To introduce the concepts of wireless devices with signal, Antenna, Radio Frequencies, Signal Propagation.
- To introduce wireless communication and networking principles that support connectivity to cellular networks, Wireless LAN, GSM, CDMA.
- To introduce the WAP Architecture, MANET and Routing

UNIT	CONTENT	HRS
I	Introduction – Applications – History of wireless communication – A Simplified reference model - Wireless transmission – Frequencies for radio transmission – Regulations – Signals –Antennas - Signal propagation: Path loss of radio signals - Additional signal propagation effects - Multi-path propagation – Multiplexing –Modulation Chapters: 1, 2.1 to 2.6	12
II	Spread spectrum – Direct sequence spread spectrum – Frequency hopping spread spectrum – Cellular systems. Medium access control: Hidden and exposed terminals – Near and far terminals – SDMA, FDMA, TDMA, Fixed TDM, Classical Aloha, slotted Aloha, Carrier sense multiple access – Reservation TDMA – Multiple access with collision avoidance – Polling – CDMA – Spread Aloha multiple access. Chapters: 3.1 to 3.3, 3.4.1 to 3.4.4, 3.4.7 to 3.4.9, 3.5.1	12
III	GSM - Mobile services – System architecture – Radio interface – Protocols – Localization and calling – Handover – Security – New Data services. UMTS and IMT-2000 - Satellite Systems: Applications – Basics – Routing – Localization – Handover.Chapters: 3.6, 4.1.1 to 4.1.8, 4.4, 5.2 to 5.6	12
IV	Wireless LAN: Infra red vs. radio transmission – Infrastructure and ad-hoc network – IEEE 802.11 – System architecture – Protocol architecture – Physics layer – Medium access	12
	control layer – MAC management – Blue tooth. Mobile network layer: Mobile IP: Goals, assumptions and requirements – entities and terminology – packet delivery – Agent discovery – Registration – Tunneling and encapsulation Recent technologies Chapters: 7.1 to 7.3.5, 7.5, 8.1.1 to 8.1.6	
V	WAP: Architecture – wireless datagram Protocol, Wireless transport layer security, Wireless transaction protocol, Wireless session protocol, Wireless application environment, Mobile ad-hoc networks – MANET Characteristics – Classification of MANETs, Routing of MANETs, Proactive Routing Protocol - DSDV, Reactive Routing Protocols – DSR, AODV.Chapter10.3.1 to 10.3.6 (Text Book 2- 6.1, 6.2, 6.4, 6.5, 6.6)	12

COURSE OUTCOMES:	
CO1	Understanding the basic concepts of Mobile and Wireless Communication
CO2	Understanding the basic concepts of Spread Spectrum. Analyzing the concepts of Medium Access Control.
CO3	Analyzing the concepts of Global System for Mobile Communication and Satellite Communications. Understanding the basic concepts of Wireless LAN

CO4	Understanding the basic concepts of Wireless LAN. Evaluate the performance of Mobile Network Layer
CO5	Understanding the basic concepts of Wireless Application Protocol and create a MoileApp with real-time application. Analyzing the concepts of Routing Protocols in MANET

TEXTBOOK:

1. Jochen Schiller, "Mobile Communications", Second Edition, PearsonEducation, 2013.
2. KumKumGarg, "Mobile Computing Theory and Practice", Pearson Education, 2014.

REFERENCES:

1. Rifaat A. Dayen, "Mobile Data & Wireless LAN Technologies", Prentice Hall,1997.
2. Steve Mann and Scoot Schibli, "The Wireless Application Protocol", John Wiley & Inc., 2000.

E-LEARNING RESOURCES:

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0
CO1	L	-	-	-	-	-	-	-	-	-
CO2	S	M	M	M	M	-	M	-	-	-
CO3	S	M	M	M	M	-	M	-	-	L
CO4	S	M	M	M	M	-	M	-	-	L
CO5	S	M	M	M	M	-	M	-	-	L
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	L	L	M	M
CO2	L	L	L	L	L
CO3	L	M	M	M	L
CO4	S	S	M	M	M
CO5	S	S	S	S	M
Total Weightage					
Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low

TEMPLATE FOR LESSON PLAN

COURSE CODE: P23CU11	TITLE OF THE COURSE: **Mobile Computing**							
Pedagogy	Total Hours	Lecture	Practical Experience	Peer Group Learning	Demo/ OER /Tutorial	GD / Seminar	ICT / Blended Learning	Field work / Internship
	60	40					20	
UNIT	**TOPIC**						**LECTURE HOURS**	**MODE OF TEACHING**
I	Introduction – Applications – History of wireless communication – A Simplified reference model						4	Black board
	Wireless transmission – Frequencies for radio transmission – Regulations – Signals –Antennas - Signal propagation						4	PPT
	Path loss of radio signals - Additional signal propagation effects - Multi-path propagation – Multiplexing – Modulation						4	Black board
II	Spread spectrum – Direct sequence spread spectrum – Frequency hopping spread spectrum – Cellular systems. Medium access control						4	Black board
	Hidden and exposed terminals – Near and far terminals – SDMA, FDMA, TDMA, Fixed TDM, Classical Aloha, slotted Aloha, Carrier sense multiple access						4	Black board
	Reservation TDMA – Multiple access with collision avoidance – Polling – CDMA – Spread Aloha multiple access.						4	PPT
III	GSM - Mobile services – System architecture – Radio interface – Protocols – Localization and calling						4	Black board
	Handover – Security – New Data services. UMTS and IMT-2000						4	Black board
	Satellite Systems: Applications – Basics – Routing – Localization – Handover.						4	PPT
IV	Wireless LAN: Infra red vs. radio transmission – Infrastructure and ad-hoc network – IEEE 802.11 – System architecture						4	Black board
	Protocol architecture – Physics layer – Medium access control layer – MAC management – Blue tooth. Mobile network layer: Mobile IP: Goals, assumptions and requirements						4	Black board

	Entities and terminology – packet delivery – Agent discovery – Registration – Tunneling and encapsulation Recent technologies.	4	Black board
V	WAP: Architecture – wireless datagram Protocol, Wireless transport layer security, Wireless transaction protocol	4	Black board
	Wireless session protocol, Wireless application environment, Mobile ad-hoc networks - MANET Characteristics	4	PPT
	Classification of MANETs, Routing of MANETs, Proactive Routing Protocol - DSDV, Reactive Routing Protocols – DSR, AODV.	4	PPT

PROGRAMME: M.C.A					
SEMESTER: IV	Part : Core XII	COURSE CODE : P23CU12			
TITLE OF THE COURSE: **Software Project Management**					
HOURS OF INSTRUCTION PER WEEK: 6 P/W 60 HrsP/S Each unit : 12 hours		CREDITS: 5	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100
NATURE OF THE COURSE					
Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented		Addresses Gender Sensitization	

Relevant to Regional need		Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need	✓			Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:
The main objectives of this course are:

1. To provide in depth knowledge about the basic concepts of software project management, project planning and Step Wise framework in project planning
2. To discuss the Project planning, cost benefit
3. To inculcate continual training and learning to improve group working

UNIT	CONTENT	HRS
I	Software Project Management -Software Project Versus Other Project –Requirement Specification –Information and Control in Organization –Introduction to step wise Project Planning –Select –Identify Scope and Objectives -Identify Project Infrastructure –AnalyseProject Characteristics –Products and Activities –Estimate Effort for each Activity –Identify Activity Risks –Allocate Resources -Review / Publicize Plan –Execute Plan and Lower Levels of Planning.	12
II	Introduction –Strategic Assessment –Technical Assessment –Cost Benefit Analysis –Cash Flow Forecasting –Cost Benefit Evaluation Techniques –Risk Evaluation –Selection of an Appropriate Project App roach –Choosing Technologies –Choice of Process Models –Structured Methods – Rap id Application Development –Waterfall Model –V-Process Model –Spiral Model – Software Prototyping –Ways of Categorizing Prototypes –Tools –Incremental Delivery –Selection Process Model.	12
III	Introduction –Problem s with Over and Under Estimates –Basis for Software Estimating –Software Effort Estimation Technique –Albrecht Function Point Analysis –Function Points – Object Points –Procedural Code Oriented Approach –COCOMO –ActivityPlanning –Project Schedules -Projects and activities –Sequencing and Scheduling Activities –Network Planning Models –Formulating a Network Planning –Adding Time Dimension –Forward	12
	Pass – Backward Pas s –Identifying the Critical Path –Activity Float -Shortening Project Duration – Identifying Critical Activities –Precedence Networks.	
IV	Introduction –Nature of Risk Man aging Identification –Analysis –Reducing –Evaluating – Z values –Resource Allocation –Nature of Resources –Requirements –Scheduling – Critical Paths – Counting the Cost –Resource Schedule –CostSchedule –Scheduling Sequence –Monitoring and Control –Creating the Frame Work -Collecting the Data – Visualizing the Progress –Cost Monitoring –Prioritizing Monitoring –Change Control.	12
V	Introduction –Types of Contract –Stages in Contract Placement –Terms of Contract – Contract Management –Acceptance –Managing People and Organizing Teams – Organizational Behavior Background –Selecting the Right Person for the Job – Instruction in the Best Methods – Motivation –Decision Making –Leadership – Organizational Structures –Software Quality –Importance –Practical Measures –Product.	12

COURSE OUTCOMES:	
CO1	Understand the fundamentals of Software Project Management
CO2	Understand the ProjectEvaluation by Strategic, Technical and Cost analysis
CO3	Understand the fundamentals of Software effort estimations
CO4	Understand the Risk Management, risk analysis and monitoring.
CO5	Understanding the various types of contracts and the Organizational Behavior Background

TEXTBOOK:

Bob Hughes (Author), Mike Cotterell (Author), Rajib Mall (Author)- 2 October 2017
Software Engineering Project Management, Richard Thayers 2nd Edition 2014 Effective Software Project Management, Robert K. Wysocki - 2010

REFERENCES:

Walker Royce, "Software Project Management , Addition Wesley.
DerrelInce, H. Sharp and M. Woodman, "Introduction to Software Project Management and Quality Assurance , Tata McGraw Hill, 1995

E-LEARNING RESOURCES:

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0
CO1	**S**	**L**	**M**	**M**	**M**	**L**	**L**	**S**	**S**	**L**
CO2	**S**	**M**	**M**	**S**	**S**	**L**	**M**	**S**	**M**	**S**
CO3	**S**	**L**	**L**	**S**	**L**	**M**	**S**	**M**	**M**	**S**
CO4	**S**	**M**	**L**	**L**	**M**	**M**	**S**	**M**	**L**	**M**
CO5	**S**	**L**	**L**	**S**	**M**	**M**	**M**	**S**	**L**	**M**
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	M	S	M
CO2	L	M	S	M	M
CO3	M	M	M	S	L
CO4	L	M	M	S	M
CO5	L	S	M	M	L

Total Weightage					
Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low

TEMPLATE FOR LESSON PLAN

COURSE CODE: P23CU12	TITLE OF THE COURSE: **Software Project Management**							
Pedagogy	Total Hours	Lecture	Practical Experience	Peer Group Learning	Demo/ OER /Tutorial	GD / Seminar	ICT / Blended Learning	Field work / Internship
	60	40					20	
UNIT	**TOPIC**						**LECTURE HOURS**	**MODE OF TEACHING**
I	Software Project Management -Software Project Versus Other Project –Requirement Specification - Information and Control in Organization						4	Black board
	–Introduction to step wise Project Planning –Select –Identify Scope and Objectives -Identify Project Infrastructure –AnalyseProject Characteristics						4	PPT
	Products and Activities –Estimate Effort for each Activity –Identify Activity Risks –Allocate Resources -Review / Publicize Plan –Execute Plan and Lower Levels of Planning.						4	Black board
II	Introduction –Strategic Assessment –Technical Assessment – Cost Benefit Analysis–Cash Flow Forecasting –Cost Benefit Evaluation Techniques.						4	Black board
	Risk Evaluation –Selection of an Appropriate Project App roach –Choosing Technologies –Choice of Process Models –						4	Black board
	Structured Methods - Rap id Application Development							
	Waterfall Model –V-Process Model –Spiral Model – Software Prototyping –Ways of Categorizing Prototypes – Tools –Incremental Delivery – Selection Process Model						4	PPT
III	Introduction –Problem s with Over and Under Estimates – Basis for Software Estimating – Software Effort Estimation Technique –Albrecht Function Point Analysis –Function Points – Object Points –Procedural Code Oriented Approach						4	Black board

	COCOMO –ActivityPlanning –Project Schedules -Projects and activities –Sequencing and Scheduling Activities – Network Planning Models –Formulating a Network Planning –Adding Time Dimension –Forward Pass	4	Black board
	Backward Pas s –Identifying the Critical Path –Activity Float -Shortening Project Duration – Identifying Critical Activities –Precedence Networks.	4	PPT
IV	Introduction –Nature of Risk Man aging Identification – Analysis –Reducing –Evaluating –Z values –Resource Allocation	4	Black board
	–Nature of Resources –Requirements –Scheduling – Critical Paths – Counting the Cost –Resource Schedule – CostSchedule –Scheduling Sequence	4	Black board
	Monitoring and Control – Creating the Frame Work - Collecting the Data – Visualizing the Progress – Cost Monitoring – Prioritizing Monitoring – Change Control	4	Black board
V	Introduction –Types of Contract –Stages in Contract Placement –Terms of Contract –Contract Management	4	Black board
	Acceptance –Managing People and Organizing Teams – Organizational Behavior Background –Selecting the Right Person for the Job	4	PPT
	Instruction on the Best Methods – Motivation –Decision Making –Leadership –Organizational Structures –Software Quality – Importance –Practical Measures –Product.	4	PPT

PROGRAMME: M.C.A		
SEMESTER: IV	Part : Elective VI	COURSE CODE : P23DU19
TITLE OF THE COURSE: **Social Networks**		

HOURS OF INSTRUCTION PER WEEK: 5 P/W 50 HrsP/S Each unit : 10 hours	CREDITS: 3	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented	✓	Addresses Gender Sensitization	
Relevant to Regional need	✓	Skill Development Oriented	✓	Addresses Environment and Sustainability	✓
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To learn about Social media, Social networking and Webcasts
- To understanding and building a Word Press Powered Website ● To analysis the Social Networking & Micro-Blogging.
- To learn and analysis the Widgets & Badges.

To explore the importance of Website optimization

UNIT	CONTENT	HRS
I	Introduction: Social Media Strategy-Important First Decisions -Websites, Blogs - RSS Feeds Mapping -Preparation - Multimedia Items Gathering Content for Blog Posts RSS Feeds & Blogs-RSS Feeds-The Feed Reader-The Feed-Options for Creating an RSS Feed-Planning Feed-Blogs-Options for Starting. Blog and RSS Feed-Feed or Blog ContentSearch Engine Optimization (SEO)-Feed Burner-RSS Feed and Blog Directories-An Optimization Plan for Blog or RSS Feed.	10
II	Building a Word Press Powered Website: Word Press as A CMS - Diversity of Word Press Sites-The Anatomy of a Word Press Site -a Brief Look at the Word Press Dashboard Planning - Site Themes Plug-ins setting up Sidebars Building Pages- Posting Blog Entries. Podcasting, Vidcasting, & Webcasting- Publishing Options for Podcast- Creating and Uploading Podcast Episodes-Publishing Podcast Optimizing Podcast- Webcasting.	10
III	Social Networking & Micro-Blogging: Facebook-The Facebook Profile -Myspace LinkedIn-Twitter-Niche Social Networking Sites-Creating Own Social Network-Promoting Social Networking Presence- Social Bookmarking & Crowd-Sourcing - Social Bookmarking-A Social Bookmarking Strategy- Crowd-Sourced News Sites- Preparation And Tracking Progress Media Communities-Image Sharing Sites-Image Sharing Strategy-	10
	Video Sharing Sites-Video Sharing Strategy-Searching And Search Engine PlacementConnecting With Others.	

IV	Widgets & Badges: Highlighting Social Web Presence-Sharing And Syndicating Content Making Site More Interactive-Promoting Products And Making Money-Using Widgets In Word Press-Widget Communities And Directories- Working Widgets Into Strategy Social Media Newsrooms-Building Social Media Newsroom - Populating The Newsroom-Social Media News Releases-Social Media Newsroom Examples. More Social Tools-Social Calendars-Social Pages Wikis-Social Search Portals-Virtual Worlds.	**10**
V	Website optimization: A Website Optimization Plan-Streamlining Web Presence-An Integration Plan- Looking to the Future-Life streaming: The Future of Blogging-Distributed Social Networking-Social Ranking, Relevancy, and ―Defriending-Web 3.0 or The Semantic Web-Mobile Technology- Measuring Your Success-A Qualitative Framework-A Quantitative Framework-Tools to Help You Measure-Come To Your Own Conclusions.	**10**

COURSE OUTCOMES:	
CO1	To understand, impart and summarize the concepts of Social media, Social networking and Webcasts
CO2	To comprehend, design and develop a Word Press Powered Website
CO3	To understand, implement and perform evaluation of Social Networking and Micro-Blogging
CO4	To collaborate, implement and analyse the Widgets and Badges in social networking environment
CO5	To understand, illustrate and perform evaluation of web optimization for social networks

TEXTBOOK:

Deltina hay ―A Survival Guide To social Media and Web 2.0 Optimization‖, Dalton Publishing, 2009

REFERENCES:

1. Miriam Salpeter ―Social Networking for Career Success‖ Learning Express, 2011.
2. Miles, Peggy, ―Internet world guide to webcasting‖ Wiley, 2008 Professionals", Wiley Publication,2015.

E-LEARNING RESOURCES:

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0
CO1	S	S	S	-	S	L	-	S	-	S
CO2	S	S	S	-	S	L	-	S	-	S
CO3	S	S	S	-	S	L	-	S	-	S
CO4	S	S	S	-	S	L	-	S	-	S
CO5	S	S	S	-	S	L	-	S	-	S

Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	M
CO2	S	S	S	M	L
CO3	S	S	M	S	M
CO4	S	S	S	M	M
CO5	L	S	S	M	M
Total Weightage					
Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low

TEMPLATE FOR LESSON PLAN

COURSE CODE: P23DU19	TITLE OF THE COURSE: **Social Networks**							
Pedagogy	Total Hours	Lecture	Practical Experience	Peer Group Learning	Demo/ OER /Tutorial	GD / Seminar	ICT / Blended Learning	Field work / Internship
	50	36					14	

UNIT	TOPIC	LECTURE HOURS	MODE OF TEACHING
I	Introduction: Social Media Strategy-Important First Decisions -Websites, Blogs - RSS Feeds Mapping -Preparation - Multimedia Items Gathering Content for Blog Posts RSS Feeds	4	Black board
	Blogs-RSS Feeds-The Feed Reader-The Feed-Options for Creating an RSS Feed-Planning Feed-Blogs-Options for Starting. Blog and RSS Feed-Feed	2	PPT
	or Blog Content-Search Engine Optimization (SEO)-Feed Burner-RSS Feed and Blog Directories-An Optimization Plan for Blog or RSS Feed.	4	Black board

II	Building a Word Press Powered Website: Word Press as A CMS - Diversity of Word Press Sites-The Anatomy of a Word Press Site -a Brief Look at the Word Press Dashboard Planning	4	Black board
	Site Themes Plug-ins setting up Sidebars Building Pages-Posting Blog Entries. Podcasting, Vidcasting, & Webcasting	4	Black board
	Publishing Options for Podcast- Creating and Uploading Podcast Episodes -Publishing Podcast Optimizing Podcast-Webcasting.	2	PPT
III	Social Networking & Micro-Blogging: Facebook-The Facebook Profile -Myspace LinkedIn-Twitter-Niche Social Networking Sites-Creating Own Social Network-Promoting Social Networking Presence- Social Bookmarking	4	Black board
	& Crowd-Sourcing - Social Bookmarking-A Social Bookmarking Strategy- Crowd-Sourced News Sites-Preparation And Tracking Progress Media Communities Image - Sharing Sites-Image Sharing Strategy	4	Black board
	Video Sharing Sites-Video Sharing Strategy-Searching And Search Engine Placement-Connecting With Others.	2	PPT
IV	Widgets & Badges: Highlighting Social Web Presence-Sharing And Syndicating Content Making Site More Interactive-Promoting Products And Making Money-Using Widgets In Word Press-Widget Communities And	4	Black board
	Directories- Working Widgets Into Strategy Social Media Newsrooms-Building Social Media Newsroom - Populating The Newsroom-Social Media News Releases.	4	Black board
	Social Media Newsroom Examples. More Social Tools-Social Calendars-Social Pages Wikis-Social Search PortalsVirtual Worlds.	2	Black board
V	Website optimization: A Website Optimization PlanStreamlining Web Presence-An Integration Plan- Looking to the Future-Life streaming: The Future of Blogging-Distributed Social Networking-Social Ranking	2	Black board
	Measuring Your Success-A Qualitative Framework -Relevancy, and -Defriending-Web 3.0 or The Semantic Web-Mobile Technology	4	PPT
	A Quantitative Framework-Tools to Help You Measure-Come To Your Own Conclusions.	4	PPT

PROGRAMME: M.C.A

SEMESTER: IV	Part : Elective VI	COURSE CODE : P23DU20P

TITLE OF THE COURSE: **Social Networks Lab**

HOURS OF INSTRUCTION PER WEEK: 5 P/W	CREDITS: 3	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented	✓	Addresses Gender Sensitization	
Relevant to Regional need	✓	Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To familiarize the tools required to manage social network applications
- To analyze social networks like Facebook, LinkedIn, Google+, GitHub
- To teach the fundamental techniques and principles in achieving a social networking environment.
- To enable students to have skills that will help them to solve real-time applications.
- To explore the Github API.

CONTENT

1. Creating and Exploring Twitter's API
2. To analyzing and visualizing tweets and tweet entities with frequency analysis
3. Creating and Exploring Facebook's Social Graph API
4. To analyze Facebook's Social Graph connections
5. Creating and Exploring LinkedIn API
6. To downloading LinkedIn connections as a CSV file
7. Creating and Exploring Google+ API
8. To create and querying Human Language Data with TF-IDF
9. Creating and Exploring GitHub's API

   To analyze GitHub interest graph

COURSE OUTCOMES:	
CO1	To understand , implement and review the fundamental techniques and principles for social networks.
CO2	To design and develop the programs using the tools required to develop and manage social network like Facebook, LinkedIn, Google+, GitHub
CO3	To create and explore the functionality of social networking tools such as GitHub
CO4	To understand , implement and review the fundamental principles for social network graphs.
CO5	To comprehend and critically analyse the existing API for social networks

MAPPING WITH PROGRAMME OUTCOMES										
CO / PO	**PO1**	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1 0**
CO1	S	S	M		M	S	-	-	-	S
CO2	S	M	S	S	S	M	-	-	-	S
CO3	S	S	S	S	S	S	-	-	-	S
CO4	S	M	S	S	S	M	-	-	-	S
CO5	S	S	S	S	S	S	-	-	-	S
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES					
CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	S	S	S	M	M
CO2	S	S	S	M	L
CO3	S	S	M	S	M
CO4	S	S	S	M	M
CO5	L	S	S	M	M
Total Weightage					
Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low

PROGRAMME: M.C.A		
SEMESTER: IV	Part : Elective VI	COURSE CODE : P23DU21
TITLE OF THE COURSE: **High Performance Computing**		

HOURS OF INSTRUCTION PER WEEK: 5 P/W 50 HrsP/S Each unit : 10 hours	CREDITS: 3	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need	✓	Entrepreneurship Oriented		Addresses Gender Sensitization	
Relevant to Regional need		Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To get a clear idea of High Performance Computing concept.
- To get brief knowledge about how to function the HPC systems.
- To get idea of what techniques used in HPC models.
- To understand a Parallel computing concepts.
- To get familiar with OpenMP technology that is widely used in HPC technology.

UNIT	CONTENT	HRS
I	**Modern processors:** Stored-program computer architecture-General purpose cache based microprocessor architecture-Memory hierarchies-Multicore processors-Multithreaded processors-Vector processors. **Basic optimization techniques for serial code:** Scalar profiling-Common sense optimizations-Simple measures, large impact-The role of compilers-C++ optimizations.	10
II	**Data access optimization:** Balance analysis and light speed estimates-Storage orderAlgorithm classification and access optimizations-The Jacobi algorithm-Algorithm classification and access optimizations-Sparse matrix-vector multiply. **Parallel computers:** Taxonomy of parallel computing paradigms-Shared-memory computers-Distributed memory computers-Hierarchical systems-Networks.	10
III	**Basics of parallelization:** Introduction to Parallelism -Parallel scalability. **Shared memory parallel programming with OpenMP:** Short introduction to OpenMP-OpenMPparallel Jacobi algorithm.	10
IV	**Efficient OpenMP programming:** Profiling OpenMP programs-Performance pitfallsParallel sparse matrix-vector multiply. **Locality optimizations on ccNUMA architectures:** Locality of access on ccNUMA-ccNUMA optimization of sparse MVM-Placement pitfalls-	10
	ccNUMA issues with C++	

V	**Distributed-memory parallel programming with MPI:** Message passing-A short introduction to MPI-MPI parallelization of a Jacobi solver. **Efficient MPI programming:** MPI performance tools-Communication parameters-Synchronization, serialization, contention-Reducing communication overhead-Understanding intranode point-to-point communication.	**10**

COURSE OUTCOMES:	
CO1	Understand of the HPC and ccNUMA concepts
CO2	Design and develop a parallel programming with modern C, C++ and new version of FORTRAN
CO3	Apply with parallel computing
CO4	Develop an efficient OpenMP programming
CO5	Evaluate an efficient MPI programming

TEXTBOOK:

1. Georg Hager, Gerhard Wellein "Introduction to High Performance Computing for Scientists and Engineers", CRC Press, 2011.**Chapters:** 1 to 10.

REFERENCES:

1. Michael W. Berry, Kyle A. Gallivan, EfstratiosGallopoulos, Ananth Grama, Bernard Philippe, Yousef Saad, Faisal Saied, "High-performance scientific computing: algorithms and applications", Springer, 2012.
2. Victor Eijkhout, "Introduction to High Performance Scientific Computing", MIT Press, 2011.

E-LEARNING RESOURCES:

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0
CO1	S	L	M	L	L	L	S	S	S	S
CO2	S	M	L	M	M	L	S	L	S	L
CO3	S	S	S	M	M	L	M	L	M	L
CO4	S	S	S	M	S	L	M	L	M	S
CO5	S	S	S	M	M	L	M	M	M	M
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	M
CO2	L	L	S	M	M

CO3	S	L	M	S	L
CO4	S	S	S	M	M
CO5	S	S	S	M	M
Total Weightage					
Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low

TEMPLATE FOR LESSON PLAN

COURSE CODE: P23DU21	TITLE OF THE COURSE: **High Performance Computing**							
Pedagogy	Total Hours	Lecture	Practical Experience	Peer Group Learning	Demo/ OER /Tutorial	GD / Seminar	ICT / Blended Learning	Field work / Internship
	50	36					14	
UNIT	**TOPIC**						**LECTURE HOURS**	**MODE OF TEACHING**
I	**Modern processors:** Stored-program computer architecture-General purpose cache based microprocessor architecture-Memory hierarchies Multicore processors - Multithreaded processors-Vector processors.						4	Black board
	Basic optimization techniques for serial code: Scalar profiling-Common sense optimizations						2	PPT
	Simple measures, large impact-The role of compilers-C++ optimizations.						4	Black board
II	**Data access optimization:** Balance analysis and light speed estimates-Storage order-Algorithm classification and access optimizations-The Jacobi algorithm-Algorithm classification and access optimizations-Sparse matrix-vector multiply.						4	Black board
	Parallel computers: Taxonomy of parallel computing paradigms-Shared-memory computers						4	Black board
	Distributed memory computers-Hierarchical systems-Networks.						2	PPT
III	**Basics of parallelization:** Introduction to Parallelism Parallel scalability.						4	Black board
	Shared memory parallel programming with OpenMP:						4	Black board

	Short introduction to OpenMP		
	OpenMP-parallel Jacobi algorithm.	2	PPT
IV	**Efficient OpenMP programming:** Profiling OpenMP programs-Performance pitfalls-Parallel sparse matrix-vector multiply.	4	Black board
	Locality optimizations on ccNUMA architectures: Locality of access on ccNUMAccNUMA optimization of sparse MVM	4	Black board
	Placement pitfalls-ccNUMA issues with C++.	2	Black board
V	**Distributed-memory parallel programming with MPI:** Message passing - A short introduction to MPI-MPI parallelization of a Jacobi solver.	2	Black board
	Efficient MPI programming: MPI performance toolsCommunication parameters	4	PPT
	Modern processors: Stored-program computer architecture-General purpose cache based microprocessor architecture-Memory hierarchies Multicore processors - Multithreaded processors-Vector processors.	4	Black board

PROGRAMME: M.C.A					
SEMESTER: IV	Part : Elective VI	COURSE CODE : P23DU22P			
TITLE OF THE COURSE: **High Performance Computing Lab**					
HOURS OF INSTRUCTION PER WEEK: 5 P/W		CREDITS: 3	CIA : 25	EXTERNAL MARKS: 75	TOTAL: 100

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	
Relevant to National need		Entrepreneurship Oriented	✓	Addresses Gender Sensitization	
Relevant to Regional need	✓	Skill Development Oriented	✓	Addresses Environment and Sustainability	
Relevant to Local need				Addresses Human Values	

LEARNING OBJECTIVES: To enable the students to:

- To understand concepts of High Performance Computing.
- To get brief knowledge about PB and Slurm.
- To understand techniques of OpenMP and OpenMPI.
- To understand Parallel computing concepts. To get familiar with CUDA

CONTENT

1. Demo: - Access and best practices on HPC
2. Matrix multiplication with Job scheduling (PB or Slurm)
3. Vectors add with malloc shared
4. Vector add program with MPI
5. Hello world task for Multithreading with openMP
6. openMP shared memory on Host and Device
7. openMP Matrix Multiplication with parallelism and Barrier 8. openMP with Reduction on operands and aggregate functionality
9. Vector and Matrix multiplication on CUDA.
10. Feed forward computing on CUDA

COURSE OUTCOMES:	
CO1	Apply and Evaluate the HPC Programs
CO2	Design and Develop a MPI Programs
CO3	Design and Develop a different programming concepts of OpenMP

CO4	Develop an efficient PB and Slurm programming
CO5	Evaluate an efficient CUDA programming

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	**PO1**	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1 0**
CO1	S	L	M	L	L	L	S	S	S	S
CO2	S	M	L	M	M	L	S	L	S	L
CO3	S	S	S	M	M	L	M	L	M	L
CO4	S	S	S	M	S	L	M	L	M	S
CO5	S	S	S	M	M	L	M	M	M	M
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	S	S	S	M	M
CO2	L	L	S	M	M
CO3	S	L	M	S	L
CO4	S	S	S	M	M
CO5	S	S	S	M	M
Total Weightage					
Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low

PROGRAMME: M.C.A						
SEMESTER: IV	Part : Skill Enhancement course III	COURSE CODE : P23SEU3				
TITLE OF THE COURSE: **Soft Skill Development Lab**						
HOURS OF INSTRUCTION PER WEEK: 3 P/W		CREDITS: 3	CIA : 25	EXTERNAL MARKS: 75		TOTAL: 100

NATURE OF THE COURSE

Relevant to Global need		Employability Oriented	✓	Addresses Professional Ethics	✓
Relevant to National need		Entrepreneurship Oriented	✓	Addresses Gender Sensitization	
Relevant to Regional need	✓	Skill Development Oriented	✓	Addresses Environment and Sustainability	✓
Relevant to Local need				Addresses Human Values	✓

LEARNING OBJECTIVES: To enable the students to:

- To enable students to gain basic communication skills in professional and social contexts effectively.
- To acquire useful words and apply them in situational context.
- To develop listening and reading skills through comprehension passages
- To enrich the leadership qualities and interpersonal communication ● To enhance essential characteristics in writing

CONTENT

Characteristics of Technical Writing

2. Development of Employability Skills
3. Vocabulary Development
4. Sentence Completion
5. Error Spotting
6. Interpretation of Verbal Analogy
7. Interpretation of Reading (Comprehension -Conception)
8. Interpretation of Reading (Comprehension -Reasoning)
9. Practice for writing E-mails/Technical Blogs/Forums
10. PPT Preparation / Demonstration of Technical Presentation
11. Preparation of Resume
12. Preparation for Job Interviews / Mock Interview Section
13. Group Discussion Skills
14. Developing Listening Skill(Comprehension)
15. Practice for Short Speeches / Situational Conversation
16. English through Mass Media
17. Essential Grammar
18. Communicating and collaborating with peer members
19. Team Empowerment
20. Persuasive Communication

COURSE OUTCOMES:	
CO1	Reilience - learning to keep going when things don't go according to plan, coping with the unfamiliar, managing disappointment and dealing with conflict.
CO2	Time and resource management, conflict resolution, teaching and mentoring others.
CO3	Teamwork – learning to connect and work with others to achieve a set task and group learning to increase the memory power.
CO4	Communication- demonstrating clear briefing and listening skills, not being afraid to ask for help and support when necessary.
CO5	Positive thinking and leadership – assessing the requirements of a task, identifying the strengths within the team, utilizing the diverse skills of the group to achieve the set objective, awareness of risk/safety.

TEXTBOOK:

1. Uma Narula, "Development Communication: Theory and Practice", Revised Edition, Har-Aanad Publication, 2019.
2. Annette Capel and Wendy Sharp, "Cambridge English: Objective First", Fourth Edition, Cambridge University Press, 2013.
3. Emma Sue-Prince, "The Advantage: The 7 Soft Skills You Need to Stay One Step Ahead", First Edition, FT Press, 2013.
4. Guy Brook-Hart, "Cambridge English: Business Benchmark",Second Edition, Cambridge University Press, 2014.
5. Norman Lewis, "How to Read Better & Faster", Binny Publishing House, NewDelhi, 1978.

REFERENCES:

1. Michael McCarthy and Felicity O'Dell, "English Vocabulary in Use :100 Units of Vocabulary Reference and Practice", Cambridge UniversityPress,1996.
2. Murphy, Raymond, "Intermediate English Grammar", Second Edition, Cambridge University Press, 1999.

E-LEARNING RESOURCES:

MAPPING WITH PROGRAMME OUTCOMES

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1										
CO2										
CO3										
CO4										
CO5										
Weightage										
Weighted % of Course Contribution to POs										

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					
CO4					
CO5					
Total Weightage					
Weighted % of Course Contribution to PSOs					

S- Strong; M-Medium; L-Low