



**SRI MEENAKSHI GOVT. ARTS COLLEGE FOR WOMEN
(AUTONOMOUS)
MADURAI – 625 002.**

DEPARTMENT OF COMPUTER APPLICATIONS

MASTER OF COMPUTER APPLICATIONS

SYLLABUS FOR THE ACADEMIC YEAR

2023 – 2024

OUTCOME BASED EDUCATION

UNDER C.B.C.S.

SRI MEENAKSHI GOVT ARTS COLLEGE FOR WOMEN (AUTONOMOUS)

DEPARTMENT OF COMPUTER APPLICATIONS

DEPARTMENT NAME : Department of Computer Applications (M.C.A)

INTRODUCTION:

The Department of Computer Applications blossomed in the year 1998 offering Master of Computer Applications course approved by AICTE. In August 2018, the BCA course was started. The Department has an enterprising faculty team of 3 Assistant Professors, 2 Guest faculties and 1 Programmer. It has more than 100 research publications to its credit. They contribute and share their knowledge to the academic community through Invited Talks and Paper presentations in National / International Conferences. The Department makes a continuous effort to upgrade the course content and enhance students' skills.

COURSES OFFERED:

- **B.C.A**
- **M.C.A**
- **M.Phil. Computer Applications.**

VISION

Enabling Students to become enterprising Academicians, Young Entrepreneurs and Responsible Citizens.

MISSION

Imparting Quality Knowledge and Essential Virtues Treading Towards Holistic Development.

PROGRAMME OUTCOME OF M.C.A

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.

PO 9 Multicultural competence

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

PO 10: Moral and ethical awareness/reasoning

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

Programme Specific Outcome (PSO)

After the completion of the programme Post graduate 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.

TANSICHE Template for MCA Programme

Sem-I	Credit	Hours	Semester-II	Credit	Hours	Semester-III	Credit	Hours	Semester-IV	Credit	Hours
1.1. Core-I	5	7	2.1. Core-IV	5	6	3.1. Core-VII	5	6	4.1. Core-XI	5	6
1.2 Core-II	5	7	2.2 Core-V	5	6	3.2 Core-VIII	5	6	4.2 Core-XII	5	6
1.3 Core-III	4	6	2.3 Core – VI	4	6	3.3 Core – IX	5	6	4.3 Project with viva voce	7	10
1.4 Discipline Specific Elective -I	3	5	2.4 Discipline Specific Elective – III	3	4	3.4 Core – X	4	6	4.4 Elective - VI (Industry / Entrepreneurship) 20% Theory 80% Practical	3	4
1.5 Generic Elective-II:	3	5	2.5 Generic Elective -IV:	3	4	3.5 Discipline Specific Elective - V	3	3	4.5 Skill Enhancement course / Professional Competency Skill	2	4
			2.6 NME I	2	4	3.6 NME II	2	3	4.6 Extension Activity	1	
						3.7 Internship/ Industrial Activity	2	-			
	20	30		22	30		26	30		23	30
Total Credit Points -91											

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 Discipline Specific 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 - Generic Elective 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 - Discipline Specific Elective 2 (DSEC2)		Internet of Things	5	3	3	25	75	100
		Internet of Things Lab						
		Network Security and Cryptography						
		Computer Vision						
		Computer Vision Lab						
Elective IV GEC/DSEC4 Generic Elective 2 (GE2)		Cyber Security	5	3	3	25	75	100
		Cyber Security Lab						
		Block Chain technologies						
		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 - Discipline Specific Elective 3 (DSEC3)		Web Technology 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 IV 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

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	Block chain Technologies
17	II	GE2	P23DU17P	Block chain Technologies Lab
18	III	DSEC3	P23DU18P	Web Technology 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

COURSE STRUCTURE ABSTRACT**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

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Madurai - 625 002**

M.C.A. DEGREE EXAMINATION – 2023-24

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|                 | <b>Part-A</b> | <b>Part-B</b> |
|-----------------|---------------|---------------|
| <b>UNIT-I</b>   | <b>2</b>      | <b>2</b>      |
| <b>UNIT-II</b>  | <b>2</b>      | <b>2</b>      |
| <b>UNIT-III</b> | <b>2</b>      | <b>2</b>      |
| <b>UNIT-IV</b>  | <b>2</b>      | <b>2</b>      |
| <b>UNIT-V</b>   | <b>2</b>      | <b>2</b>      |

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

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

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**Total = 75**

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**Evaluation Pattern****I. Internship**

- Students are expected to undergo Summer Internship/ Industrial training for a minimum of 30 hours in the semesters mentioned in the template.
- Evaluation pattern for Internship shall be as follows:
  - Attendance (Mandatory) - 40 marks
  - Field work and performance - 40 marks
  - Report writing - 20 marks

**II. Extension Activity**

- Extension activities should be carried out after the class hours for a minimum of 15 hours.
- Evaluation pattern for Extension Activity shall be as follows:
  - Attendance - 50 marks
  - Participation - 25 marks
  - Report - 25 marks

**III. 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/<br>Choice of the Topic | Methodology/<br>Technology used | Effective content delivery | Interaction/<br>Answering questions | Total |
|-------------------------------------------|---------------------------------|----------------------------|-------------------------------------|-------|
| 5                                         | 5                               | 5                          | 5                                   | 20    |

**Review - II**

| Work Progress | Development of ideas | Effective content delivery | Interaction/<br>Answering questions | Total |
|---------------|----------------------|----------------------------|-------------------------------------|-------|
| 5             | 5                    | 5                          | 5                                   | 20    |

**Review - II**

| Final outcome of the project | Implementation & execution | Effective content delivery | Interaction/<br>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    |

## SYLLABUS

|             |        |            |                                         |
|-------------|--------|------------|-----------------------------------------|
| Programme : | M.C.A  | Part-III : | Core-I                                  |
| Semester :  | I      | Hours :    | 6 P/W 60 HrsP/S<br>Each unit : 12 hours |
| Sub.Code :  | P23CU1 | Credits :  | 6                                       |

Title of the Paper : **Discrete Mathematics**

### Course Objective

- 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 matrix & characteristic equations
- To study the graphs and its types

### Unit-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 examples-Classification of functions-Composition of functions-Inverse function.

### Unit-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.

### Unit-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.

### Unit-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 Theorem-problems.

### Unit-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

### Text book

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

### Reference Book

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

**Course Outcomes**

On the successful completion of the course, students will be able

|      |                                                                                       |       |
|------|---------------------------------------------------------------------------------------|-------|
| CO1: | To understand the concepts of relations and functions, distinguish among normal forms | K2    |
| CO2: | To analyze and evaluate the recurrence relations                                      | K4,K5 |
| CO3: | To distinguish among various normal forms and predicate calculus                      | K5    |
| CO4: | To solve and know various types of matrices                                           | K1    |
| CO5: | To evaluate and solve various types of graphs                                         | K5    |

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

**Mapping with Programme Outcomes**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | S   | S   | -   | S   | L   | -   | M   | M   | M    | M    | S    |
| CO2 | S   | S   | M   | -   | S   | L   | -   | M   | M   | M    | M    | S    |
| CO3 | S   | S   | M   | -   | S   | L   | -   | M   | M   | S    | S    | S    |
| CO4 | S   | S   | M   | -   | S   | L   | -   | M   | M   | M    | M    | S    |
| CO5 | S   | S   | M   | -   | S   | L   | -   | M   | M   | M    | M    | S    |

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

| Units          | Topic                                                                                                                                                     | Lecture Hours | Mode Of Teaching |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------|
| <b>UNIT I</b>  |                                                                                                                                                           |               |                  |
|                | <b>Relations</b> - Binary relations-Operations on relations-properties of binary relations in a set.                                                      | 4             | Black board      |
|                | Equivalence relations— Representation of a relation by a matrix - Representation of a relation by a digraph.                                              | 4             | PPT              |
|                | <b>Functions</b> -Definition and examples-Classification of functions-Composition of functions-Inverse function.                                          | 4             | Black board      |
| <b>UNIT II</b> |                                                                                                                                                           |               |                  |
|                | <b>Mathematical Logic</b> -Logical connectives- <b>Well formed formulas</b> – Truth table of well formed formula –Algebra of proposition – Quine’s method | 4             | Black board      |

|          |                                                                                                                                                                                                                                      |   |             |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-------------|
|          | <b>Normal forms of well formed formulas-</b> Disjunctive normal form-Principal Disjunctive normal form-Conjunctive normal form-Principal conjunctive normal form.                                                                    | 4 | Black board |
|          | <b>Rules of Inference for propositional calculus – Quantifiers-</b> Universal Quantifiers- Existential Quantifiers.                                                                                                                  | 4 | PPT         |
| UNIT III |                                                                                                                                                                                                                                      |   |             |
|          | <b>Recurrence Relations-</b> Formulation -solving recurrence Relation by Iteration- solving Recurrence Relations- Solving Linear Homogeneous Recurrence Relations of Order Two- Solving Linear Non homogeneous Recurrence Relations. | 4 | Black board |
|          | <b>Permutations-</b> Cyclic permutation- Permutations with repetitions- permutations of sets with indistinguishable objects.                                                                                                         | 4 | Black board |
|          | <b>Combinations-</b> Combinations with repetition.                                                                                                                                                                                   | 4 | PPT         |
| UNIT IV  |                                                                                                                                                                                                                                      |   |             |
|          | <b>Matrices-</b> special types of matrices-Determinants-Inverse of a square matrix                                                                                                                                                   | 4 | Black board |
|          | Cramer’s rule for solving linear equations-Elementary operations-Rank of a matrix-solving a system of linear equations                                                                                                               | 4 | Black board |
|          | characteristic roots and characteristic vectors-Cayley-Hamilton Theorem-problems.                                                                                                                                                    | 4 | Black board |
| UNIT V   |                                                                                                                                                                                                                                      |   |             |
|          | <b>Graphs</b> -Connected Graphs -Euler Graphs- Euler line-Hamiltonian circuits and paths                                                                                                                                             | 2 | Black board |
|          | planar graphs – Complete graph-Bipartite graph                                                                                                                                                                                       | 4 | PPT         |
|          | Hyper cube graph-Matrix representation of graphs                                                                                                                                                                                     | 3 | PPT         |

Programme : **M.C.A**

Part-III : **Core II**

Semester : **I**

Hours : **6 P/W 60 HrsP/S**

**Each unit : 12 hours**

Sub.Code : **P23CU2**

Credits : **6**

Title of the Paper : **Linux and Shell Programming**

### Course Objective

- 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-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 parentheses-Looking at case. (Book-1, Chapters: 3, 11, and 12)

## Unit-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 options-Standardizing 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)

## Unit-III

**Creating Functions:** Basic script functions-Returning a value-Using variables in functions-Array 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)

## Unit-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)

## Unit-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)

**Text book:**

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

**Reference Books:**

1. CliffFlynt,SarathLakshman,ShantanuTushar, “Linux Shell Scripting Cookbook ”, Packt Publishing, 3<sup>rd</sup> Edition, 2017.
2. Stephen G.Kochan, Patrick Wood, “Shell Programming in Unix, Linux, and OS X”, Addison Wesley Professional, 4<sup>th</sup> 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

**Course Outcomes**

On the successful completion of the course, students will be able

|      |                                                                                                                                            |       |
|------|--------------------------------------------------------------------------------------------------------------------------------------------|-------|
| CO1: | To understand, apply and analyze the concepts and methodology of Linux shell programming                                                   | K1-K6 |
| CO2: | To comprehend, impart and apply the fundamentals of control structure and script controls                                                  | K1-K6 |
| CO3: | To understand, analyse and evaluate the functions, graphical desktop interface and editors                                                 | K1-K6 |
| CO4: | To collaborate, apply and review the concepts and methodology of regular expression and advanced gawk                                      | K1-K6 |
| CO5: | To comprehend, use and illustrate the advanced concepts such as alternate shell scripts, data connectivity and bash scripting using python | K1-K6 |

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

**Mapping with Programme Outcomes**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | S   | S   | -   | S   | L   | -   | M   | M   | M    | M    | S    |
| CO2 | S   | S   | M   | -   | S   | L   | -   | M   | M   | M    | M    | S    |
| CO3 | S   | S   | M   | -   | S   | L   | -   | M   | M   | S    | S    | S    |
| CO4 | S   | S   | M   | -   | S   | L   | -   | M   | M   | M    | M    | S    |
| CO5 | S   | S   | M   | -   | S   | L   | -   | M   | M   | M    | M    | S    |

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

| Units    | Topic                                                                                                                                                                                                    | Lecture Hours | Mode Of Teaching |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------|
| UNIT I   |                                                                                                                                                                                                          |               |                  |
|          | <b>Basic bash Shell Commands:</b> Interacting with the shell-Traversing the file system-Listing files and directories-Managing files and directories-Viewing file contents.                              | 4             | Black board      |
|          | <b>Basic Script Building:</b> Using multiple commands-Creating a script file-Displaying messages-Using variables-Redirecting input and output-Pipes-Performing math-Exiting the script.                  | 4             | PPT              |
|          | <b>Using Structured Commands:</b> Working with the if-then statement-Nesting ifs-Understanding the test command-Testing compound conditions-Using double brackets and parentheses-Looking at case.       | 4             | Black board      |
| UNIT II  |                                                                                                                                                                                                          |               |                  |
|          | <b>More Structured Commands:</b> Looping with for statement-Iterating with the until statement-Using the while statement-Combining loops-Redirecting loop output.                                        | 4             | Black board      |
|          | <b>Handling User Input:</b> Passing parameters -Tracking parameters-Being shifty-Working with options-Standardizing options-Getting user input.                                                          | 4             | Black board      |
|          | <b>Script Control:</b> Handling signals-Running scripts in the background-Forbidding hang-ups -Controlling a Job-Modifying script priority-Automating script execution.                                  | 4             | PPT              |
| UNIT III |                                                                                                                                                                                                          |               |                  |
|          | <b>Creating Functions:</b> Basic script functions-Returning a value-Using variables in functions-Array and variable functions-Function recursion-Creating a library-Using functions on the command line. | 4             | Black board      |
|          | <b>Writing Scripts for Graphical Desktops:</b> Creating text menus-Building text window widgets-Adding X Window graphics.                                                                                | 4             | Black board      |
|          | <b>Introducing sed and gawk:</b> Learning about the sed Editor-Getting introduced to the gawk Editor-Exploring sed Editor basics.                                                                        | 4             | PPT              |
| UNIT IV  |                                                                                                                                                                                                          |               |                  |
|          | <b>Regular Expressions:</b> Defining regular expressions-Looking at the basics-Extending our patterns-Creating expressions.                                                                              | 4             | Black board      |
|          | <b>Advanced sed:</b> Using multiline commands-Understanding the hold space-Negating a command-Changing the flow-Replacing via a pattern-Using sed in scripts-Creating sed utilities.                     | 4             | Black board      |

|               |                                                                                                                                                                                                                                                                                 |   |             |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-------------|
|               | <b>Advanced gawk:</b> Reexamining gawk-Using variables in gawk-Using structured commands-Formatting the printing-Working with functions.                                                                                                                                        | 4 | Black board |
| <b>UNIT V</b> |                                                                                                                                                                                                                                                                                 |   |             |
|               | <b>Working with Alternative Shells:</b> Understanding the dash shell-Programming in the dash shell-Introducing the zsh shell-Writing scripts for zsh. <b>Writing Simple Script Utilities:</b> Automating backups-Managing user accounts-Watching disk space.                    | 2 | Black board |
|               | <b>Producing Scripts for Databases, Web, and E-Mail:</b> Writing database shell scripts-Using the Internet from your scripts-Emailing reports from scripts.                                                                                                                     | 4 | PPT         |
|               | <b>Using Python as a Bash Scripting Alternative:</b> 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. | 3 | PPT         |

Programme : **M.C.A**Part-III : **Core III**Semester : **I**Hours : **6 P/W 60 HrsP/S****Each unit : 12 hours**Sub.Code : **P23CU3**Credits : **4**Title of the Paper : **Python Programming****Course Objectives:**

- 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 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.

**Unit II**

Strings and Text Files: Accessing Characters and substrings in strings - Data encryption-Strings 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 - Higher-Order Functions.

### Unit 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.

### Unit 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.

### Unit 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.

#### Text Book:

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)**

#### Reference Books:

1. CliffFlynt,SarathLakshman,ShantanuTushar, “Linux Shell Scripting Cookbook ”, Packt Publishing, 3<sup>rd</sup> Edition, 2017.
2. Stephen G.Kochan, Patrick Wood, “Shell Programming in Unix, Linux, and OS X”, Addison Wesley Professional, 4<sup>th</sup> 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

#### Course Outcomes

On the successful completion of the course, students will be able to

|     |                                                                                                                                         |               |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------|---------------|
| CO1 | Comprehend the programming skills in python and develop applications using conditional branches and loops                               | <b>K1- K6</b> |
| 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                                            |               |

|            |                                                  |  |
|------------|--------------------------------------------------|--|
| <b>CO5</b> | Design interactive web applications using Django |  |
|------------|--------------------------------------------------|--|

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

### Mapping with Programme Outcomes

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | S   | M   | S   | M   | S   | S   | S   | S   | M    | S    | S    |
| CO2 | S   | S   | S   | M   | S   | S   | S   | S   | S   | S    | M    | S    |
| CO3 | S   | M   | S   | S   | M   | S   | M   | S   | S   | M    | S    | S    |
| CO4 | S   | S   | S   | S   | S   | S   | S   | M   | S   | S    | M    | S    |
| CO5 | S   | S   | S   | S   | S   | S   | S   | S   | S   | M    | M    | S    |

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

| Units           | Topic                                                                                                                                              | Lecture Hours | Mode Of Teaching |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------|
| <b>UNIT I</b>   |                                                                                                                                                    |               |                  |
|                 | Introduction : Fundamental ideas of Computer Science - Strings, Assignment, and Comments - Numeric Data types and character sets.                  | 4             | Black board      |
|                 | Expressions – Loops and Selection Statements: Definite iteration: the for Loop                                                                     | 4             | PPT              |
|                 | selection: if and if-else statements - Conditional iteration: the while Loop.                                                                      | 4             | Black board      |
| <b>UNIT II</b>  |                                                                                                                                                    |               |                  |
|                 | Strings and Text Files: Accessing Characters and substrings in strings - Data encryption-Strings and Number systems.                               | 4             | Black board      |
|                 | String methods – Text - Lists and Dictionaries: Lists – Dictionaries – Design with Functions                                                       | 4             | Black board      |
|                 | A Quick review - Problem Solving with top-Down Design - Design with recursive Functions - Managing a Program’s namespace - Higher-Order Functions. | 4             | PPT              |
| <b>UNIT III</b> |                                                                                                                                                    |               |                  |
|                 | Design with Classes: Getting inside Objects and Classes – Data-Modeling Examples – Building a New Data Structure                                   | 4             | Black board      |
|                 | The Two – Dimensional Grid - Structuring Classes with Inheritance and Polymorphism - GraphicalUser Interfaces - The Behavior of terminal           | 4             | Black board      |

|                |                                                                                                                                                      |   |             |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------|---|-------------|
|                | Based programs and GUI-Based programs - Coding Simple GUI-Based programs - Windows and Window Components - Command Buttons and responding to events. | 4 | PT          |
| <b>UNIT IV</b> |                                                                                                                                                      |   |             |
|                | Working with Python Packages: NumPy Library-Ndarray – Basic Operations – Indexing, Slicing and Iteration                                             | 4 | Black board |
|                | Array manipulation - Pandas –The Series – The DataFrame - The Index Objects – Data Vizualization with Matplotlib                                     | 4 | Black board |
|                | The Matplotlib Architecture – pyplot – The Plotting Window – Adding Elements to the Chart – Line Charts – Bar Charts – Pie charts.                   | 4 | Black board |
| <b>UNIT V</b>  |                                                                                                                                                      |   |             |
|                | Django: Installing Django – Building an Application – Project Creation                                                                               | 2 | Black board |
|                | Designing the Data Schema - Creating an administration site for models                                                                               | 4 | PPT         |
|                | Working with QuerySets and Managers – Retrieving Objects – Building List and Detail Views.                                                           | 3 | PPT         |

## **Electives I**

Programme : **M.C.A**

Part-III : **Elective -I**

Semester : **I**

Hours : **6 P/W 60 HrsP/S**

**Each unit : 12 hours**

Sub.Code : **P23DU01**

Credits : **3**

Title of the Paper : **Data Engineering and Management**

### **Course Objectives:**

- 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-I**

**DATABASE DEVELOPMENT:** Database architecture of an information system-Overview of the database development process-Conceptual data modeling-Relational data analysis-Roles 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 management-Relationship between data management and enterprise.

**Unit-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.

**Unit-III:**

USE OF PACKAGED APPLICATION SOFTWARE: Application software packages-Impact 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.

**Unit-IV:**

CRM: Three main pillars of CRM. GETTING TO KNOW YOUR CUSTOMER: 360-degree client view. UTILIZING ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN YOUR CRM STRATEGY: 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.

**Unit-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.

**Text Books:**

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)

**Ref. Books:**

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.

**Course Outcome:**

On the successful completion of the course, students will be able to,

| Course Outcome | Description                                                          | Knowledge Level |
|----------------|----------------------------------------------------------------------|-----------------|
| CO1            | Comprehend the Data Management concepts and analyse the relationship | K1- K6          |



|     |                                                                         |  |
|-----|-------------------------------------------------------------------------|--|
|     | 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                                       |  |

K1- Remember, K2 - Understand, K3 - Apply, K4 - Analyze, K5 - Evaluate, K6 -Create

**Mapping with Programme Outcomes:**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | S   | M   | S   | M   | S   | S   | S   | S   | M    | S    | S    |
| CO2 | S   | S   | S   | M   | S   | S   | S   | S   | S   | S    | M    | S    |
| CO3 | S   | M   | S   | S   | M   | S   | M   | S   | S   | M    | S    | S    |
| CO4 | S   | S   | S   | S   | S   | S   | S   | M   | S   | S    | M    | S    |
| CO5 | S   | S   | S   | S   | S   | S   | S   | S   | S   | M    | M    | S    |

L - Low, M- Medium, S – Strong

| Units           | Topic                                                                                                                                                                                                                                             | Lecture Hours | Mode Of Teaching |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------|
| <b>UNIT I</b>   |                                                                                                                                                                                                                                                   |               |                  |
|                 | DATABASE DEVELOPMENT: Database architecture of an information system-Overview of the database development process-Conceptual data modeling-Relational data analysis-Roles of a data model-Physical database design.                               | 4             | Black board      |
|                 | 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             | Black board      |
| <b>UNIT II</b>  |                                                                                                                                                                                                                                                   |               |                  |
|                 | 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. | 4             | Black board      |
|                 | DATA QUALITY: Issues associated with poor data quality-Causes of poor data quality-Dimensions of data quality-Data model quality- Improving data quality.                                                                                         | 4             | Black board      |
|                 | DATA ACCESSIBILITY: Data security-Data integrity-Data recovery.                                                                                                                                                                                   | 4             | PPT              |
| <b>UNIT III</b> |                                                                                                                                                                                                                                                   |               |                  |
|                 | USE OF PACKAGED APPLICATION SOFTWARE: Application software packages-Impact on data management.                                                                                                                                                    | 4             | Black board      |

|         |                                                                                                                                                                                                          |   |             |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-------------|
|         | 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 | Black board |
|         | BUSINESS INTELLIGENCE: Data warehousing-Multidimensional model of data-Standard reporting tools-Online analytical processing OLAP-Relational schema for a data warehouse.                                | 4 | PPT         |
| UNIT IV |                                                                                                                                                                                                          |   |             |
|         | CRM: Three main pillars of CRM. GETTING TO KNOW YOUR CUSTOMER: 360-degree client view.                                                                                                                   | 4 | Black board |
|         | UTILIZING ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN YOUR CRM STRATEGY:                                                                                                                             | 4 | Black board |
|         | 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 | Black board |
| UNIT V  |                                                                                                                                                                                                          |   |             |
|         | CLOUD VERSUS ON PREMISE VERSUS HYBRID: Factors influencing vendor selection-Hybrid deployment-what are your options.                                                                                     | 2 | Black board |
|         | 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 | 4 | PPT         |
|         | Social selling and advertising-Implementation tools-Sustainable CRM platform.                                                                                                                            | 3 | PPT         |

Programme : **M.C.A**  
Semester : **I**  
Sub.Code : **P23DU02P**

Part-III : **Elective -I**  
Hours : **6 P/w**  
Credits : **3**

Title of the Paper : **Data Engineering and Management Lab**

### Course Objectives:

- 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
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**

**On the successful completion of the course, students will be able to**

| Course Outcome | Description                                                                                  | Knowledge Level |
|----------------|----------------------------------------------------------------------------------------------|-----------------|
| CO1            | Comprehend the scripting knowledge in MongoDB and perform basic operations in a shell prompt | <b>K1- K6</b>   |
| 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                                                  |                 |

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

**Mapping with Programme Outcomes**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | S   | S   | S   | S   | M   | S   | S   | S   | M    | S    | S    |
| CO2 | S   | S   | S   | S   | S   | S   | S   | S   | S   | S    | L    | S    |
| CO3 | S   | M   | S   | S   | M   | S   | M   | S   | S   | S    | S    | S    |
| CO4 | S   | S   | S   | M   | S   | S   | S   | L   | S   | S    | M    | S    |
| CO5 | S   | S   | S   | S   | M   | S   | S   | S   | S   | S    | S    | S    |

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

Programme : **M.C.A**  
Semester : **I**  
Sub.Code : **P23DU03**

Part-III : **Elective -I**  
Hours : **6 P/w 60 HrsP/S**  
**Each unit : 12 hours**  
Credits : **3**

Title of the Paper : **Architecture and Frameworks**

### **Course Objectives**

- 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 – 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.

### **Unit – II**

Domain Knowledge – Developing business acumen – Domain-driven design – requirement engineering – requirement elicitation –Software Quality attributes: Maintainability – Usability –Availability – Portability – Interoperability - Testability.

### **Unit – 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.

### **Unit – IV**

Designing orthogonal software systems – Minimizing complexity – SOLID design principles – Software architecture patterns – layered – Event-driven architecture – Model-View patterns – Service-oriented architecture.

### **Unit – 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.

**Text Book**

Joseph Ingeno, “Software Architect’s Handbook” Packt Publishing 2018.

**Reference books**

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

**Course Outcomes**

On the successful completion of the course, students will be able to

|     |                                                                                                                                                                                                 |       |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| CO1 | Understand, analyze and evaluate the purpose of Software architecture and development methodologies with consideration of risk management                                                       | K1-K6 |
| CO2 | Comprehend, apply and evaluate the domain knowledge for software development process and determine the impact of quality attributes.                                                            | K1-K6 |
| CO3 | Understand, track and examine the systematic approach for various software design models with effective document process                                                                        | K1-K6 |
| CO4 | Illustrate and summarize the functions of orthogonal systems with complexity, design principles and design pattern for software architecture                                                    | K1-K6 |
| 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 | K1-K6 |

**K1- Remember, K2- Understand, K3- Apply , K4- Analyze, K5- evaluate and K6- Create**

**Mapping with Programme Outcome**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | M   | S   | -   | L   | M   | S   | M   | M   | L   | S    | -    | -    |
| CO2 | M   | S   | -   | M   | M   | L   | S   | S   | M   | M    | S    | -    |
| CO3 | S   | M   | -   | S   | S   | M   | S   | M   | M   | S    | M    | -    |
| CO4 | S   | M   | L   | S   | M   | L   | S   | L   | S   | M    | S    | M    |
| CO5 | M   | S   | M   | L   | S   | L   | M   | S   | L   | S    | -    | M    |

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

| Units           | Topic                                                                                                                                                           | Lecture Hours | Mode Of Teaching |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------|
| <b>UNIT I</b>   |                                                                                                                                                                 |               |                  |
|                 | Software architecture introduction – Importance of Software architecture –Software architecture consumers – Architect role                                      | 4             | Black board      |
|                 | 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             | Black board      |
| <b>UNIT II</b>  |                                                                                                                                                                 |               |                  |
|                 | Domain Knowledge – Developing business acumen – Domain-driven design – requirement engineering – requirement elicitation                                        | 4             | Black board      |
|                 | Software Quality Attributes: Maintainability                                                                                                                    | 4             | Black board      |
|                 | Usability –Availability – Portability – Interoperability - Testability.                                                                                         | 4             | PPT              |
| <b>UNIT III</b> |                                                                                                                                                                 |               |                  |
|                 | Software Architectures design – Importance - Top-down Versus bottom-up design approaches – Architectural drivers – Documenting the Software architecture design | 4             | Black board      |
|                 | Systematic approach - Attribute-driven design – Microsoft’s technique for architecture and design –Architecture-centric design method                           | 4             | Black board      |
|                 | Architecture development method – Tracking the progress of the software architecture’s design.                                                                  | 4             | PPT              |
| <b>UNIT IV</b>  |                                                                                                                                                                 |               |                  |
|                 | Designing orthogonal software systems – Minimizing complexity – SOLID design principles                                                                         | 4             | Black board      |
|                 | Software architecture patterns – layered – Event-driven architecture                                                                                            | 4             | Black board      |
|                 | Model-View patterns – Service-oriented architecture.                                                                                                            | 4             | Black board      |
| <b>UNIT V</b>   |                                                                                                                                                                 |               |                  |
|                 | Architecting Modern Applications.- Importance of Performance – Performance improvement - Server side caching                                                    | 2             | Black board      |
|                 | Web application performance – Database performance                                                                                                              | 4             | PPT              |
|                 | Securing software systems – Threat modelling – Secure by design.                                                                                                | 3             | PPT              |

Programme : **M.C.A** Part-III : **Elective -I**  
 Semester : **I** Hours : **6 P/w**  
 Sub.Code : **P23DU04P** Credits : **3**

Title of the Paper : **Architecture and Frameworks - Lab**

**Course Objectives**

- 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.

Note: Use the solid servers and client specification for implementation  
<https://github.com/solid/specification/>.

Implement the following using Linux / Windows environments

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

**Course Outcomes**

On the successful completion of the course, students will be able to

|     |                                                                                                     |       |
|-----|-----------------------------------------------------------------------------------------------------|-------|
| CO1 | Comprehend the programming skills of Software architecture tools and packages                       | K1-K6 |
| CO2 | Understand and implement the user profiles and authentication with recovery mechanism.              | K1-K6 |
| CO3 | Comprehend and evaluate the access control and content representation use of FTP server             | K1-K6 |
| CO4 | Understand and implement reading and writing resources for various applications                     | K1-K6 |
| CO5 | Identify and examine the notifications, friends, and follower list of social application protocols. | K1-K6 |

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5-Evaluate, K6- Create**

**Mapping Course outcomes with Programme outcomes**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| 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   | -   | -   | -   | -    | -    | -    |

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

**Electives - II**

Programme : **M.C.A**

Semester : **I**

Sub.Code : **P23DU05**

Part-III : **Elective II**

Hours : **6 P/w 60 HrsP/S**

**Each unit : 12 hours**

Credits : **3**

Title of the Paper : **Software Development Technologies**

**Course Objectives**

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

**Unit -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.

**Unit-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, Implementing 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.

### Unit-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 with the process. Tracking code: Number of repositories, Git repository, structure, branching pattern, Azure repos configuration, Git and Azure.

### Unit-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.

### Unit-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.

### Text Book

1. Harsh Chawla and Hemant Kathuria, Building Microservices Applications on Microsoft Azure- Designing, 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.

### Reference Books

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”, AddisonWesley- Pearson Publication, First Ediiton 2015.
3. John Ferguson Smart, ”Jenkins, The Definitive Guide”, O’Reilly Publication, First Ediiton 2011.

### Course Outcomes

On the successful completion of the course, students will be able to

|      |                                                                                                                                                       |       |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| CO1: | To understand, apply and summarize the basic concepts of Micro services communication Microsoft Azure and Dev Ops for software development life cycle | K1-K6 |
| CO2: | To illustrate, and implement Azure Kubernetes Service tools for software development life cycle                                                       | K1-K6 |

|      |                                                                                                                       |       |
|------|-----------------------------------------------------------------------------------------------------------------------|-------|
| CO3: | To recognize, analyse and summarize the functionalities of .NET Dev Ops for Azure applications                        | K1-K6 |
| CO4: | To understand, design and evaluate the principles and architecture service tools for software development life cycle. | K1-K6 |
| CO5: | To comprehend, implement and review the functionalities of API and API gateways for cloud and Azure applications      | K1-K6 |

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

**Mapping with Programme Outcomes**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | S   | M   | -   | M   | -   | -   | -   | S   | -    | -    | -    |
| CO2 | S   | S   | M   | -   | M   | -   | -   | -   | S   | -    | -    | -    |
| CO3 | S   | S   | S   | -   | S   | -   | -   | -   | S   | S    | S    | S    |
| CO4 | S   | S   | M   | -   | M   | -   | -   | -   | S   | -    | -    | -    |
| CO5 | S   | S   | M   | -   | M   | -   | -   | -   | S   | -    | -    | -    |

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

| Units          | Topic                                                                                                                                                                                                                                                                                                                      | Lecture Hours | Mode Of Teaching |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------|
| <b>UNIT I</b>  |                                                                                                                                                                                                                                                                                                                            |               |                  |
|                | <b>Implementing Microservices:</b> Client to microservices communication, Interservice communication, data considerations, security, monitoring, microservices hosting platform options.                                                                                                                                   | 4             | Black board      |
|                | Azure Service Fabric: Introduction, core concepts, supported programming models, service fabric clusters, develop and deploy applications of service fabric.                                                                                                                                                               | 4             | PPT              |
|                | 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             | Black board      |
| <b>UNIT II</b> |                                                                                                                                                                                                                                                                                                                            |               |                  |
|                | <b>Azure Kubernetes Service (AKS):</b> Introduction to kubernetes and AKS, AKS development tools, Deploy applications on AKS. Monitoring AKS: Monitoring, Azure monitor and analytics, monitoring                                                                                                                          | 4             | Black board      |
|                | AKS clusters, native kubernetes dashboard, Prometheus and Grafana. Securing Microservices: Authentication in microservices, Implementing security using API gateway pattern, Creating application using Ocrlot and securing APIs with Azure AD.                                                                            | 4             | Black board      |
|                | 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              |

| UNIT III |                                                                                                                                                                                                                    |   |             |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-------------|
|          | <b>.NET DevOps for Azure:</b> DevOps introduction, Problem and solution. Professional Grade DevOps Environment: The state of DevOps, professional grade DevOps vision, DevOps architecture, tools for professional | 4 | Black board |
|          | DevOps environment, DevOps centered application. Tracking work: Process template, Types of work items, Customizing the process, Working with the process.                                                          | 4 | Black board |
|          | Tracking code: Number of repositories, Git repository, structure, branching pattern, Azure repos configuration, Git and Azure.                                                                                     | 4 | PPT         |
| UNIT IV  |                                                                                                                                                                                                                    |   |             |
|          | <b>Building the code:</b> Structure of build, using builds with .NET core and Azure pipelines, Validating the code: Strategy for defect detection, Implementing defect detection.                                  | 4 | Black board |
|          | Release candidate creation: Designing release candidate architecture, Azure artifacts workflow for release candidates, Deploying the release: Designing deployment pipeline                                        | 4 | Black board |
|          | Implementing deployment in Azure pipelines. Operating and monitoring release: Principles, Architectures for observability, Jumpstarting observability.                                                             | 4 | Black board |
| UNIT V   |                                                                                                                                                                                                                    |   |             |
|          | <b>Introduction to APIs:</b> Introduction, API economy, APIs in public sector. API Strategy and Architecture: API Strategy, API value chain                                                                        | 2 | Black board |
|          | 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.                                                         | 3 | PPT         |

Programme : **M.C.A**  
 Semester : **I**  
 Sub.Code : **P23DU06P**

Part-III : **Elective II**  
 Hours : **6 P/w**  
 Credits : **3**

Title of the Paper : **Software Development Technologies Lab**

### Course Objectives

- 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.

**List of Programs**

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**

On the successful completion of the course, students will be able to

|      |                                                                                                                  |       |
|------|------------------------------------------------------------------------------------------------------------------|-------|
| CO1: | To Understand and analyse the importance of Jenkins to Build, Deploy and Test Software Applications              | K1-K6 |
| CO2: | To synthesis and summarize the importance of Software Configuration Management in DevOps                         | K1-K6 |
| CO3: | To identify, analyze and illustrate the Containerization of OS images and deployment of applications over Docker | K1-K6 |
| CO4  | To design, analyze and develop the Pull based Software Configuration Management                                  | K1-K6 |
| CO5  | To design, analyze and develop Puppet Manifest                                                                   | K1-K6 |

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

**Mapping with Programme Outcomes**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | S   | M   | -   | M   | -   | -   | -   | S   | S    | S    | S    |
| CO2 | S   | S   | M   | -   | M   | -   | -   | -   | S   | S    | S    | S    |
| CO3 | S   | S   | M   | -   | M   | -   | -   | -   | S   | S    | S    | S    |
| CO2 | S   | S   | M   | -   | M   | -   | -   | -   | S   | S    | S    | S    |
| CO3 | S   | S   | M   | -   | M   | -   | -   | -   | S   | S    | S    | S    |

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

Programme : M.C.A

Semester : I

Sub.Code : P23DU07

Part-III : Elective II

Hours : 6 P/w 60 HrsP/S

Each unit : 12 hours

Credits : 3

Title of the Paper : **Soft Computing**

### **COURSE OBJECTIVES:**

- 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-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.

### **UNIT - 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-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-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.

### **UNIT-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.

### **UNIT-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 – 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 Area-First of Maxima - Fuzzy Set Theory - Fuzzy

Arithmetic And Fuzzy Measures: Fuzzy Measures – Belief and Plausibility Measures-Probability Measures-Possibility and Necessity Measures- Formation of Rules –Fuzzy Inference Systems (FIS) – Fuzzy Decision Making – Fuzzy Logic Control Systems.

**UNIT-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 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.

**TEXT BOOKS**

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

**REFERENCE BOOKS**

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.

**COURSE OUTCOMES:**

- On the successful completion of the course, students will be able to

|            |                                                                                                    |         |    |
|------------|----------------------------------------------------------------------------------------------------|---------|----|
| <b>CO1</b> | To provide an introduction to the basic principles, techniques, and applications of soft computing | K- 1 K2 | LO |
| <b>CO2</b> | To get familiar with Neural network architectures and supervised learning algorithms               | K3      | IO |

|            |                                                                                                    |        |    |
|------------|----------------------------------------------------------------------------------------------------|--------|----|
| <b>CO3</b> | To understand the architectures and algorithms of Unsupervised Learning techniques                 | K3- K4 | HO |
| <b>CO4</b> | Develop the skills to gain a basic understanding of fuzzy logic theory and fuzzy inference systems | K4     | IO |
| <b>CO5</b> | Ability to learn traditional optimization and search techniques and genetic programming            | K5     | HO |

**MAPPING WITH PROGRAMME OUTCOMES**

|            | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> | <b>PO6</b> | <b>PO7</b> | <b>PO8</b> | <b>PO9</b> | <b>PO10</b> | <b>PO11</b> | <b>PO12</b> |
|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|
| <b>CO1</b> | S          | M          | S          | M          | S          | S          | S          | M          | S          | M           | S           | S           |
| <b>CO2</b> | M          | S          | M          | S          | M          | M          | M          | S          | M          | S           | S           | M           |
| <b>CO3</b> | M          | M          | S          | S          | S          | M          | M          | S          | S          | S           | S           | S           |
| <b>CO4</b> | S          | S          | M          | M          | M          | S          | S          | S          | S          | M           | M           | M           |
| <b>CO5</b> | S          | S          | S          | S          | S          | M          | S          | M          | M          | S           | S           | M           |

**S- STRONG; M-MEDIUM; L-LOW**

| <b>Units</b>   | <b>Topic</b>                                                                                                                                                                                                                                                               | <b>Lecture Hours</b> | <b>Mode Of Teaching</b> |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------------------|
| <b>UNIT I</b>  |                                                                                                                                                                                                                                                                            |                      |                         |
|                | <b>INTRODUCTION TO SOFT COMPUTING:</b> Artificial Neural Networks- Biological Neurons- Basic Models of Artificial Neural Networks                                                                                                                                          | 4                    | Black board             |
|                | 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                    | Black board             |
| <b>UNIT II</b> |                                                                                                                                                                                                                                                                            |                      |                         |
|                | <b>SUPERVISED LEARNING NETWORK :</b> 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                    | Black board             |
|                | 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                    | Black board             |
|                | 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                     |

| UNIT III |                                                                                                                                                                                                                                                                             |   |             |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-------------|
|          | <b>UNSUPERVISED LEARNING NETWORK:</b> Associative Memory Networks - Auto Associative Memory Network-Architecture-Flowchart for Training Process-Training Algorithm-Testing Algorithm                                                                                        | 4 | Black board |
|          | Bidirectional Associative Memory- Architecture-Discrete Bidirectional Associative Memory-Iterative Auto Associative Memory Networks                                                                                                                                         | 4 | Black board |
|          | Linear AutoAssociative Memory-Kohonen Self-Organizing Feature Map- Architecture-Flowchart for Training Process-Training Algorithm.                                                                                                                                          | 4 | PPT         |
| UNIT IV  |                                                                                                                                                                                                                                                                             |   |             |
|          | <b>INTRODUCTION TO FUZZY LOGIC:</b> 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 | Black board |
|          | 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 Area-First of Maxima                                       | 4 | Black board |
|          | Fuzzy Set Theory - Fuzzy Arithmetic And Fuzzy Measures: Fuzzy Measures – Belief and Plausibility Measures-Probability Measures-Possibility and Necessity Measures- Formation of Rules –Fuzzy Inference Systems (FIS) – Fuzzy Decision Making – Fuzzy Logic Control Systems. | 4 | Black board |
| UNIT V   |                                                                                                                                                                                                                                                                             |   |             |
|          | <b>GENETIC ALGORITHM:</b> Introduction - Biological Background - Traditional Optimization and Search Techniques -Gradient Based Local Optimization Method-                                                                                                                  | 2 | Black board |
|          | Random Search-Stochastic Hill Climbing-Simulated Annealing-Symbolic Artificial Intelligence-Operators in Genetic Algorithm - Encoding-Selection-Crossover-Mutation                                                                                                          | 4 | PPT         |
|          | Stopping Conditions for Genetic Algorithm Flow-Genetic Programming-Working of Genetic Programming-Characteristics of Genetic Programming-Data Representation.                                                                                                               | 3 | PPT         |

Programme : **M.C.A**Part-III : **Elective II**Semester : **I**Hours : **6 P/w**Sub.Code : **P23DU08P**Credits : **3**Title of the Paper : **Soft Computing Lab**



**COURSE OBJECTIVES:**

- 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.

**Program List**

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
10. Implementation of fuzzy based arithmetic operations

**COURSE OUTCOMES:**

On the successful completion of the course, students will be able to

|     |                                                           |        |    |
|-----|-----------------------------------------------------------|--------|----|
| CO1 | To apply supervised learning algorithms for real datasets | K- 1K2 | LO |
| CO2 | To implement Unsupervised Learning techniques             | K3     | IO |
| CO3 | To apply fuzzy based arithmetic and logical operations    | K3- K4 | HO |
| CO4 | To find solutions for problems using Genetic algorithm    | K4     | IO |
| CO5 | To implement DeMorgan's Law                               | K5     | HO |

**MAPPING WITH PROGRAMME OUTCOMES**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | M   | M   | S   | M   | S   | S   | S   | M   | S   | M    | S    | S    |
| CO2 | M   | S   | M   | M   | M   | M   | M   | S   | M   | S    | M    | M    |

|            |   |   |   |   |   |   |   |   |   |   |   |   |
|------------|---|---|---|---|---|---|---|---|---|---|---|---|
| <b>CO3</b> | M | M | S | S | S | M | M | S | S | S | S | S |
| <b>CO4</b> | S | S | S | M | M | S | S | M | S | S | S | M |
| <b>CO5</b> | S | S | S | S | S | M | M | M | M | S | M | M |

**S- STRONG; M-MEDIUM; L-LOW**

## Semester - II

Programme : **M.C.A** Part-III : **Core IV**  
Semester : **II** Hours : **6 P/W 60 HrsP/S**  
**Each unit : 12 hours**  
Sub.Code : **P23CU4** Credits : **5**

Title of the Paper : **Data Structures and Algorithms**

### Course Objectives:

- 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-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.

### Unit-II

**Algorithm Analysis:** Experimental Studies-Seven Functions-Asymptotic Analysis. **Recursion:** Illustrative Examples-Analyzing Recursive Algorithms-Linear Recursion- Binary Recursion-Multiple Recursion.

### Unit-III

**Stacks, Queues, and Deques:** Stacks- Queues- Double-Ended Queues Linked. **Lists:** Singly Linked Lists-Circularly Linked Lists-Doubly Linked Lists. **Trees:** General Trees-Binary Trees-Implementing Trees-Tree Traversal Algorithms.

### Unit-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.

**Unit-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.

**Text book:**

1. Rance D. Necaie, “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.

**Reference books:**

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.

**Course Outcome:**

On the successful completion of the course, students will be able to,

|     |                                                                                                                                      |       |
|-----|--------------------------------------------------------------------------------------------------------------------------------------|-------|
| CO1 | Understand various ADT concepts                                                                                                      | K1-K6 |
| 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                                                                                 |       |

**K1- Remember, K2 - Understand, K3 - Apply , K4 - Analyze, K5 - Evaluate, K6 -Create**

**Mapping with Programme Outcomes:**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | M   | L   | L   | L   | L   | S   | S   | S   | L    | M    | M    |
| CO2 | S   | M   | S   | M   | M   | L   | L   | L   | L   | L    | M    | M    |
| CO3 | S   | S   | S   | L   | L   | L   | M   | M   | M   | M    | M    | L    |

|     |   |   |   |   |   |   |   |   |   |   |   |   |
|-----|---|---|---|---|---|---|---|---|---|---|---|---|
| CO4 | S | S | S | L | L | L | M | M | M | L | L | L |
| CO5 | S | S | S | L | M | M | S | S | S | S | M | L |

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

| Units    | Topic                                                                                                                            | Lecture Hours | Mode Of Teaching |
|----------|----------------------------------------------------------------------------------------------------------------------------------|---------------|------------------|
| UNIT I   |                                                                                                                                  |               |                  |
|          | <b>Abstract Data Types:</b> Introduction-Date Abstract Data Type-Bags-Iterators.                                                 | 4             | Black board      |
|          | <b>Arrays:</b> Array Structure-Python List-Two Dimensional Arrays-Matrix Abstract Data Type.                                     | 4             | PPT              |
|          | <b>Sets, Maps:</b> Sets-Maps- Multi-Dimensional Arrays.                                                                          | 4             | Black board      |
| UNIT II  |                                                                                                                                  |               |                  |
|          | <b>Algorithm Analysis:</b> Experimental Studies-Seven Functions-Asymptotic Analysis.                                             | 4             | Black board      |
|          | <b>Recursion:</b> Illustrative Examples-Analyzing Recursive Algorithms-Linear Recursion                                          | 4             | Black board      |
|          | Binary Recursion-Multiple Recursion.                                                                                             | 4             | PPT              |
| UNIT III |                                                                                                                                  |               |                  |
|          | <b>Stacks, Queues, and Deques:</b> Stacks- Queues- Double-Ended Queues Linked.                                                   | 4             | Black board      |
|          | <b>Lists:</b> Singly Linked Lists-Circularly Linked Lists-Doubly Linked Lists.                                                   | 4             | Black board      |
|          | <b>Trees:</b> General Trees-Binary Trees-Implementing Trees-Tree Traversal Algorithms.                                           | 4             | PPT              |
| UNIT IV  |                                                                                                                                  |               |                  |
|          | <b>Priority Queues:</b> Priority Queue Abstract Data Type- Implementing a Priority Queue- Heaps-Sorting with a Priority Queue.   | 4             | Black board      |
|          | <b>Maps, Hash Tables, and Skip Lists:</b> Maps and Dictionaries-Hash Tables                                                      | 4             | Black board      |
|          | Sorted Maps-Skip Lists-Sets, Multisets, and Multimaps.                                                                           | 4             | Black board      |
| UNIT V   |                                                                                                                                  |               |                  |
|          | <b>Search Trees:</b> Binary Search Trees-Balanced Search Trees-AVL Trees-Splay Trees.                                            | 2             | Black board      |
|          | <b>Sorting and Selection:</b> Merge sort-Quick sort-Sorting through an Algorithmic Lens- Comparing Sorting Algorithms-Selection. | 4             | PPT              |
|          | <b>Graph Algorithms:</b> Graphs-Data Structures for Graphs-Graph Traversals-Shortest Paths-Minimum Spanning Trees.               | 3             | PPT              |

|             |               |            |                                                 |
|-------------|---------------|------------|-------------------------------------------------|
| Programme : | <b>M.C.A</b>  | Part-III : | <b>Core-V</b>                                   |
| Semester :  | <b>II</b>     | Hours :    | <b>6 P/W 60 HrsP/S Each unit :<br/>12 hours</b> |
| Sub.Code :  | <b>P23CU5</b> | Credits :  | <b>5</b>                                        |

Title of the Paper : **Big Data Analytics**

### Course Objectives

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

### UNIT 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.

### UNIT 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.

### UNIT 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.

### UNIT 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.

### UNIT 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.

**Text Book:**

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

**Reference Book:**

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

**Course Outcomes**

On the successful completion of the course, students will be able to

|      |                                                                                                                               |       |
|------|-------------------------------------------------------------------------------------------------------------------------------|-------|
| CO1: | To understand, illustrate and evaluate the concepts and techniques of Data Science, Big Data Analytics and its tools          | K1-K6 |
| CO2: | To collaborate,apply and review the computing for big data in Hadoop, and NoSQL environment.                                  | K1-K6 |
| CO3: | To comprehend, implement and review the concepts of data science and big data analytics projects using MapReduce, and MongoDB | K1-K6 |
| CO4: | To understand, use and analyze the concepts of big data analytics projects using HIVE database.                               | K1-K6 |
| CO5: | To illustrate, develop and review the concepts of PIG database in Hadoop environment.                                         | K1-K6 |

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5 Evaluate, K6- Create**

**Mapping with Programme Outcomes**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | -   | -   | -   | -   | L   | -   | -   | -   | -    | -    | -    |
| CO2 | S   | -   | M   | -   | M   | L   | -   | -   | -   | -    | -    | -    |
| CO3 | S   | -   | S   | -   | S   | L   | -   | -   | -   | S    | S    | S    |
| CO4 | S   | -   | S   | -   | S   | L   | -   | -   | -   | S    | S    | S    |
| CO5 | S   | -   | S   | -   | S   | L   | -   | -   | -   | S    | S    | S    |

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

| Units           | Topic                                                                                                                                                                                                                                                              | Lecture Hours | Mode Of Teaching |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------|
| <b>UNIT I</b>   |                                                                                                                                                                                                                                                                    |               |                  |
|                 | <b>Big Data and Analytics:</b> Classification of Digital Data: Structured Data- Semi Structured Data and Unstructured Data.                                                                                                                                        | 4             | Black board      |
|                 | 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             | Black board      |
| <b>UNIT II</b>  |                                                                                                                                                                                                                                                                    |               |                  |
|                 | <b>Technology Landscape:</b> NoSQL, Comparison of SQL and NoSQL, Hadoop -RDBMS Versus Hadoop - Distributed Computing Challenges                                                                                                                                    | 4             | Black board      |
|                 | Hadoop Overview - Hadoop Distributed File System - Processing Data with Hadoop                                                                                                                                                                                     | 4             | Black board      |
|                 | Managing Resources and Applications with Hadoop YARN - Interacting with Hadoop Ecosystem.                                                                                                                                                                          | 4             | PPT              |
| <b>UNIT III</b> |                                                                                                                                                                                                                                                                    |               |                  |
|                 | <b>Mongodb and Mapreduce Programming :</b> MongoDB: Mongo DB - Terms used in RDBMS and Mongo DB.                                                                                                                                                                   | 4             | Black board      |
|                 | Data Types - MongoDB Query Language. MapReduce: Mapper – Reducer – Combiner                                                                                                                                                                                        | 4             | Black board      |
|                 | Partitioner – Searching – Sorting – Compression.                                                                                                                                                                                                                   | 4             | PPT              |
| <b>UNIT IV</b>  |                                                                                                                                                                                                                                                                    |               |                  |
|                 | <b>Hive:</b> Introduction – Architecture - Data Types - File Formats - Hive Query Language Statements – Partitions                                                                                                                                                 | 4             | Black board      |
|                 | Bucketing – Views - Sub- Query – Joins – Aggregations - Group by and Having – RCFile - Implementation                                                                                                                                                              | 4             | Black board      |
|                 | Hive User Defined Function - Serialization and Deserialization.                                                                                                                                                                                                    | 4             | Black board      |
| <b>UNIT V</b>   |                                                                                                                                                                                                                                                                    |               |                  |
|                 | <b>Pig:</b> Introduction - Anatomy – Features – Philosophy - Use Case for Pig - Pig Latin Overview - Pig Primitive Data Types - Running Pig - Execution Modes of Pig                                                                                               | 2             | Black board      |
|                 | 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.                                                                                                                                                                              | 3             | PPT              |

Programme : **M.C.A**Part-III : **Core -VI**

Semester : **II** Hours : **6 P/W**  
 Sub.Code : **P23CU6P** Credits : **4**

Title of the Paper : **Data Structures and Algorithms Lab**

**Course Objectives:**

- 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.

**Implement the following problems using Python 3.4 and above**

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 Outcome:**

On the successful completion of the course, students will be able to,

|     |                                                             |       |
|-----|-------------------------------------------------------------|-------|
| CO1 | Strong understanding in various ADT concepts                | K1-K6 |
| 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 |       |

K1- Remember, K2 - Understand, K3 - Apply , K4 - Analyze, K5 - Evaluate, K6 -Create



**Mapping with Programme Outcomes:**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | M   | L   | L   | L   | L   | S   | S   | M   | M    | S    | S    |
| CO2 | S   | M   | S   | M   | M   | L   | S   | M   | S   | L    | M    | M    |
| CO3 | S   | S   | S   | L   | L   | L   | M   | M   | M   | M    | S    | L    |
| CO4 | S   | S   | S   | M   | M   | S   | M   | M   | S   | S    | S    | L    |
| CO5 | S   | S   | S   | S   | L   | M   | S   | M   | M   | M    | M    | L    |

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

**Electives III**

Programme : **M.C.A**

Part-III : **Elective III**

Semester : **II**

Hours : **5 P/W 50 HrsP/S**

**Each unit : 10 hours**

Sub.Code : **P23DU09**

Credits : **3**

Title of the Paper : **Internet of Things**

**Course 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 I FUNDAMENTALS OF IOT**

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.

**UNIT II IOT PROTOCOLS**

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 – 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.

**UNIT – III DESIGN AND DEVELOPMENT**

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.

**UNIT – IV**

Prototyping Online Components: Getting started with an API - Writing a New API - Real-Time Reactions - Other Protocols. Techniques for Writing Embedded Code: Memory Management - Performance and Battery Life – Libraries - Debugging.

**UNIT – 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.

**Text Books:**

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)

**Reference Books:**

1. Ovidiu Vermesan and Peter Friess, “Internet of Things – From Research and Innovation to Market Deployment” , 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.

**Course Outcomes**

On the successful completion of the course, students will be able to

|      |                                                                                             |        |
|------|---------------------------------------------------------------------------------------------|--------|
| CO1: | Comprehend the IoT evolution with its architecture and sensors                              | K1- K6 |
| 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 realtime |        |
| CO5: | Recognize the ethics of business models and perform security analysis                       |        |

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

**Mapping with Programme Outcomes**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | S   | M   | S   | S   | S   | S   | S   | S   | S    | S    | S    |
| CO2 | S   | S   | S   | S   | S   | S   | S   | M   | S   | S    | M    | S    |
| CO3 | S   | M   | S   | S   | S   | S   | M   | S   | S   | M    | S    | S    |
| CO4 | S   | S   | S   | S   | S   | S   | S   | S   | S   | S    | M    | S    |
| CO5 | S   | S   | S   | S   | M   | S   | S   | S   | S   | M    | M    | S    |

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

| Units           | Topic                                                                                                                                                          | Lecture Hours | Mode Of Teaching |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------|
| <b>UNIT I</b>   |                                                                                                                                                                |               |                  |
|                 | Evolution of Internet of Things – Enabling Technologies – IOT Architectures: oneM2M, IOT World Forum (IOTWF)                                                   | 4             | Black board      |
|                 | and Alternative IOT models – Simplified IOT Architecture and Core IOT Functional Stack – Fog, Edge and Cloud in IOT                                            | 4             | PPT              |
|                 | Functional blocks of an IOT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects.                                                        | 4             | Black board      |
| <b>UNIT II</b>  |                                                                                                                                                                |               |                  |
|                 | 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             | Black board      |
|                 | Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IOT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks | 4             | Black board      |
|                 | Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT.                                          | 4             | PPT              |
| <b>UNIT III</b> |                                                                                                                                                                |               |                  |
|                 | Prototyping Embedded Devices: Electronics - Embedded Computing Basics – Arduino - Raspberry Pi - Beagle Bone Black - Electric Imp.                             | 4             | Black board      |
|                 | Prototyping the Physical Design: Non digital Methods -                                                                                                         | 4             | Black board      |
|                 | Laser Cutting - 3D printing - CNC Milling - Repurposing/Recycling.                                                                                             | 4             | PPT              |
| <b>UNIT IV</b>  |                                                                                                                                                                |               |                  |
|                 | Prototyping Online Components: Getting started with an API - Writing a New API - Real-Time Reactions - Other Protocols.                                        | 4             | Black board      |
|                 | Techniques for Writing Embedded Code: Memory Management                                                                                                        | 4             | Black board      |

|               |                                                                                                                                      |   |             |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------|---|-------------|
|               | Performance and Battery Life – Libraries - Debugging.                                                                                | 4 | Black board |
| <b>UNIT V</b> |                                                                                                                                      |   |             |
|               | Business Models: History of Business Models – Model – Internet of Starting up – Lean Startups. Moving to Manufacture: Designing Kits | 2 | Black board |
|               | Designing Printed circuit boards – Certification – Costs - Scaling Up Software.                                                      | 4 | PPT         |
|               | Ethics: Privacy – Control – Environment – Solutions.                                                                                 | 3 | PPT         |

Programme : **M.C.A**  
Semester : **II**  
Sub.Code : **P23DU10P**

Part-III : **Elective III**  
Hours : **5 P/W**  
Credits : **3**

Title of the Paper : **Internet of Things Lab**

### Course Objectives:

- 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
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**

On the successful completion of the course, students will be able to,

|            |                                                |                |
|------------|------------------------------------------------|----------------|
| <b>CO1</b> | Implement IoT programs to turn ON/OFF LED      | <b>K1 - K6</b> |
| <b>CO2</b> | Develop IoT programs for object detection      |                |
| <b>CO3</b> | Create IoT programs for agricultural purpose   |                |
| <b>CO4</b> | Implement web server program for local hosting |                |
| <b>CO5</b> | Design IoT application for health monitoring   |                |

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

**Mapping with Programme Outcomes**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | S   | M   | S   | S   | S   | M   | S   | S   | S    | S    | S    |
| CO2 | S   | S   | S   | S   | S   | S   | S   | M   | S   | S    | M    | S    |
| CO3 | S   | M   | S   | S   | S   | S   | M   | S   | S   | M    | S    | S    |
| CO4 | S   | S   | S   | S   | S   | S   | S   | S   | S   | L    | M    | S    |
| CO5 | S   | S   | S   | S   | M   | S   | L   | S   | S   | M    | M    | S    |

S- Strong; M-Medium; L-Low

Programme : **M.C.A**

Part-III : **Elective III**

Semester : **II**

Hours : **5 P/W 50 HrsP/S**

**Each unit : 10 hours**

Sub.Code : **P23DU11**

Credits : **3**

Title of the Paper : **Computer Vision**

**Course Objectives:**

- 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-I**

**Basic Image Handling and Processing:** PIL – the Python Imaging Library-Matplotlib-NumPy-SciPy-Advanced example: Image de-noising. **Local Image Descriptors:** Harris corner detector-SIFT - Scale-Invariant Feature Transform-Matching Geotagged Images.

**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.

**Unit-III**

**Multiple View Geometry:**Epipolar Geometry-Computing with Cameras and 3D Structure-Multiple View Reconstruction-Stereo Images. **Clustering Images:** K-means Clustering-Hierarchical Clustering-Spectral Clustering.

**Unit-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 Classifier-Support Vector Machines-Optical Character Recognition.

**Unit-V**

**Image Segmentation:** Graph Cuts-Segmentation using Clustering-Variational Methods. **OpenCV:** Python Interface-OpenCV Basics-Processing Video-Tracking.

**Course Outcome:**

On the successful completion of the course, students will be able to,

|     |                                                                                            |       |
|-----|--------------------------------------------------------------------------------------------|-------|
| CO1 | To understand and recall computer vision and its application areas                         | K1-K6 |
| 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                             |       |

**K1- Remember, K2 - Understand, K3 - Apply , K4 - Analyze, K5 - Evaluate, K6 -Create**

**Mapping with Programme Outcomes:**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | L   | M   | L   | L   | L   | M   | M   | M   | S    | S    | L    |
| CO2 | S   | M   | L   | M   | M   | L   | S   | L   | S   | L    | S    | L    |
| CO3 | S   | S   | S   | M   | M   | L   | M   | L   | M   | L    | M    | L    |
| CO4 | S   | S   | S   | M   | M   | L   | M   | L   | M   | L    | S    | L    |
| CO5 | S   | S   | S   | M   | M   | L   | S   | L   | S   | L    | S    | L    |

L - Low, M- Medium, S - Strong

| Units    | Topic                                                                                                                                                                                      | Lecture Hours | Mode Of Teaching |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------|
| UNIT I   |                                                                                                                                                                                            |               |                  |
|          | <b>Basic Image Handling and Processing:</b> PIL – the Python Imaging Library-Matplotlib-NumPy-SciPy-Advanced example: Image de-noising.                                                    | 4             | Black board      |
|          | <b>Local Image Descriptors:</b> Harris corner detector-SIFT                                                                                                                                | 4             | PPT              |
|          | Scale-Invariant Feature Transform-Matching Geotagged Images.                                                                                                                               | 4             | Black board      |
| UNIT II  |                                                                                                                                                                                            |               |                  |
|          | <b>Image to Image Mappings:</b> Homographies-Warping images-Creating Panoramas.                                                                                                            | 4             | Black board      |
|          | <b>Camera Models and Augmented Reality:</b> The Pin-hole Camera Model-Camera Calibration                                                                                                   | 4             | Black board      |
|          | Pose Estimation from Planes and Markers-Augmented Reality.                                                                                                                                 | 4             | PPT              |
| UNIT III |                                                                                                                                                                                            |               |                  |
|          | <b>Multiple View Geometry:</b> Epipolar Geometry-Computing with Cameras and 3D Structure-Multiple View Reconstruction-Stereo Images.                                                       | 4             | Black board      |
|          | <b>Clustering Images:</b> K-means Clustering                                                                                                                                               | 4             | Black board      |
|          | Hierarchical Clustering-Spectral Clustering.                                                                                                                                               | 4             | PPT              |
| UNIT IV  |                                                                                                                                                                                            |               |                  |
|          | <b>Searching Images:</b> Content based Image Retrieval-Visual Words-Indexing Images- Searching the Database for Images-Ranking Results using Geometry-Building Demos and Web Applications. | 4             | Black board      |

|               |                                                                                          |   |             |
|---------------|------------------------------------------------------------------------------------------|---|-------------|
|               | <b>Classifying Image Content: K-Nearest Neighbors</b>                                    | 4 | Black board |
|               | Bayes Classifier-Support Vector Machines-Optical Character Recognition.                  | 4 | Black board |
| <b>UNIT V</b> |                                                                                          |   |             |
|               | <b>Image Segmentation:</b> Graph Cuts-Segmentation using Clustering-Variational Methods. | 2 | Black board |
|               | <b>OpenCV:</b> Python Interface-OpenCV Basics                                            | 4 | PPT         |
|               | Processing Video-Tracking.                                                               | 3 | PPT         |

Programme : **M.C.A**  
Semester : **II**  
Sub.Code : **P23DU12P**

Part-III : **Elective III**  
Hours : **5 P/W**  
Credits : **3**

Title of the Paper : **Computer Vision Lab**

### Course Objectives:

- 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.
- Implement the following problems using Python with OpenCV

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.
10. Write a program to classify an Image using KNN Classification algorithm.

### Course Outcome:

On the successful completion of the course, students will be able to,



|     |                                                                                  |       |
|-----|----------------------------------------------------------------------------------|-------|
| CO1 | To develop and implement the image loading and exploring                         | K1-K6 |
| 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              |       |

**K1- Remember, K2 - Understand, K3 - Apply , K4 - Analyze, K5 - Evaluate, K6 -Create**

**Mapping with Programme Outcomes:**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | L   | M   | L   | L   | L   | M   | M   | M   | S    | S    | L    |
| CO2 | S   | M   | L   | M   | M   | L   | S   | L   | S   | L    | S    | L    |
| CO3 | S   | S   | S   | M   | M   | L   | M   | L   | M   | L    | M    | L    |
| CO4 | S   | S   | S   | M   | M   | L   | M   | L   | M   | L    | S    | L    |
| CO5 | S   | S   | S   | M   | M   | L   | S   | L   | S   | L    | S    | L    |

L - Low, M- Medium, S - Strong

Programme : **M.C.A**

Part-III : **Elective III**

Semester : **II**

Hours : **5 P/W 50 HrsP/S**

**Each unit : 10 hours**

Sub.Code : **P23DU13**

Credits : **3**

Title of the Paper : **Network Security and Cryptography**

**Course Objectives:**

The main objectives of this course are to:

1. Enable students to learn the Introduction to Cryptography, Web Security and Case studies in Cryptography.
2. To gain knowledge on classical encryption techniques and concepts of modular arithmetic and 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:1 INTRODUCTION**

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.

**Unit:2 CRYPTOSYSTEM**

Public-key Cryptosystem: Introduction to Number Theory - RSA Algorithm – Key Management - Diffie-Hellman Key exchange – Elliptic Curve Cryptography Message Authentication and Hash functions – Hash and Mac Algorithm – Digital Signatures and Authentication Protocol.

**Unit:3 NETWORK SECURITY**

Network Security Practice: Authentication Applications – Kerberos – X.509 Authentication services and Encryption Techniques. E-mail Security – PGP – S / MIME – IP Security.

**Unit:4 WEB SECURITY**

Web Security - Secure Socket Layer – Secure Electronic Transaction. System Security - Intruders and Viruses – Firewalls – Password Security.

**Unit:5 CASE STUDY**

Case Study: Implementation of Cryptographic Algorithms – RSA – DSA – ECC (C/JAVA Programming).

Network Forensic – Security Audit - Other Security Mechanism: Introduction to: Stenography – Quantum Cryptography – Water Marking - DNA Cryptography

**Text Books**

- 1 William Stallings, “Cryptography and Network Security”, PHI/Pearson Education.
- 2 Bruce Schneier, “Applied Cryptography”, CRC Press.

**Reference Books**

- 1 A.Menezes, P Van Oorschot and S.Vanstone, “Hand Book of Applied Cryptography”, CRC Press, 1997
- 2 Ankit Fadia, ”Network Security”, MacMillan.

**Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]**

- 1 <https://nptel.ac.in/courses/106/105/106105031/>
- 2 <http://www.nptelvideos.in/2012/11/cryptography-and-network-security.html>
- 3 <https://www.tutorialspoint.com/cryptography/index.htm>

**Expected Course Outcomes:**

On the successful completion of the course, student will be able to:

- |   |                                                                                                                                  |        |
|---|----------------------------------------------------------------------------------------------------------------------------------|--------|
| 1 | Understand the process of the cryptographic algorithms                                                                           | K1, K2 |
| 2 | Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication | K2, K3 |
| 3 | Apply and analyze appropriate security techniques to solve network security problem                                              | K3, K4 |
| 4 | Explore suitable cryptographic algorithms                                                                                        | K4, K5 |
| 5 | Analyze different digital signature algorithms to achieve authentication and design secure applications                          | K5, K6 |

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**

**Mapping with Programming Outcomes**

| Cos | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 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    |

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

| Units  | Topic                                                                                                | Lecture Hours | Mode Of Teaching |
|--------|------------------------------------------------------------------------------------------------------|---------------|------------------|
| UNIT I |                                                                                                      |               |                  |
|        | Introduction to Cryptography – Security Attacks – Security Services – Security Algorithm             | 4             | Black board      |
|        | Stream cipher and Block cipher - Symmetric and Asymmetric-key Cryptosystem Symmetric Key Algorithms: | 4             | PPT              |
|        | Introduction – DES – Triple DES – AES – IDEA – Blowfish – RC5.                                       | 4             | Black board      |

| UNIT II  |                                                                                                                   |   |             |
|----------|-------------------------------------------------------------------------------------------------------------------|---|-------------|
|          | <b>CRYPTOSYSTEM:</b> Public-key Cryptosystem: Introduction to Number Theory - RSA Algorithm                       | 4 | Black board |
|          | KeyManagement -Diffie- Hellman Key exchange –Elliptic CurveCryptography Message Authentication and Hash functions | 4 | Black board |
|          | Hash and Mac Algorithm – Digital Signatures and Authentication Protocol.                                          | 4 | PPT         |
| UNIT III |                                                                                                                   |   |             |
|          | <b>NETWORK SCURITY:</b> Network Security Practice: Authentication Applications                                    | 4 | Black board |
|          | Kerberos–X.509Authentication services and Encryption Techniques.                                                  | 4 | Black board |
|          | E-mail Security – PGP – S / MIME – IP Security.                                                                   | 4 | PPT         |
| UNIT IV  |                                                                                                                   |   |             |
|          | <b>WEB SECURITY:</b> Web Security- Secure Socket Layer                                                            | 4 | Black board |
|          | Secure Electronic Transactions. System Security                                                                   | 4 | Black board |
|          | Intruders and Viruses – Firewalls– Password Security.                                                             | 4 | Black board |
| UNIT V   |                                                                                                                   |   |             |
|          | Case Study: Implementation of Cryptographic Algorithms–RSA–DSA–ECC(C/JAVA Programming).                           | 2 | Black board |
|          | Network Forensic – Security Audit - Other Security Mechanism                                                      | 4 | PPT         |
|          | Introduction to: Stenography –Quantum Cryptography – Water Marking - DNA Cryptography                             | 3 | PPT         |

**Electives IV**Programme : **M.C.A**Part-III : **Elective IV**Semester : **II**Hours : **5 P/W 50 HrsP/S****Each unit : 10 hours**Sub.Code : **P23DU14**Credits : **3**Title of the Paper : **Cyber Security****Course Objectives:**

- 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 – 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.

### **Unit – 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.

### **Unit – 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.

### **Unit – 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.

### **Unit – 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.

### **Text books:**

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)

**Reference Books:**

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.

**Course Outcomes**

On the successful completion of the course, students will be able to

|      |                                                                                                                                                                        |        |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| CO1: | Understand, describe, analyze and examine the basics of Cyber security concepts and its implementation in India                                                        | K1- K6 |
| 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 | K1- K6 |
| CO3: | Understand, apply and evaluate the various investigation roles and Wi Fi protecting mechanisms.                                                                        | K1- K6 |
| CO4: | Understand, illustrate and evaluate the method of seize the digital information and evidence forensics data and evaluate the forensics reports                         | K1- K6 |
| CO5: | Comprehend, apply and appraise the methods digital forensics with cybercrime prevention techniques                                                                     | K1- K6 |

**K1- Remember, K2- Understand, K3- Apply , K4- Analyze, K5- Evaluate, K6- Create**

**Mapping with Programme Outcomes**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| 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    | M    | L    |
| CO4 | S   | M   | L   | S   | M   | L   | S   | M   | -   | M    | -    | -    |
| CO5 | M   | S   | M   | L   | S   | L   | M   | S   | -   | S    | -    | -    |

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

| Units           | Topic                                                                                                                                                                       | Lecture Hours | Mode Of Teaching |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------|
| <b>UNIT I</b>   |                                                                                                                                                                             |               |                  |
|                 | 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 | 4             | PPT              |
|                 | generating secure password – using password manager-enabling two-step verification – security computer using free antivirus.                                                | 4             | Black board      |
| <b>UNIT II</b>  |                                                                                                                                                                             |               |                  |
|                 | Tips for buying online: Clearing cache for browsers – wireless LAN-major issues with WLAN                                                                                   | 4             | Black board      |
|                 | 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.                                                                 | 4             | PPT              |
| <b>UNIT III</b> |                                                                                                                                                                             |               |                  |
|                 | 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 Wi-Fi – fourth amendment expectation of privacy in WLAN.       | 4             | PPT              |
| <b>UNIT IV</b>  |                                                                                                                                                                             |               |                  |
|                 | 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.                               | 4             | Black board      |
| <b>UNIT V</b>   |                                                                                                                                                                             |               |                  |
|                 | 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. | 3 | PPT |
|--|-------------------------------------------------------------------------------|---|-----|

Programme : **M.C.A** Part-III : **Elective IV**  
Semester : **II** Hours : **5 P/W**  
Sub.Code : **P23DU15P** Credits : **3**

Title of the Paper : **Cyber Security Lab**

### COURSE OBJECTIVES

- 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

Implement the following using any cyber security tools

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 metasploit
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

On the successful completion of the course, students will be able to

|      |                                                                                      |       |
|------|--------------------------------------------------------------------------------------|-------|
| CO1: | Comprehend the programming skills in Change the wireless device mode as monitor mode | K1-K6 |
| CO2: | Understand and implement multiple vulnerabilities webserver                          | K1-K6 |
| CO3: | Evaluate the use of different wireless device modes                                  | K1-K6 |
| CO4: | Design to Solve related to find the subdomains of webpage                            | K1-K6 |
| CO5: | Create and apply open ports in the network                                           | K1-K6 |

**K1- Remember, K2- Understand, K3- Apply , K4- Analyze, K5-Evaluate, K6- Create**



**Mapping Course outcomes with Programme outcomes**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | -   | -   | -   | -   | L   | -   | -   | -   | -    | -    | -    |
| CO2 | S   | -   | M   | -   | M   | L   | -   | -   | -   | -    | -    | -    |
| CO3 | S   | -   | S   | -   | S   | L   | -   | -   | -   | S    | S    | S    |
| CO4 | S   | -   | S   | -   | S   | L   | -   | -   | -   | S    | S    | S    |
| CO5 | S   | -   | S   | -   | S   | L   | -   | -   | -   | S    | S    | S    |

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

Programme : **M.C.A**

Part-III : **Elective IV**

Semester : **II**

Hours : **5 P/W 50 HrsP/S**

**Each unit : 10 hours**

Sub.Code : **P23DU16**

Credits : **3**

Title of the Paper : **Blockchain Technologies**

**Course Objectives**

- To understand about Blockchain is an emerging technology platform for developing decentralized applications and data storage.
- To comprehend fundamentals of Public Key Cryptography technology and Consensus Algorithms.
- To familiarize with Bitcoin Network, Bitcoin Clients, APIs and Payment technology of blockchain operations.
- To engage with Components of the Ethereum ecosystem.
- To grasp about Development Tools and Frameworks.

**Unit I: Blockchain, Decentralization**

**Blockchain** :The growth of blockchain technology - Distributed systems - The history of blockchain and Bitcoin - Blockchain - Consensus - CAP theorem and blockchain. **Decentralization**: Decentralization using blockchain - Methods of decentralization -Routes to decentralization - Blockchain and full ecosystem decentralization - Pertinent terminology - Platforms for decentralization - Innovative trends.

**Unit II: Public Key Cryptography, Consensus Algorithms and Smart Contracts**

**Public Key Cryptography**: Asymmetric cryptography - Cryptographic constructs and blockchain technology. **Consensus Algorithms**: Introducing the consensus problem -Analysis and design - Classification - Algorithms - Choosing an algorithm. **Smart Contracts**: History - Definition - Ricardian contracts - Smart contract templates – Oracles - Deploying smart contracts - DAO

**Unit III: Bitcoin**

**Bitcoin:** Bitcoin—an overview - Cryptographic keys - Transactions - Blockchain – Mining. **Bitcoin Network and Payments:** The Bitcoin network - Wallets - Bitcoin payments -Innovation in Bitcoin - Advanced protocols - Bitcoin investment and buying and sellingBitcoin. **Bitcoin Clients and APIs:** Bitcoin client installation - Experimenting further with bitcoin-cli - Bitcoin programming.

**Unit IV: Alternative Coins**

**Alternative Coins:** Theoretical foundations - Difficulty adjustment and retargeting algorithms - Bitcoin limitations - Extended protocols on top of Bitcoin -Development of altcoins.**Ethereum: Ethereum** – an overview - Ethereum network - Components of the Ethereum ecosystem - EthereumVirtual Machine (EVM) - Smart contracts. - Blocks and blockchain - Wallets and client - Nodes and miners - APIs, tools, and DApps - Supporting protocols - Programming languages.

**Unit V: Development Tools and Frameworks, Use Cases & Security**

**Development Tools and Frameworks :**Languages - Compilers - Tools and libraries - Frameworks - Contract development and deployment - Layout of a Solidity source code file - Solidity language. **Use Cases:** IoT – Government - Health -Finance – Media. **Scalability and Other Challenges:** Scalability - Privacy - Security - Other challenges.

**Text Books**

Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder. Bitcoin and Cryptocurrency Technologies. Princeton University Press, 2016. ISBN 978-0691171692

**References**

Andreas Antonopoulos. Mastering Bitcoin: Programming the open block chain. Oreilly Publishers, 2017. ISBN 978-9352135745

**Course Outcomes**

On the successful completion of the course, students will be able to

|      |                                                                                                                                           |       |
|------|-------------------------------------------------------------------------------------------------------------------------------------------|-------|
| CO1: | Understand, apply and examine the characteristics of blockchain,bitcoin and consensus algorithm in centralized and decentralized methods. | K1-K6 |
| CO2: | Comprehend and demonstrate the application of hashing and public key cryptography in protecting the blockchain.                           | K1-K6 |
| CO3: | Understand and analyse the elements of trust in a Blockchain: validation, verification, and consensus.                                    | K1-K6 |
| CO4  | Comprehend and evaluate the alternate coin, Ethereum and smart contract.                                                                  | K1-K6 |
| CO5  | Grasp and apply the knowledge of Tools and languages for applications                                                                     | K1-K6 |

K1- Remember, K2- Understand, K3- Apply , K4- Analyze, K5-Evaluate, K6- Create

## Mapping Course outcomes with Programme outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | -   | -   | -   | -   | L   | -   | -   | -   | -    | -    | -    |
| CO2 | S   | -   | M   | -   | M   | L   | -   | -   | -   | -    | -    | -    |
| CO3 | S   | -   | S   | -   | S   | L   | -   | -   | -   | S    | S    | S    |
| CO4 | S   | -   | S   | -   | S   | L   | -   | -   | -   | S    | S    | S    |
| CO5 | S   | -   | S   | -   | S   | L   | -   | -   | -   | S    | S    | S    |

S- Strong; M-Medium; L-Low

| Units    | Topic                                                                                                                                                                                        | Lecture Hours | Mode Of Teaching |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------|
| UNIT I   |                                                                                                                                                                                              |               |                  |
|          | <b>Blockchain</b> :The growth of blockchain technology - Distributed systems - The history of blockchain and Bitcoin - Blockchain - Consensus - CAP theorem and blockchain.                  | 4             | Black board      |
|          | <b>Decentralization</b> : Decentralization using blockchain - Methods of decentralization -Routes to decentralization                                                                        | 4             | PPT              |
|          | Blockchain and full ecosystem decentralization - Pertinent terminology - Platforms for decentralization - Innovative trends.                                                                 | 4             | Black board      |
| UNIT II  |                                                                                                                                                                                              |               |                  |
|          | <b>Public Key Cryptography</b> : Asymmetric cryptography - Cryptographic constructs and blockchain technology.                                                                               | 4             | Black board      |
|          | <b>Consensus Algorithms</b> : Introducing the consensus problem -Analysis and design - Classification - Algorithms - Choosing an algorithm.                                                  | 4             | Black board      |
|          | <b>Smart Contracts</b> : History - Definition - Ricardian contracts - Smart contract templates – Oracles - Deploying smart contracts - DAO                                                   | 4             | PPT              |
| UNIT III |                                                                                                                                                                                              |               |                  |
|          | <b>Bitcoin</b> : Bitcoin—an overview - Cryptographic keys - Transactions - Blockchain – Mining.                                                                                              | 4             | Black board      |
|          | <b>Bitcoin Network and Payments</b> : The Bitcoin network - Wallets - Bitcoin payments -Innovation in Bitcoin - Advanced protocols - Bitcoin investment and buying and sellingBitcoin.       | 4             | Black board      |
|          | <b>Bitcoin Clients and APIs</b> : Bitcoin client installation - Experimenting further with bitcoin-cli - Bitcoin programming.                                                                | 4             | PPT              |
| UNIT IV  |                                                                                                                                                                                              |               |                  |
|          | <b>Alternative Coins</b> : Theoretical foundations - Difficulty adjustment and retargeting algorithms - Bitcoin limitations - Extended protocols on top of Bitcoin -Development of altcoins. | 4             | Black board      |
|          | <b>Ethereum</b> : <b>Ethereum</b> – an overview - Ethereum network - Components of the Ethereum ecosystem - EthereumVirtual Machine (EVM) - Smart contracts.                                 | 4             | Black board      |

|               |                                                                                                                                                                                                       |   |             |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-------------|
|               | Blocks and blockchain - Wallets and client - Nodes and miners - APIs, tools, and DApps - Supporting protocols - Programming languages.                                                                | 4 | Black board |
| <b>UNIT V</b> |                                                                                                                                                                                                       |   |             |
|               | <b>Development Tools and Frameworks :</b> Languages - Compilers - Tools and libraries - Frameworks - Contract development and deployment - Layout of a Solidity source code file - Solidity language. | 2 | Black board |
|               | <b>Use Cases:</b> IoT – Government - Health -Finance – Media.                                                                                                                                         | 4 | PPT         |
|               | <b>Scalability and Other Challenges:</b> Scalability - Privacy - Security - Other challenges.                                                                                                         | 3 | PPT         |

Programme : **M.C.A**  
 Semester : **II**  
 Sub.Code : **P23DU17P**

Part-III : **Elective IV**  
 Hours : **5 P/W**  
 Credits : **3**

Title of the Paper : **Blockchain Technologies Lab**

**Course Objectives**

- 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.

**Implement the following**

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

### Course Outcomes

On the successful completion of the course, students will be able to:

|      |                                                                                     |       |
|------|-------------------------------------------------------------------------------------|-------|
| CO1: | Enable to setup your own private Blockchain and deploy smart contracts on Ethereum. | K1-K6 |
| CO2: | Gains familiarity and implement with cryptography and Consensus algorithms.         | K1-K6 |
| CO3: | Create and deploy projects using Web3j.                                             | K1-K6 |
| CO4: | Recall and deploy the structure and mechanism of Bitcoin, Ethereum, Hyperledger     | K1-K6 |
| CO5: | Implement Blockchain for various use cases                                          | K1-K6 |

### Mapping with Programme Outcomes:

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| 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   | -   | -   | -   | -    | -    | -    |

S – Strong, M – Medium, L - Low

Programme : **M.C.A**

Part-III : **Skill Enhancement course I**

Semester : **II**

Hours : **2 P/W**

Sub.Code : **P23SEU1**

Credits : **2**

Title of the Paper : **Fundamentals of Human Rights**

### Course Objectives:

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.

**Expected Course Outcomes:**

On the successful completion of the course, student will be able to:

|      |                                                                          |       |
|------|--------------------------------------------------------------------------|-------|
| CO1: | Remember the concept of natural rights.                                  | K1-K6 |
| CO2: | Understand the historical growth of the idea of human rights.            | K1-K6 |
| CO3: | Assess the importance of Human Rights and respect the rights of others.  | K1-K6 |
| CO4: | Analyze the issues and challenges of Human Rights.                       | K1-K6 |
| CO5: | Evaluate the role of various organization in protection of Human Rights. | K1-K6 |

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

**Unit I: Introduction:**

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.

**Unit II: Human Rights in India:**

Development of Human Rights in India – Constituent Assembly and Indian Constitution – Fundamental Rights and its Classification – Directive Principles of State Policy – Fundamental Duties.

**Unit III: Rights of Marginalized and other Disadvantaged People:**

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.

**Unit 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).

**Unit 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.

**References**

1. Sudarshanam Gankidi, Human Rights in India: Prospective and Retrospective, Rawat Publications, Jaipur, 2019.
2. Satvinder Juss, 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 Wiley & 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.

**Mapping with Programme Outcomes**

| COs | 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    |

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

| Units          | Topic                                                                                                                  | Lecture Hours | Mode Of Teaching |
|----------------|------------------------------------------------------------------------------------------------------------------------|---------------|------------------|
| <b>UNIT I</b>  |                                                                                                                        |               |                  |
|                | Meaning and Definitions of Human Rights – Characteristics and Importance of Human Rights – Evolution of Human Rights – | 4             | Black board      |
|                | Formation, Structure and Functions of the UNO - Universal Declaration of Human Rights                                  | 4             | PPT              |
|                | International Covenants – Violations of Human Rights in the Contemporary Era.                                          | 4             | Black board      |
| <b>UNIT II</b> |                                                                                                                        |               |                  |
|                | Development of Human Rights in India – Constituent Assembly and Indian Constitution                                    | 4             | Black board      |

|                 |                                                                                                                                                             |   |             |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-------------|
|                 | Fundamental Rights and its Classification                                                                                                                   | 4 | Black board |
|                 | Directive Principles of State Policy – Fundamental Duties.                                                                                                  | 4 | PPT         |
| <b>UNIT III</b> |                                                                                                                                                             |   |             |
|                 | <b>Rights of Marginalized and other Disadvantaged People:</b> Rights of Women – Rights of Children – Rights of Differently Abled                            | 4 | Black board |
|                 | Rights of Elderly - Rights of Scheduled Castes – Rights of Scheduled Tribes – Rights of Minorities                                                          | 4 | Black board |
|                 | Rights of Prisoners – Rights of Persons Living with HIV/AIDS – Rights of LGBT.                                                                              | 4 | PPT         |
| <b>UNIT IV</b>  |                                                                                                                                                             |   |             |
|                 | <b>Human Rights Movements:</b> Peasant Movements (Tebhaga and Telangana)                                                                                    | 4 | Black board |
|                 | Scheduled Caste Movements (Mahar and Ad-Dharmi) – Scheduled Tribes Movements (Santhal and Munda)                                                            | 4 | Black board |
|                 | Environmental Movements ( Chipko and Narmada BachaoAndolan) – Social Reform Movements (Vaikom and Self Respect).                                            | 4 | Black board |
| <b>UNIT V</b>   |                                                                                                                                                             |   |             |
|                 | <b>Redressal Mechanisms:</b> Protection of Human Rights Act, 1993 (Amendment 2019) – Structure and Functions of National and State Human Rights Commissions | 2 | Black board |
|                 | National Commission for SCs – National Commission for STs – National Commission for Women                                                                   | 4 | PPT         |
|                 | National Commission for Minorities – Characteristics and Objectives of Human Rights Education.                                                              | 3 | PPT         |

### Semester III

Programme : **M.C.A**

Part-III : **Core VII**

Semester : **III**

Hours : **6 P/W 60 HrsP/S**

**Each unit : 12 hours**

Sub.Code : **P23CU7**

Credits : **5**

Title of the Paper : **Advanced Java Programming**

#### Course Objectives

- 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 – 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.

**Unit – 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.

**Unit – 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.

**Unit- 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.

**Unit – 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 Existing Rows - Creating and Deleting Tables - Creating a New Database with JDBC - Scrollable Result Sets.

**Text Books:**

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

**Reference books :**

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.

**Course Outcomes**

**On the successful completion of the course, students will be able**

|      |                                                                                                          |       |
|------|----------------------------------------------------------------------------------------------------------|-------|
| CO1: | Understand the Object Oriented Program including classes and methods; inheritance and exception handling | K1-K6 |
|------|----------------------------------------------------------------------------------------------------------|-------|

|      |                                                                                                   |        |
|------|---------------------------------------------------------------------------------------------------|--------|
| CO2: | Complete comprehension of String functions and I/O Streams                                        | K1-K6  |
| CO3: | Creation of graphical representation using Applet                                                 | K1-K6  |
| CO4: | Application of Servlets for designing Web based applications                                      | K1- K6 |
| CO5: | Usage of JDBC connectivity and implementation of the concept to get desired results from database | K1-K6  |

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

### Mapping with Programme Outcomes

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | S   | S   | -   | M   | S   | -   | -   | -   | S    | M    | -    |
| CO2 | S   | S   | S   | -   | M   | S   | -   | -   | -   | L    | M    | -    |
| CO3 | S   | S   | M   | -   | L   | S   | -   | -   | -   | M    | M    | -    |
| CO4 | M   | S   | M   | -   | S   | S   | -   | -   | -   | M    | S    | -    |
| CO5 | S   | M   | M   | -   | M   | L   | -   | -   | -   | M    | M    | -    |

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

| Units   | Topic                                                                                            | Lecture Hours | Mode Of Teaching |
|---------|--------------------------------------------------------------------------------------------------|---------------|------------------|
| UNIT 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      |
| UNIT 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              |

| UNIT 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         |
| UNIT 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 |
| UNIT V   |                                                                                                                                      |   |             |
|          | Network Programming: Working with URLs- Working with Sockets - Remote Method Invocation. Introduction to Database Management Systems | 2 | 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.                                            | 3 | PPT         |

Programme : **M.C.A**

Semester : **III**

Sub.Code : **P23CU8**

Part-III : **Core VIII**

Hours : **6 P/W 60 HrsP/S**

**Each unit : 12 hours**

Credits : **5**

Title of the Paper : **Web Technology**

### **COURSE OBJECTIVES:**

- 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 -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

## UNIT – II

**INTRODUCTION TO XHTML AND CSS:** Basic syntax, Standard structure, Basic text-markup, 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<span> and <div>tags, Conflict resolution.

## UNIT - 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.

## UNIT- 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.

## UNIT - 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.

### TEXT BOOKS:

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

**REFERENCE BOOKS:**

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

**COURSE OUTCOMES:**

On the successful completion of the course, students will be able

|     |                                                                            |        |    |
|-----|----------------------------------------------------------------------------|--------|----|
| CO1 | Design dynamic web pages using Javascript, JQuery and Angular Java scripts | K1     | LO |
| CO2 | Develop Web pages using HTML, CSS and XML                                  | K2     | IO |
| CO3 | Create web application using PHP and MySQL                                 | K3, K4 | HO |
| CO4 | To design dynamic web pages using Angular JavaScript                       | K2,K3  | HO |
| CO5 | Develop interactive web pages using JQuery                                 | K4,K5  | HO |

**MAPPING WITH PROGRAMME OUTCOMES**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | M   | S   | S   | S   | S   | M   | M   | S   | M   | M    | S    | S    |
| CO2 | S   | S   | M   | S   | S   | S   | M   | S   | S   | S    | S    | S    |
| CO3 | S   | S   | S   | M   | S   | S   | M   | M   | S   | M    | M    | S    |
| CO4 | S   | S   | S   | M   | S   | M   | M   | S   | S   | M    | S    | M    |
| CO5 | S   | S   | S   | M   | S   | S   | M   | S   | M   | S    | S    | M    |

**S- STRONG; M-MEDIUM; L-LOW**

| Units  | Topic                                                                                                                                                | Lecture Hours | Mode Of Teaching |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------|
| UNIT I |                                                                                                                                                      |               |                  |
|        | <b>WEB FUNDAMENTALS AND HTML:</b> 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 |
| <b>UNIT II</b>  |                                                                                                                                                                                                                                                                             |   |             |
|                 | <b>INTRODUCTION TO XHTML AND CSS:</b> 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 formats, Selector forms, Property value forms, Font properties                                                                                                       | 4 | Black board |
|                 | List properties, color, alignment of text, the box model, background images, The<span> and <div>tags, Conflict resolution.                                                                                                                                                  | 4 | PPT         |
| <b>UNIT III</b> |                                                                                                                                                                                                                                                                             |   |             |
|                 | <b>THE BASICS OF JAVASCRIPT:</b> 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 |
|                 | <b>JAVASCRIPT AND XHTML DOCUMENTS:</b> 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         |
| <b>UNIT IV</b>  |                                                                                                                                                                                                                                                                             |   |             |
|                 | <b>DYNAMIC DOCUMENTS WITH JAVASCRIPT AND XML:</b> 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 |

| UNIT V |                                                                                                                                                                                    |   |             |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-------------|
|        | <b>PHP, ANGULAR JS AND JQUERY:</b> Introduction to PHP: Overview of PHP -General Syntactic Characteristics - Primitives, Operations, and Expressions - Output - Control Statements | 2 | 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.                                                         | 3 | PPT         |

Programme : **M.C.A**

Part-III : **Core IX**

Semester : **III**

Hours : **6 P/W**

Sub.Code : **P23CU9P**

Credits : **4**

Title of the Paper : **Advanced Java Programming Lab**

### **COURSE OBJECTIVES:**

- 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

### **List of Experiments:**

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**

On the successful completion of the course, students will be able to

|      |                                                                                                                                       |        |    |
|------|---------------------------------------------------------------------------------------------------------------------------------------|--------|----|
| CO1: | Implement classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem | K1, K2 | LO |
| CO2: | Apply Applets and Swing programs                                                                                                      | K3     | IO |
| CO3: | Develop Servlets and JSP for creating Web based applications using JDBC                                                               | K4, K5 | HO |

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

**Mapping with Programme Outcomes**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 |     |     |     |     |     |     |     |     |     |      |      |      |
| CO2 |     |     |     |     |     |     |     |     |     |      |      |      |
| CO3 |     |     |     |     |     |     |     |     |     |      |      |      |

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

Programme : **M.C.A**

Semester : **III**

Sub.Code : **P23CU10**

Part-III : **Core X**

Hours : **5 P/W 50 HrsP/S**

**Each unit : 10 hours**

Credits : **3**

Title of the Paper : **Advanced Machine Learning**

**Course Objectives**

- 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 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.



## Unit II:

Lazy Learning – **Classification 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.

## Unit 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.

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.

## Unit 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- 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.

## Unit 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.

**Text Books:**

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.

**Reference Books:**

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.

**Course Outcomes**

**On the successful completion of the course, students will be able to**

|     |                                                                                                       |              |
|-----|-------------------------------------------------------------------------------------------------------|--------------|
| CO1 | To understand, impart and analyze the concepts and of Machine Learning Techniques and types of data   | <b>K1-K6</b> |
| CO2 | To comprehend, apply and evaluate the classification techniques for real-world applications           | <b>K1-K6</b> |
| CO3 | To understand, use and perform evaluation of Regression methods                                       | <b>K1-K6</b> |
| CO4 | To recognize, implement and analyse the unsupervised techniques for real-world applications           | <b>K1-K6</b> |
| CO5 | To understand, identify, implement and review the deep learning techniques for real-time applications | <b>K1-K6</b> |

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

**Mapping with Programme Outcomes**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | S   | -   | -   | S   | L   | -   | S   | -   | -    | -    | -    |
| CO2 | S   | S   | M   | -   | S   | L   | -   | S   | -   | -    | -    | -    |
| CO3 | S   | S   | S   | -   | S   | L   | -   | S   | -   | S    | S    | S    |
| CO4 | S   | S   | M   | -   | S   | L   | -   | S   | -   | -    | -    | -    |
| CO5 | S   | S   | S   | -   | S   | L   | -   | S   | -   | S    | S    | S    |

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

| Units  | Topic                                                                                                     | Lecture Hours | Mode Of Teaching |
|--------|-----------------------------------------------------------------------------------------------------------|---------------|------------------|
| UNIT I |                                                                                                           |               |                  |
|        | <b>Introducing Machine Learning:</b> 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                                                                                                                                                                                                             | 4 | PPT         |
|          | Choosing a Machine Learning Algorithm - Using Machine Learning concepts.                                                                                                                                                                                                                       | 4 | Black board |
| UNIT II  |                                                                                                                                                                                                                                                                                                |   |             |
|          | Lazy Learning – <b>Classification Using Nearest Neighbors:</b> 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 |
|          | <b>Classification Using Decision Trees and Rules:</b> Understanding Decision Trees- Example – Identifying Risky Bank Loans using C5.0 Decision Trees- Understanding Classification Rules- Example – Identifying Poisonous Mushrooms with Rule Learners.                                        | 4 | PPT         |
| UNIT III |                                                                                                                                                                                                                                                                                                |   |             |
|          | Forecasting Numeric Data – <b>Regression Methods:</b> 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.                                              | 4 | PPT         |
| UNIT IV  |                                                                                                                                                                                                                                                                                                |   |             |
|          | Finding Groups of Data – <b>Clustering with K-Means:</b> 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 meta-learning- Understanding Ensembles- Bagging- Boosting- Random forests. | 4 | Black board |

| UNIT V |                                                                                                                                                                                                                                                                                                                  |   |             |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-------------|
|        | <b>Introduction to Deep Learning:</b> 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).                                                       | 2 | Black board |
|        | <b>Convolutional Neural Networks (CNNs):</b> 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         |
|        | <b>Recurrent Neural Networks (RNNs):</b> 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. | 3 | PPT         |

### **Elective V**

Programme : **M.C.A**

Part-III : **Elective V**

Semester : **III**

Hours : **5 P/W**

Sub.Code : **P23DU18P**

Credits : **3**

Title of the Paper : **Web Technologies Lab**

### **COURSE OBJECTIVES:**

**At the end of the course, the student should be able to do:**

- 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.

### **PROGRAM LIST**

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:**

On the successful completion of the course, students will be able

|            |                                                                           |        |    |
|------------|---------------------------------------------------------------------------|--------|----|
| <b>CO1</b> | Design dynamic web pages using JavaScript, Jquery and Angular Java script | K1     | LO |
| <b>CO2</b> | Develop Web pages using HTML, CSS and XML                                 | K2     | IO |
| <b>CO3</b> | Create web application using PHP and MySQL                                | K3, K4 | HO |
| <b>CO4</b> | Develop interactive web pages using Jquery                                | K2,K3  | HO |
| <b>CO5</b> | To design dynamic web pages using Angular javascript                      | K4,K5  | HO |

**MAPPING WITH PROGRAMME OUTCOMES**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | M   | S   | S   | S   | S   | M   | M   | S   | M   | M    | S    | M    |
| CO2 | S   | S   | M   | S   | S   | S   | M   | S   | S   | S    | M    | S    |
| CO3 | S   | S   | S   | M   | M   | S   | M   | M   | S   | M    | M    | S    |
| CO4 | S   | M   | S   | M   | S   | M   | M   | S   | S   | M    | S    | M    |
| CO5 | M   | M   | S   | M   | S   | S   | M   | S   | M   | M    | S    | M    |

**S- STRONG; M-MEDIUM; L-LOW**

|             |                |            |                                                                  |
|-------------|----------------|------------|------------------------------------------------------------------|
| Programme : | <b>M.C.A</b>   | Part-III : | <b>Skill enhancement course-II<br/>(self study course) - lab</b> |
| Semester :  | <b>III</b>     | Hours :    | <b>2 P/W</b>                                                     |
| Sub.Code :  | <b>P23SEU2</b> | Credits :  | <b>2</b>                                                         |

Title of the Paper : **Integrated Technology (AML) Lab**

### Course Objectives

- 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.

### List of Programs

1. Write a python program to compute the Central Tendency Measures: Mean, Median, Mode, Measure of Dispersion: Variance, Standard Deviation
2. Implement a Linear Regression and Multiple Linear Regression with a Real Dataset
3. Implementation of Logistic Regression using sklearn
4. Implement a binary classification model.
5. Classification with Nearest Neighbours and NavieBaye Algorithm
6. Implementation Decision tree for classification using sklearn and its parameter tuning
7. Implement the k-means algorithm.
8. Implement an Image Classifier using CNN in TensorFlow/Keras.
9. Implement an Autoencoder in TensorFlow/Keras.
10. Implement a SimpleLSTM using TensorFlow/Keras.

### Course Outcomes

**On the successful completion of the course, students will be able to**

|            |                                                                                                                                    |              |
|------------|------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <b>CO1</b> | To understand and implement the mathematical and statistical prospective of machine learning algorithms through python programming | <b>K1-K6</b> |
| <b>CO2</b> | To recognize and develop the machine learning models through python in built functions                                             | <b>K1-K6</b> |
| <b>CO3</b> | To understand, impart and develop the machine learning models for real-time dataset                                                | <b>K1-K6</b> |
| <b>CO4</b> | To comprehend , impart and implement the deep learning models for real-time applications                                           | <b>K1-K6</b> |
| <b>CO5</b> | To identify and evaluate the performance machine learning models for real-time dataset                                             | <b>K1-K6</b> |

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

**Mapping with Programme Outcomes**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | S   | S   | -   | S   | -   | -   | -   | M   | -    | -    | -    |
| CO2 | S   | S   | S   | -   | S   | -   | -   | -   | M   | -    | -    | -    |
| CO3 | S   | S   | S   | -   | S   | -   | -   | -   | M   | S    | S    | S    |
| CO4 | S   | S   | S   | -   | S   | -   | -   | -   | M   | -    | -    | -    |
| CO5 | S   | S   | S   | -   | S   | -   | -   | -   | M   | S    | S    | S    |

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

**Semester - IV**

Programme : **M.C.A**

Part-III : **Core XI**

Semester : **IV**

Hours : **6 P/W 60 HrsP/S**

**Each unit : 12 hours**

Sub.Code : **P23CU11**

Credits : **5**

Title of the Paper : **Mobile Computing**

**Course Objective:**

- 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-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

**Unit-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

**Unit-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

**Unit-IV**

Wireless LAN: Infra red vs. radio transmission – Infrastructure and ad-hoc network – IEEE 802.11 – System architecture – Protocol architecture – Physics layer – Medium access 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

**Unit-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)

**Text Book:**

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

**Reference Books:**

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.

**Course Outcomes:**

On the successful completion of the course, students will be able to

|     |                                                                                                                                                                          |            |    |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----|
| CO1 | Understanding the basic concepts of Mobile and Wireless Communication                                                                                                    | K1, K2     | LO |
| CO2 | Understanding the basic concepts of Spread Spectrum. Analyzing the concepts of Medium Access Control.                                                                    | K3         | IO |
| CO3 | Analyzing the concepts of Global System for Mobile Communication and Satellite Communications. Understanding the basic concepts of Wireless LAN                          | K4         | HO |
| CO4 | Understanding the basic concepts of Wireless LAN. Evaluate the performance of Mobile Network Layer                                                                       | K2, K5     | HO |
| 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 | K2, K4, K6 | HO |

K1- Remember, K2- Understand, K3- Apply , K4- Analyze, K5- Evaluate, K6- Create



**Mapping Course outcomes with Programme outcomes**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | L   | -   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    |
| CO2 | S   | M   | M   | M   | M   | -   | M   | -   | -   | -    | -    | -    |
| CO3 | S   | M   | M   | M   | M   | -   | M   | -   | -   | L    | -    | M    |
| CO4 | S   | M   | M   | M   | M   | -   | M   | -   | -   | L    | -    | M    |
| CO5 | S   | M   | M   | M   | M   | -   | M   | -   | -   | L    | -    | M    |

3. S- Strong; M-Medium; L-Low

| Units           | Topic                                                                                                                                                                   | Lecture Hours | Mode Of Teaching |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------|
| <b>UNIT I</b>   |                                                                                                                                                                         |               |                  |
|                 | 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      |
| <b>UNIT II</b>  |                                                                                                                                                                         |               |                  |
|                 | 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              |
| <b>UNIT III</b> |                                                                                                                                                                         |               |                  |
|                 | 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              |
| <b>UNIT IV</b>  |                                                                                                                                                                         |               |                  |
|                 | 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      |

| UNIT V |                                                                                                                         |   |             |
|--------|-------------------------------------------------------------------------------------------------------------------------|---|-------------|
|        | WAP: Architecture – wireless datagram Protocol, Wireless transport layer security, Wireless transaction protocol        | 2 | 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. | 3 | PPT         |
|        |                                                                                                                         |   |             |

Programme : **M.C.A** Part-III : **Core XII**  
 Semester : **IV** Hours : **6 P/W 60 HrsP/S**  
**Each unit : 12 hours**  
 Sub.Code : **P23CU12** Credits : **5**

Title of the Paper : **Software Project Management**

### Course Objectives:

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

### Expected Course Outcomes:

On the successful completion of the course, student will be able to:

- |   |                                                                                         |        |
|---|-----------------------------------------------------------------------------------------|--------|
| 1 | Understand the fundamentals of Software Project Management                              | K2/ K4 |
| 2 | Understand the Project Evaluation by Strategic, Technical and Cost analysis             | K2/ K4 |
| 3 | Understand the fundamentals of Software effort estimations                              | K2/ K4 |
| 4 | Understand the Risk Management, risk analysis and monitoring.                           | K2/ K4 |
| 5 | Understanding the various types of contracts and the Organizational Behavior Background | K2/ K4 |

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

#### Unit:1 Introduction

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 –Analyse Project Characteristics –Products and Activities – Estimate Effort for each Activity –Identify Activity Risks –Allocate Resources -Review / Publicize Plan – Execute Plan and Lower Levels of Planning.

#### Unit:2 Project Evaluation

Introduction –Strategic Assessment –Technical Assessment –Cost Benefit Analysis –Cash Flow Forecasting –

Cost Benefit Evaluation Techniques –Risk Evaluation –Selection of an Appropriate Project Approach – Choosing Technologies –Choice of Process Models –Structured Methods – Rapid Application Development – Waterfall Model –V-Process Model –Spiral Model – Software Prototyping –Ways of Categorizing Prototypes –Tools –Incremental Delivery –Selection Process Model.

### **Unit:3 Software Effort Estimation**

Introduction –Problems 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 Pass – Backward Pass –Identifying the Critical Path –Activity Float –Shortening Project Duration –Identifying Critical Activities –Precedence Networks.

### **Unit:4 Risk Management**

Introduction –Nature of Risk Management 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.

### **Unit:5 Managing Contracts**

Introduction –Types of Contract –Stages in Contract Placement –Terms of Contract –ContractManagement – Acceptance –Managing People and Organizing Teams –Organizational BehaviorBackground –Selecting the Right Person for the Job –Instruction in the Best Methods – Motivation –Decision Making –Leadership – Organizational Structures –Software Quality –Importance –Practical Measures –Product.

### **Text Books**

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

### **Reference Books**

1. Walker Royce, “Software Project Management , Addition Wesley.
2. DerrellInce, H. Sharp and M. Woodman, “Introduction to Software Project Management and Quality Assurance , Tata McGraw Hill, 1995

### **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]**

- 1 <https://nptel.ac.in/courses/106/105/106105218/>
- 2 [https://swayam.gov.in/nd1\\_noc19\\_cs70/preview](https://swayam.gov.in/nd1_noc19_cs70/preview)
- 3 <https://freevideolectures.com/course/4071/nptel-software-project-management>
- 4 <https://www.nptelvideos.com/video.php?id=918>
- 5 <https://www.classcentral.com/course/swayam-software-project-management-14294>
- 6 <https://www.w3schools.in/sdlc-tutorial/software-development-life-cycle-sdlc/>

**Mapping with Programme Outcomes:**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 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    |

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

| Units           | Topic                                                                                                                                                                                                                            | Lecture Hours | Mode Of Teaching |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------|
| <b>UNIT I</b>   |                                                                                                                                                                                                                                  |               |                  |
|                 | 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      |
| <b>UNIT II</b>  |                                                                                                                                                                                                                                  |               |                  |
|                 | 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 Approach –Choosing Technologies –Choice of Process Models –Structured Methods - Rapid Application Development                                                               | 4             | Black board      |
|                 | Waterfall Model –V-Process Model –Spiral Model – Software Prototyping – Ways of Categorizing Prototypes –Tools –Incremental Delivery – Selection Process Model                                                                   | 4             | PPT              |
| <b>UNIT III</b> |                                                                                                                                                                                                                                  |               |                  |
|                 | 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 Pass –Identifying the Critical Path –Activity Float -Shortening Project Duration –Identifying Critical Activities –Precedence Networks.                                                                                 | 4             | PPT              |
| <b>UNIT IV</b>  |                                                                                                                                                                                                                                  |               |                  |
|                 | 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      |

| UNIT V |                                                                                                                                                                    |   |             |
|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-------------|
|        | Introduction –Types of Contract –Stages in Contract Placement –Terms of Contract –ContractManagement                                                               | 2 | Black board |
|        | Acceptance –Managing People and Organizing Teams –Organizational BehaviorBackground –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. | 3 | PPT         |

### **Electives -- IV**

Programme : **M.C.A** Part-III : **Elective IV**  
Semester : **IV** Hours : **5 P/W 50 HrsP/S**  
**Each unit : 10 hours**  
Sub.Code : **P23DU19** Credits : **3**

Title of the Paper : **Social Networks**

### **Course Objectives**

- 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 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 Content-Search Engine Optimization (SEO)-Feed Burner-RSS Feed and Blog Directories-An Optimization Plan for Blog or RSS Feed.

**UNIT 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 Plugins 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.

**UNIT 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-Video Sharing Sites-Video Sharing Strategy-Searching And Search Engine Placement-Connecting With Others.

**UNIT 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.

**Unit 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.

**Text Book:**

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

**Reference Books:**

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.

**Course Outcomes**

On the successful completion of the course, students will be able to

|      |                                                                                                  |       |
|------|--------------------------------------------------------------------------------------------------|-------|
| CO1: | To understand, impart and summarize the concepts of Social media, Social networking and Webcasts | K1-K6 |
| CO2: | To comprehend, design and develop a Word Press Powered Website                                   | K1-K6 |
| CO3: | To understand, implement and perform evaluation of Social Networking and Micro-Blogging          | K1-K6 |
| CO4  | To collaborate, implement and analyse the Widgets and Badges in social networking environment    | K1-K6 |
| CO5  | To understand, illustrate and perform evaluation of web optimization for social networks         | K1-K6 |

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

**Mapping with Programme Outcomes**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | S   | S   | -   | S   | L   | -   | S   | -   | S    | S    | S    |
| CO2 | S   | S   | S   | -   | S   | L   | -   | S   | -   | S    | S    | S    |
| CO3 | S   | S   | S   | -   | S   | L   | -   | S   | -   | S    | S    | S    |
| CO4 | S   | S   | S   | -   | S   | L   | -   | S   | -   | S    | S    | S    |
| CO5 | S   | S   | S   | -   | S   | L   | -   | S   | -   | S    | S    | S    |

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

| Units    | Topic                                                                                                                                                                                                           | Lecture Hours | Mode Of Teaching |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------|
| UNIT I   |                                                                                                                                                                                                                 |               |                  |
|          | Introduction: Social Media Strategy-Important First Decisions -Websites, Blogs - RSS Feeds Mapping -Preparation - Multimedia Items Gathering Content for Blog Posts RSS Feeds and                               | 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                                                                      | 4             | 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      |
| UNIT 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.                                                                                    | 4             | PPT              |
| UNIT 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.                                                                                                        | 4             | PPT              |
| UNIT 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 Portals-Virtual Worlds.                                                                                    | 4             | Black board      |
| UNIT 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      | 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.                                                                                                                                | 3             | PPT              |

Programme : **M.C.A** Part-III : **Elective VI**  
 Semester : **IV** Hours : **5 P/W**  
 Sub.Code : **P23DU20P** Credits : **3**

Title of the Paper : **Social Networks Lab**

### Course Objectives

- 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.

### List of Programs

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
10. To analyze GitHub interest graph

### Course Outcomes

On the successful completion of the course, students will be able to

|      |                                                                                                                                           |       |
|------|-------------------------------------------------------------------------------------------------------------------------------------------|-------|
| CO1: | To understand , implement and review the fundamental techniques and principles for social networks.                                       | K1-K6 |
| CO2: | To design and develop the programs using the tools required to develop and manage social network like Facebook, LinkedIn, Google+, GitHub | K1-K6 |
| CO3: | To create and explore the functionality of social networking tools such as GitHub                                                         | K1-K6 |
| CO4  | To understand , implement and review the fundamental principles for social network graphs.                                                | K1-K6 |
| CO5  | To comprehend and critically analyse the existing API for social networks                                                                 | K1-K6 |

**K1- Remember, K2- Understand, K3- Apply , K4- Analyze, K5- Evaluate, K6- Create**



**Mapping with Programme Outcomes**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | S   | M   |     | M   | S   | -   | -   | -   | S    | -    | -    |
| CO2 | S   | M   | S   | S   | S   | M   | -   | -   | -   | S    | -    | -    |
| CO3 | S   | S   | S   | S   | S   | S   | -   | -   | -   | S    | S    | S    |
| CO4 | S   | M   | S   | S   | S   | M   | -   | -   | -   | S    | -    | -    |
| CO5 | S   | S   | S   | S   | S   | S   | -   | -   | -   | S    | S    | S    |

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

Programme : **M.C.A** Part-III : **Elective VI**  
Semester : **IV** Hours : **5 P/W 50 HrsP/S**  
**Each unit : 10 hours**  
Sub.Code : **P23DU21** Credits : **3**

Title of the Paper : **High Performance Computing**

**Course Objectives:**

- 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-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.

**Unit-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. **Parallel computers:** Taxonomy of parallel computing paradigms-Shared-memory computers-Distributed memory computers-Hierarchical systems-Networks.

**Unit-III**

**Basics of parallelization:** Introduction to Parallelism -Parallel scalability. **Shared memory parallel programming with OpenMP:** Short introduction to OpenMP-OpenMP-parallel Jacobi algorithm.

**Unit-IV**

**Efficient OpenMP programming:** Profiling OpenMP programs-Performance pitfalls-Parallel sparse matrix-vector multiply. **Locality optimizations on ccNUMA architectures:** Locality of access on ccNUMA-ccNUMA optimization of sparse MVM-Placement pitfalls-ccNUMA issues with C++.

**Unit-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.

**Text book:**

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

**Reference books:**

1. Michael W. Berry, Kyle A. Gallivan, Efstratios Gallopoulos, 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.

**Course Outcome:**

On the successful completion of the course, students will be able to,

|     |                                                                                         |         |
|-----|-----------------------------------------------------------------------------------------|---------|
| CO1 | Understand of the HPC and ccNUMA concepts                                               | K1 - K6 |
| 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                                                   |         |

**K1- Remember, K2 - Understand, K3 - Apply , K4 - Analyze, K5 - Evaluate, K6 -Create**

Mapping with Programme Outcomes:

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | L   | M   | L   | L   | L   | S   | S   | S   | S    | M    | L    |
| CO2 | S   | M   | L   | M   | M   | L   | S   | L   | S   | L    | S    | L    |
| CO3 | S   | S   | S   | M   | M   | L   | M   | L   | M   | L    | S    | L    |
| CO4 | S   | S   | S   | M   | S   | L   | M   | L   | M   | S    | S    | S    |
| CO5 | S   | S   | S   | M   | M   | L   | M   | M   | M   | M    | S    | L    |

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

| Units    | Topic                                                                                                                                                                                                                                             | Lecture Hours | Mode Of Teaching |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------|
| UNIT I   |                                                                                                                                                                                                                                                   |               |                  |
|          | <b>Modern processors:</b> Stored-program computer architecture-General purpose cache based microprocessor architecture-Memory hierarchies -Multicore processors -Multithreaded processors-Vector processors.                                      | 4             | Black board      |
|          | <b>Basic optimization techniques for serial code:</b> Scalar profiling-Common sense optimizations                                                                                                                                                 | 4             | PPT              |
|          | Simple measures, large impact-The role of compilers-C++ optimizations.                                                                                                                                                                            | 4             | Black board      |
| UNIT II  |                                                                                                                                                                                                                                                   |               |                  |
|          | <b>Data access optimization:</b> 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      |
|          | <b>Parallel computers:</b> Taxonomy of parallel computing paradigms-Shared-memory computers                                                                                                                                                       | 4             | Black board      |
|          | Distributed memory computers-Hierarchical systems-Networks.                                                                                                                                                                                       | 4             | PPT              |
| UNIT III |                                                                                                                                                                                                                                                   |               |                  |
|          | <b>Basics of parallelization:</b> Introduction to Parallelism -Parallel scalability.                                                                                                                                                              | 4             | Black board      |
|          | <b>Shared memory parallel programming with OpenMP:</b> Short introduction to OpenMP                                                                                                                                                               | 4             | Black board      |
|          | OpenMP-parallel Jacobi algorithm.                                                                                                                                                                                                                 | 4             | PPT              |
| UNIT IV  |                                                                                                                                                                                                                                                   |               |                  |
|          | <b>Efficient OpenMP programming:</b> Profiling OpenMP programs-Performance pitfalls-Parallel sparse matrix-vector multiply.                                                                                                                       | 4             | Black board      |
|          | <b>Locality optimizations on ccNUMA architectures:</b> Locality of access on ccNUMA-ccNUMA optimization of sparse MVM                                                                                                                             | 4             | Black board      |
|          | Placement pitfalls-ccNUMA issues with C++.                                                                                                                                                                                                        | 4             | Black            |
| UNIT V   |                                                                                                                                                                                                                                                   |               |                  |
|          | <b>Distributed-memory parallel programming with MPI:</b> Message passing - A short introduction to MPI-MPI parallelization of a Jacobi solver.                                                                                                    | 2             | Black board      |
|          | <b>Efficient MPI programming:</b> MPI performance tools-Communication parameters                                                                                                                                                                  | 4             | PPT              |
|          | Synchronization, serialization, contention-Reducing communication overhead-Understanding intranode point-to-point communication.                                                                                                                  | 3             | PPT              |

Programme : **M.C.A** Part-III : **Elective VI**  
 Semester : **IV** Hours : **5 P/W**  
 Sub.Code : **P23DU22P** Credits : **3**

Title of the Paper : **High Performance Computing Lab**

**Course Objectives:**

- 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.

(Implemented either PB, Slurm, OpenMP, OpenMPI, and CUDA)

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 Outcome:**

On the successful completion of the course, students will be able to,

|     |                                                               |         |
|-----|---------------------------------------------------------------|---------|
| CO1 | Apply and Evaluate the HPC Programs                           | K1 - K6 |
| 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                        |         |

**1- Remember, K2 - Understand, K3 - Apply , K4 - Analyze, K5 - Evaluate, K6 -Create**

**Mapping with Programme Outcomes:**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | L   | M   | L   | L   | L   | S   | S   | S   | S    | M    | L    |
| CO2 | S   | M   | L   | M   | M   | L   | S   | L   | S   | L    | S    | L    |
| CO3 | S   | S   | S   | M   | M   | L   | M   | L   | M   | L    | S    | L    |
| CO4 | S   | S   | S   | M   | S   | L   | M   | L   | M   | S    | S    | S    |
| CO5 | S   | S   | S   | M   | M   | L   | M   | M   | M   | M    | S    | L    |

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

Programme : **M.C.A**

Part-III : **Skill Enhancement course  
III**

Semester : **IV**

Hours : **3P/W**

Sub.Code : **P23SEU3**

Credits : **2**

Title of the Paper : **Soft Skill Development Lab**

**Course Objective**

This course enables the students:

- 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

**Exercises**

1. 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

### **Text Books**

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.

### **Reference Books**

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