GURU NANAK COLLEGE
(AUTONOMOUS)

VELACHERY ROAD, CHENNAI – 600042

(Re-accredited at 'A-Grade' by NAAC) Affiliated to University of Madras
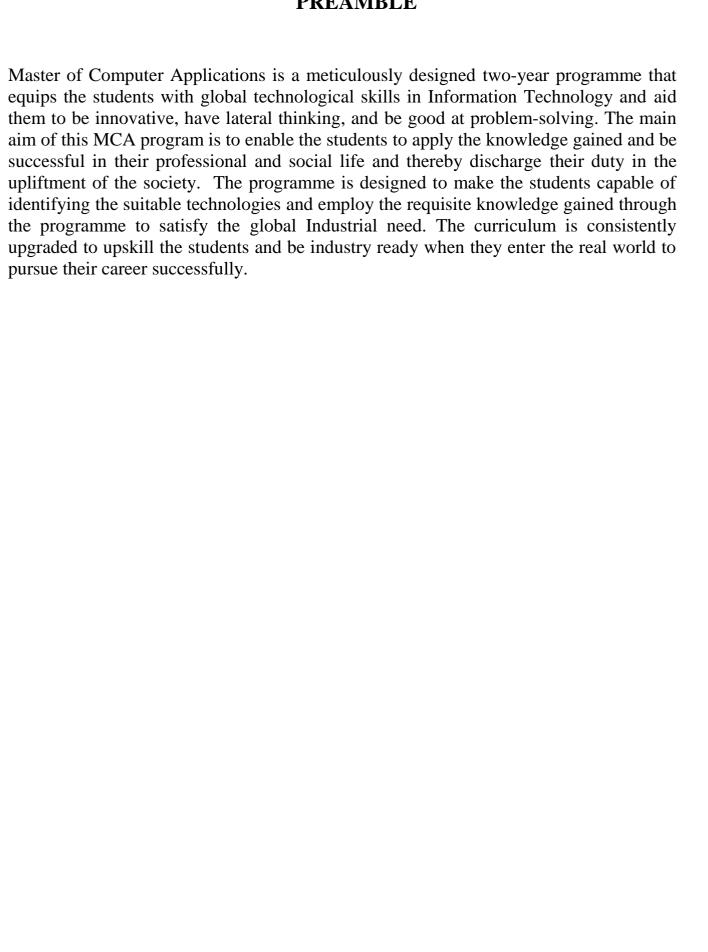

MASTER OF COMPUTER APPLICATIONS
(MCA)

(SEMESTER PATTERN WITH CHOICE BASED CREDIT SYSTEM)

SYLLABUS

(For the candidates admitted for the Academic year 2022-23 and thereafter)

PREAMBLE

Master of Computer Applications is a meticulously designed two-year programme that equips the students with global technological skills in Information Technology and aid them to be innovative, have lateral thinking, and be good at problem-solving. The main aim of this MCA program is to enable the students to apply the knowledge gained and be successful in their professional and social life and thereby discharge their duty in the upliftment of the society. The programme is designed to make the students capable of identifying the suitable technologies and employ the requisite knowledge gained through the programme to satisfy the global Industrial need. The curriculum is consistently upgraded to upskill the students and be industry ready when they enter the real world to pursue their career successfully.

LEARNING OUTCOME BASED CURRICULUM FRAMEWORK
From the Academic Year (2022-23) and thereafter

VISION:

To impart essential knowledge in Information technology to the students, and enhance their ability to apply the knowledge gained and be successful in their professional and social life, contribute to their progress and thereby get involved in the upliftment of the society.

MISSION:

- Equip the students with global technological skills in Information Technology that enhance them to be innovative, have lateral thinking, and good at problem-solving.

- Increase Industry - Institute Interaction to enlighten the students about the required skills to be successful in their careers.

- Train and develop the students as IT Professionals with Confidence, Competence, Commitment, and Character.

PROGRAMME OUTCOMES

PO 1: Identify, formulate and Analyse the current real world requirements of Clients and Handle the constraints and challenges in Software Development and Construct the Software efficiently.

PO 2: Implement knowledge gained in Information Technology to find and propose the solution for Novel Real-world problems that dynamically change in an efficient manner.

PO 3: Design appropriate architecture and build Applications that meet the requirements of the Clients as expected by them.

PO 4: Employ apt tools and Integrated Development Environments efficiently and accordingly learn and apply new techniques and tools for the software development.

PO 5: Implement ethical principles and commit to professional ethics and responsibilities and norms of Software Development practices and work effectively as an individual, at different levels in diverse teams.

PROGRAMME SPECIFIC OUTCOMES

PSO 1 : Identify, Explain and Deploy current technologies in the IT industry. Employ the requisite knowledge gained in Networking, System Software, Application Software and Database Management Systems, and be suitable for the global Industrial need.

PSO2 : Investigate the dynamically changing real world scenario and requirements , learn continuously and be Persistent in the face of challenges and succeed in career .

COURSE STRUCTURE

(for Bridge Course – for non-IT Students)

- MCA Department offers need-based bridge course to meet pre-requisite requirements and academic needs of students with different backgrounds.
- Based on the qualifications of the students admitted the mentoring team of the department shall recommend to carry out the bridge courses as mandatory course for that candidate.
- Two weeks bridge courses need to be organized before the commencement of the first semester.
- Nurturing and evaluation process of bridge and foundation courses is left to the respective academic units.

SYLLABUS FOR THE BRIDGE COURSE

PROGRAMMING IN C

Introduction to C– History of C, Features of C, Structure of C Program, Character Set, C Tokens-Keywords, Identifiers, Constants, Variables, Data types, Operators. Statements-Selection statements (Decision Making)- if and switch statements with examples, Repetition statements (loops)- while, for, do-while statements with examples, Unconditional statements- break, continue, goto statements with examples.

PROGRAMMING SOLVING TECHNIQUES

Problem Analysis, Process Analysis, Conceptual Development of Solution. Development Tools: Algorithm: Types of Algorithm, Algorithm of Analysis, Advantage and Disadvantage of Algorithm , Top Down Design. **Idea of Algorithm**: Representation of Algorithm, Flowcharts: Concept, Symbols, Rules of flowcharting, Advantage and Disadvantage of Flowchart, Pseudo code with examples, From algorithms to programs, source code.

INFORMATION TECHNOLOGY

Introduction to computer and computing: evolution of computing devices, data and information, types of data. **Software:** purpose and types – system and application software, operating system, Translators: Compiler, Interpreter and Assembler, Linker, Loader, device drivers, programming tools, generic and specific purpose software, classification of programming languages (high level language, machine language), Study of Programming Language (Procedure Oriented, Object- Base, Event-Base)

Operating System (OS): Need for operating system, brief introduction to functions of OS, user interface, Popular operating systems-Microsoft DOS, Microsoft Windows, UNIX and Linux, **Types of OS:** Concepts of Batch, Multi Programmed, Time Sharing, Parallel, Real Time and Distributed.

Number systems - Decimal, Binary, Octal, Hexadecimal conversion from one to another, Basic Arithmetic Operations: Integer Addition and Subtraction, Signed numbers, Binary Arithmetic, 1's and 2's Complement Arithmetic, Fixed and Floating point numbers, Floating point representation, Logic gates.

Database Systems: File-Oriented Approach, Database-oriented Approach-Components of Database system, Advantages & Disadvantages of Database approach, Applications of Database systems,

Introduction to Computer Network

Need of Computer Network, Advantages of Computer Network, Uses of Computer Network, Network Models, Categories of Networks and Internetworks, Network Topologies (Bus, Star, Ring, Star Bus, Star Ring and Physical Mesh).

CODING PRACTICES

1. Write a C program to enter two numbers and perform all arithmetic operations.

2. Write a C program to enter length and breadth of a rectangle and find its perimeter.

3. Write a C program to enter length and breadth of a rectangle and find its area.

4. Write a C program to enter radius of a circle and find its diameter, circumference and area.

5. Write a C program to enter length in centimeter and convert it into meter and kilometer.

6. Write a C program to enter temperature in Celsius and convert it into Fahrenheit.

7. Write a C program to enter temperature in Fahrenheit and convert to Celsius

8. Write a C program to convert days into years, weeks and days.

9. Write a C program to find power of any number x ^ y.

10. Write a C program to enter any number and calculate its square root.

11. Write a C program to enter two angles of a triangle and find the third angle.

12. Write a C program to enter base and height of a triangle and find its area.

13. Write a C program to calculate area of an equilateral triangle.

14. Write a C program to enter marks of five subjects and calculate total, average and percentage.

15. Write a C program to enter P, T, R and calculate Simple Interest.

16. Write a C program to enter P, T, R and calculate Compound Interest.

MATHEMATICAL FOUNDATIONS FOR COMPUTER SCIENCE

Mathematical Logic: Statement Calculus – Connectives – normal forms – Predicate Calculus – Theory of inference for statement Calculus – Predicate Calculus including theory of inference.
Set Theory: Basic concepts of set theory: Roots of Equations: Graphical Method – Bisection Method – False-Position Method – Fixed-Point Iteration – Newton-RaphsonMethod – Secant Method

MASTER OF COMPUTER APPLICATIONS
COURSE STRUCTURE 2022 -24 Batch

Semester	Part	Course	Subject Code	Title	Hours	Credits	Internal	External	Total
I	III	Core Paper-1	20PMCA301	Operating Systems – Internals and Design Principles	5	4	50	50	100
	III	Core Paper-2	20PMCA302	Advanced Database Management Systems	5	4	50	50	100
	III	Core Paper-3	20PMCA303	Open Source Technologies	5	4	50	50	100
	III	Elective-1	20PMCA306	Elective-I	5	3	50	50	100
	III	Core Paper-4	20PMCA304P	Practical - I : ADBMS Lab	4	2	50	50	100
	III	Core Paper-5	20PMCA305P	Practical - II : Open Source Technology Lab	4	2	50	50	100
	IV	Soft Skill-1	20PGSL402	Language and Communication Skill	2	2	50	50	100
						CREDIT TOTAL =			**21**
II	III	Core Paper-6	20PMCA307	Data Science using R	4	4	50	50	100
	III	Core Paper-7	20PMCA308	Artificial Intelligence	4	4	50	50	100
	III	Core Paper-8	20PMCA309	Software Development Operations(DevOps)	4	4	50	50	100
	III	Elective -2	20PMCA310	Elective -II	4	3	50	50	100
	III	Extra-Disciplinary-I	20PMCA311	Statistics for Data Analytics	4	3	50	50	100
	III	Core Paper-9	20PMCA312P	Practical - III : Data Science Lab	4	2	50	50	100
	III	Core Paper-10	20PMCA313P	Practical - IV : Advanced Java Technology Lab	4	2	50	50	100
	IV	Soft Skill-2	19PGSL407	Quantitative Aptitude	2	2	50	50	100
	III	Internship	20PINT401	During I year summer vacation 4 to 6 weeks – Evaluation will be at the end of third semester.					
						CREDIT TOTAL =			**24**

	III	Core Paper-11	20PMCA314	Machine Learning	4	4	50	50	100
	III	Elective –3	20PMCA317	Elective -III	4	3	50	50	100
	III	Elective –4	20PMCA316	Elective -IV	4	3	50	50	100
	III	Elective –V	20PMCA315	Elective -V	4	3	50	50	100
	III	Extra-Disciplinary-II	20PMCA318	Software Testing	4	3	50	50	100
III	III	Core Paper-12	20PMCA319P	Practical – V: Robotic Process Automation Lab	4	2	50	50	100
	III	Core Paper-13	20PMCA320P	Practical - VI : Advanced Python Lab	4	2	50	50	100
	IV	Soft Skill-3	20PGSL405	Data Visualization Tool	2	2	50	50	100
	III	Internship	20PINT401	During I Year Summer Vacation 4 to 6 Weeks		2			100
				CREDIT TOTAL =				**24**	
IV	III	Core Paper – 14	20PMCA321	**LATEST TECHNOLOGY -1**	4	3	50	50	100
	III	Core Paper – 15	20PMCA322	**LATEST TECHNOLOGY – 2**	4	3	50	50	100
	III	Project	20PMCA323	Project and Viva Voce	20	17	20	60+20	100
	IV	Soft Skill-4	20PGSL406	Architectural Design using Star UML	2	2	50	50	100
				CREDIT TOTAL =				**25**	
				OVERALL CREDIT TOTAL =				**94**	

ELECTIVES

Course	Subject Code	Title
Elective - I	20PMCA306	Software Engineering
	20PMCA324	Computer Communication and Networking
	20PMCA325	Software Project Management
Elective - II	20PMCA310	Advanced Java Technology
	20PMCA326	Android Applications Development
	20PMCA327	Linux Administration and Network Programming
Elective - III	20PMCA317	Advanced Python
	20PMCA328	Object Oriented Analysis, Design and UML
	20PMCA329	Design and Analysis of Algorithm
Elective - IV	20PMCA316	Robotic Process Automation
	20PMCA330	MATLAB Programming
	20PMCA331	Visual Programming Using C# And Vb.Net
Elective - V	20PMCA315	Cloud Computing
	20PMCA332	e-Commerce
	20PMCA333	Human Resource Management

QUESTION PAPER PATTERN

Section	Question Component	Numbers	Marks	Total
Section - A	**Definition / Principle** Answer ALL questions (Each in 50 words)	1-10	2	20
Section - B	**Short Answer** Answer any 5 out of 7 questions (Each in 300 words)	11-17	7	35
Section - C	**Essay** Answer any 3 out of 5 questions (Each in 1200 words)	18-22	15	45

DISTRIBUTION OF QUESTIONS

Sections	Units	No. of Questions	
		Theory	**Problems**
Section A	Unit – 1	2	
	Unit – 2	2	
	Unit – 3	2	
	Unit – 4	2	
	Unit – 5	2	
Section B	Unit – 1	2	
	Unit – 2	2	
	Unit – 3	1	
	Unit – 4	1	
	Unit – 5	1	
Section C	Unit – 1	1	
	Unit – 2	1	
	Unit – 3	1	
	Unit – 4	1	
	Unit – 5	1	

SEMESTER I

CORE – 1

OPERATING SYSTEMS   – INTERNALS AND DESIGN PRINCIPLES

SUBJECT CODE : 20PMCA301	THEORY	MARKS : 100
SEMESTER : I	CREDITS : 4	No. OF HOURS PER WEEK : 5

COURSE FRAMEWORK:
- To understand the basic concepts and working of Operating Systems
- At the end of the session students will be having basic knowledge in Operating Systems Internals and Design Principles

COURSE OUTCOMES:
1. Describe the basic concepts in Operating systems like Multiprogramming, Time Sharing, Services, System calls, System programs, Process, Concurrent Processes. Explain CPU Scheduling and differentiate Scheduling algorithms
2. Realize about Process Synchronization done by Operating System, Explain Classical problems in Synchronization, Inter process communications, Deadlocks and Deadlock handling
3. Appraise and discriminate Storage Management methodologies like Swapping, Paging and Segmentation, Virtual memory, Page Replacement Algorithms, Free Space Management, Disk Scheduling, allocation methods, performance and reliability   improvements
4. Explain Files, their protection, operations, access methods, File system organization and Directory structure.
5. Recognize Protection and security provided by an Operating System and realize the security Problems. Examine intrusion detection and cryptography.

UNIT-I : **OVERVIEW**: What Operating systems do – Operating System Structure – Operating System Operations – Process Management – Memory Management – Storage Management – Protection and Security – Kernel Data Structures – Open Source Operating systems.**(15 Hours)**

UNIT-II : PROCESS MANAGEMENT: Process Concept – Operations on Process – Threads - Inter Process communication – Process Scheduling : Basic concepts – Scheduling Criteria – Scheduling algorithms- Real Time CPU Scheduling – Synchronization : Introduction – Critical Section problem – Mutex Locks - Semaphores – Classic Problems of Synchronization- Monitors – Threads. **(15 Hours)**

UNIT-III : MEMORY MANAGEMENT: Introduction – **Memory Management Strategies** : Swapping – Segmentation – Paging – Demand Paging – Page Replacement Algorithms – Thrashing. **STORAGE MANAGEMENT :** File Concept – Access Method- Directory and Disk Structure – File System Mounting – File Sharing – Protection -   RAID structure and RAID Levels . **(15 Hours)**

UNIT-IV : PROTECTION AND SECURITY: System Protection : Goals- Principles- Domain of Protection – Access Matrix – Access Control – Revocation of Access Rights – **System Security :** Security Problem – Program Threats – Cryptography as a security tool – User Authentication – Firewalling - Computer Security Classification. **(15 Hours)**

UNIT-V : DISTRIBUTED OPERATING SYSTEM: Distributed Computing System :
Introduction – Advantages - Introduction to Distributed Computing Environment (DCE) **–
Distributed Operating System :** Introduction - Issues in Designing a Distributed Operating
System- Security : Potential Attacks – Cryptography- Authentication – Access Control –Digital
Signatures .   **(15 Hours)**

PRESCRIBED BOOKS :
   1. Abraham Silberschatz; Peter B. Galvin ; Greg Gagne, Operating System Concepts, 9th
      Edition, John Wiley & Sons (Asia) Pte Ltd
   2. Pradeep K. Sinha , Distributed Operating Systems, IEEE Computer Society Press, 1997

REFERENCE BOOKS :
   1. William Stallings, Operating Systems Internals and Design Principles, 7th Edition,
      Prentice Hall.
   2. Andrew S. Tanenbaum ; Herbert Bos , Modern Operating Systems, 4th Edition , Pearson
      Education, Inc.

CORE – 2

ADVANCED DATABASE MANAGEMENT SYSTEMS

SUBJECT CODE : 20PMCA302	THEORY	MARKS : 100
SEMESTER : I	CREDITS : 4	No. OF HOURS PER WEEK : 5

COURSE FRAMEWORK:
- To understand the advanced Database Management Systems concepts.
- At the end of this course, students will be able to work with DBMS, write and executewith SQL queries and PL/SQL cursors, procedures, functions and triggers.

COURSE OUTCOMES:
1. Discuss basic concepts, need, advantages and characteristics of Database and Relational Database Management systems
2. Design Entity Relationship diagram for the given Problem requirements using the appropriate notations. Create, Alter, Normalize and Delete Database Tables. Examine Transaction Control Language commands. Understand Database Administrator's tasks and User Privileges.
3. Examine data in a database precisely. Illustrate usage of Commands like, Select, Insert, Update and Delete.
4. Explain basics of PL/SQL. Create and appraise Database objects like Store Procedures, Functions and triggers. Handle Exception conditions efficiently.
5. Understand about MongoDB and NoSQL Databases

UNIT-I : Introduction : Definition of Data, Database and DBMS – Need for database – Advantages of Relational Database Systems - ACID Properties - **Database related terms** : Concurrency, Consistency, Data Availability, Reliability, Transparency, Data Integrity and Data Security.   **(15 Hours)**

UNIT-II : Relational data structure: Relation – Domains & Attributes – Keys – SQL Data types – **E-R model:** Entities, Entity Sets – Relationships and Mapping Cardinalities, Relationship Sets – ER Diagram Notations – Participation Constraints - Extended E-R Features
– Rules for transforming ER Diagram into Tables – **Data Definition Language** : Create, Alter and Drop Tables –**Normalization** : Need, Normalization process - **Normal forms :** 1NF, 2NF and 3 NF – Denormalization. **Transaction Control Language (TCL) commands:** Commit, Savepoint, Rollback - **Database Administration:** DBA Tasks – User Privileges. **(15 Hours)**

UNIT-III: Data Manipulation Language: Insert, Update, Delete and Select statement withall its clauses – **Subqueries** : Nested and Correlated subqueries - **JOINS :** Self Join, Equi Join, Non-Equi Join, Outer Join **- VIEWS :** View Definition – Uses of Views -Simple and ComplexViews- View Expansion -   Updating tables through views.   **(15 Hours)**

UNIT-IV : PL / SQL: Basic Concepts - Tables and Records Manipulations – Control Statements – Anonymous blocks, Stored Procedures, Functions, Exception handling, Cursors and Triggers.
                                                                                                                              (15 Hours)

UNIT-V : Introduction to NoSQL ("not only SQL") Databases & MongoDB :
Introducing NoSQL and MongoDB - What Is NoSQL- Choosing RDBMS, NoSQL, or Both -
Understanding MongoDB - MongoDB Data Types - Planning Your Data Model.

(15 Hours)

PRESCRIBED BOOKS :
1. Henry Forth, Abraham Silberschatz, S. Sudharshan,"*Database System Concepts*",
   5ᵗʰEdition, 2006, TMH.
2. Database Management System - Post, Gerald V ,Tata McGraw-Hill, 2004
3. Database Management System - Date ,C.J., Galgotia Publications
4. An introduction to Database Systems - Bipin C Desai Galgotia Publications Ltd.,
5. Sams Teach Yourself NoSQL with MongoDB in 24 Hours, 2015 - Brad Dayley

REFERENCE BOOKS :
1. Raghu Ramakrishnan ,"Database Management Systems", McGraw Hill Publishing
   CompanyLimited, 2004.

CORE - 3

OPEN SOURCE TECHNOLOGIES

SUBJECT CODE : 20PMCA303	THEORY	MARKS : 100
SEMESTER : I	CREDITS : 4	No. OF HOURS PER WEEK : 5

COURSE FRAMEWORK:
- To explore the features of various open source platforms and frameworks used in webapplications development.
- At the end of this course students will be able to easily Design front end web pages andconnect to the back end databases.

COURSE OUTCOMES:
1. Discuss about the fundamental concepts of HTML, CSS and understand basic manipulations
2. Understand basics of Javascript and demonstrate by creating simple applications
3. Understand basics of PHP and demonstrate by creating simple applications
4. Explain about Form Handling in PHP and demonstrate.
5. Understand basics of AngularJS and demonstrate by creating simple application.

UNIT-I : Introduction to HTML - Formatting and Fonts– Anchors – Backgrounds – Images – Hyperlinks – Lists – Tables –Nested Tables– Frames - HTML Forms- HTML Media – Audioand Video. **CASCADING STYLE SHEET (CSS)** : Introduction to Cascading Style Sheet (CSS): The need for CSS, Introduction to CSS – Basic syntax and structure - Inline Styles – Embedding Style Sheets - Linking External Style Sheets – Backgrounds - Manipulating text - Margins and Padding. **(15 Hours)**

UNIT-II: JavaScript: Introduction, Data types and Variables - Operators, Dialog Boxes, Control Statements: if ,Nested if, while, do..while, switch, break and continue, Functions: Creating and calling functions, Recursion, Declaration and allocating Arrays, sorting andSearching Arrays, Math Object and String Object. **(15 Hours)**

UNIT-III: PHP: Introduction to PHP, Incorporating PHP within HTML, Structure of PHP, variables, Operators, echo and print commands, functions, variables scope. Expressions and control flow in PHP: Operators, conditional, looping, break, continue in PHP, PHP Functions, Include and Require Files. **(15 Hours)**

UNIT-IV: Form Handling: Retrieving Submitted Data, PHP $_GET, PHP $_POST,$_REQUEST,$_SERVER Variables, Accessing MYSQL using PHP-Querying MySQL Database with PHP, Connecting to a MySQL database, Querying the database, Closing a Connection. **(15 Hours)**

UNIT-V: AngularJS : The Basics of AngularJS, Directives and Expressions,MVC, Filters- Built-in-Filters-Types of Built-in Filters, Modules-Directives- Built-in Directives, Working with Forms, Model Binding, AngularJS Forms, Validating Forms. **(15 Hours)**

PRESCRIBED BOOKS :

1. Deitel, Deitel and Nieto, "Internet and World Wide Web – How to program", PearsonEducation Asia, 5th Edition, 2011.
2. Nixon Robin,Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5,O'Reilly publication
3. Andrew Grant,Apress , "Beginning AngularJS".

REFERENCE BOOKS :

1. Ken Williamson, " Learning AngularJs", Oreilly, 5th Edition, 2015.

SOFTWARE ENGINEERING

SUBJECT CODE : 20PMCA306	THEORY	MARKS : 100
SEMESTER : I	CREDITS : 3	No. OF HOURS PER WEEK : 5

COURSE FRAMEWORK:
- To understand about software engineering in detail.
- At the end of this course students will be able to understand the software engineering process and its intricacies.

COURSE OUTCOMES:
1. Understand about basics of Software and Software Process models
2. Discuss about Agile Process models and understand about Teams and Software Engineering using Cloud
3. Understand about Requirement Engineering and UML models
4. Discuss about the design process and models and understand quality factors, impact of Software defects and reviews
5. Explain about SQA Processes and Product characteristics and discuss.

UNIT-I : Defining Software-Software Application Domains - Legacy Software- Changing Nature of Software- The Software Process- Software Engineering Practice - Software Development Myths - A Generic Process Model : Defining a Framework Activity-Identifying a Task Set- Process Patterns- Process Assessment and Improvement- The Waterfall Model: Incremental Process Models- Evolutionary Process Models- Specialized Process Models: Component-Based Development- The Formal Methods Model -Aspect-Oriented Software Development. Personal and Team Process Models. **(15 Hours)**

UNIT-II : Agility: Cost of Change- Agile Process- Extreme Programming- Other Agile Process Models: Scrum- Dynamic Systems Development Method- Agile Modeling- Agile Unified Process- Tool Set for the Agile Process- Characteristics of a Software Engineer: Software Team and Team Structure- Agile Teams- Impact of Social Media- Software Engineering Using the Cloud- CollaborationTools. Software Engineering Knowledge: Core Principles- Principles That Guide Each Framework Activity- Work Practices. **(15 Hours)**

UNIT-III: Requirements Engineering: Establishing the Groundwork- Eliciting Requirements- Developing Use Cases- Building the Analysis Model- Requirements Analysis- Scenario-Based Modeling- UML Models That Supplement the Use Case- Identifying Analysis Classes- Specifying Attributes- Defining Operations- Class-Responsibility-Collaborator Modeling- Associations and Dependencies- Creating a Behavioral Model: Identifying Events with the Use Case- State Representations- Patterns for Requirements Modeling- Requirements Modeling for Web and Mobile Apps. **(15 Hours)**

UNIT-IV: The Design Process- Design Concepts- The Design Model- quality concepts: Software Quality- Garvin's Quality Dimensions- McCall's Quality Factors- ISO 9126 Quality Factors- Software Quality Dilemma- Cost Impact of Software Defects- Defect Amplification and Removal- Review Metrics and Their Use- Formal Technical Reviews- software quality assurance: Elements of Software Quality Assurance. **(15 Hours)**

UNIT-V : SQA Processes and Product Characteristics- SQA Tasks, Goals, and Metrics- Statistical Software Quality Assurance- Software Reliability- The ISO 9000 Quality Standards- The SQA Plan- Software Configuration Management- Version Control- Change Control- Impact Management- Status Reporting- Content Management- Project management concepts: people, product, process- Metrics in the Process and Project Domains- Software Measurement. **(15 Hours)**

PRESCRIBED BOOK:
1. Roger. S. Pressman, 2015, Software Engineering A Practitioner"s approach, Eighth Edition,Tata McGraw-Hill, New Delhi.

ELECTIVE – I

COMPUTER COMMUNICATION AND NETWORKING

SUBJECT CODE : 20PMCA324	THEORY	MARKS : 100
SEMESTER : I	CREDITS : 3	No. OF HOURS PER WEEK : 5

COURSE FRAMEWORK:
- To understand the basic aspects of Computer Communication and Networking.
- At the end of this course students will have a good understanding about ComputerCommunication and Networking.

COURSE OUTCOMES:
1. Recognize Computer Networks, Topology, categories of networks and OSI layers
2. Explain about Data Link Layer, Error Detection and handling, protocols
3. Describe about Network Layer, Switching types, Connection oriented and connection less services, Routers and Routing algorithms.
4. Interpret LAN protocols, Token rings, Token bus, Addressing and frame format, LAN Security, Threats etc
5. Recognize TCP/IP Networking, Architecture, Internetworking, Network characteristics, Network Addressing and Routing

UNIT-I : Computer Networks - Applications - Line configuration - Topology - Transmission Modes - Categories of Network: LAN, MAN, WAN - OSI Layer. Physical Layer: Signals - spectrum - bandwidth of analog/digital signals. **(15 Hours)**

UNIT-II : Data Link Layer: Error Detection - Error correction- Line discipline Flow Control: stop - wait protocol and sliding window protocol Error control: ARQ, Go-back-n ARQ, selective - repeat ARQ. Data Link Protocols: Asynchronous protocols – synchronous protocol.   **(15 Hours)**

UNIT-III: Network Layer: Circuit switching - packet switching- message switching - Connection oriented and connectionless services. Routing Algorithms – congestion control Algorithms - internetworking - Routers and Switches- Introduction to firewalls. **(15 Hours)**

UNIT-IV : LAN Protocols: Ethernet - Token Ring - Token Bus - FDDI - Addressing and Frame format – Bridges - LAN Security: Types of threats - Levels of security Wireless LAN: need - components - Receiving Devices - advantages and disadvantages. **(15 Hours)**

UNIT-V : TCP/IP Networking : TCP/IP Architecture - Structural overview – Internetworking model - Protocol evolution - Division of functions - Networkcharacteristics - implementation characteristics - Network addressing and Routing: Datagram Header - IP address space. **(15 Hours)**

PRESCRIBED BOOKS:
1. Behruz A. Ferouzon, "Data Communication and Networking", Tata McGraw, 2004.

REFERENCE BOOKS:
1. Andrew S.Tanenbaum,"Computer Networks ", III edition - Pearson Education, 1998.
2. William Stallings , "Data and Computer Communication " , Pearson Education, 5th Edition, September 2000.

ELECTIVE – I

SOFTWARE PROJECT MANAGEMENT

SUBJECT CODE : 20PMCA325S	THEORY	MARKS : 100
SEMESTER : I	CREDITS : 3	No. OF HOURS PER WEEK : 5

COURSE FRAMEWORK:
- To understand the basic concepts and approaches used to manage software projects.
- At the end of this course students will apply Software Project Management concepts to real time software projects.

COURSE OUTCOMES
1. Explain the Software Product and differentiate Software Process models.
2. Demonstrate Requirement Elicitation, Analysis, and Specification. Experiment Object-oriented software development, Use case Modeling.
3. Describe the Software Design Process, Design Concepts and Principles, Software Modeling and UML. Distinguish and appraise Architectural Design, User Interface Design, Function-oriented Design
4. Interpret Software Analysis and distinguish different approaches, types and levels of Software Testing.
5. Describe and Discuss Software Maintenance & Software Project Measurement, Software Configuration Management (SCM), Software Change Management, Version Control, Change control and Reporting, Program Comprehension Techniques, Project Management Concepts.

UNIT-I : Introduction to Software Project Management- Software project versus other types of project- problems- management control- Stakeholders- Requirement Specification – Information and control in organizations ,step wise project planning- Select-identify scope and objectives identify project infrastructure- Analyse project characteristics- products and activities- Estimate effort for each activity- Allocate resources- Review/ publicize plan- Execute plan and lower levels of planning. Project evaluation- Strategic assessment- technical assessment cost benefit analysis- cash flow forecasting- cost- benefit evaluation techniques riskevaluation. **(15 Hours)**

UNIT-II : Selection of an appropriate project approach- choosing technologies technical plan contents list- choice of process models- structured methods-rapid application development- waterfall model -process model-spiral model software prototyping- ways of categorizing prototypes- tools- incremental delivery- selecting process model -Software effort estimation- introduction where- problems with over and under estimates- basis for software estimating software effort estimation technique- expert judgement- COCOMO -Activity Planning- sequencing and scheduling activities- network planning models- representing lagged activities- forward pass- backward pass identifying the critical path. **(15 Hours)**

UNIT-III: Risk Management- nature of risk- managing- identification-analysis reducing- evaluating- z values. Resource allocation- nature of resources requirements- scheduling- critical paths- counting the cost-resource schedule cost schedule- scheduling sequence. Monitoring and control- creating the frame work- collecting the data- visualizing the progress- cost monitoring- earned value- prioritizing, monitoring-Change control. **(15 Hours)**

UNIT-IV: Managing contracts- types of contract- stages in contract placement terms of a

contract-contract management- acceptance. Managing people and organizing teams-organizational behaviour background- selecting the right person for the job- instruction in the best methods-motivation- decision making leadership- organizational structures. **(15 Hours)**

UNIT-V: Ethics in Information Technology – an Overview of ethics – Ethics for IT professionals and IT users, Computer and internet crime – privacy workplace monitoring – advanced surveillance technology. **(15 Hours)**

PRESCRIBED BOOKS:
1. Hughes and M. Cotterell, 2005, Software Project Management, 4th Edition, Tata McGraw Hill, NewDelhi.

REFERENCE BOOKS:
1. K. Heldman, 2005, Project Management Professionals, 3 rd Edition, Wiley Dreamtech
   (i) Bhforooz& Hudson, 2004, Software Engineering, Oxford Press.

CORE – 4

PRACTICAL – I : ADBMS LAB

SUBJECT CODE : 20PMCA304P	PRACTICAL	MARKS : 100
SEMESTER : I	CREDITS : 2	No. OF HOURS PER WEEK : 4

COURSE FRAMEWORK:
- To have hands-on experience in PL/SQL.
- At the end of this course, students will be able to create stored procedures, functions, cursors and triggers using PL/SQL.

COURSE OUTCOMES:
1. Analyze the given problem to develop PL /SQL code
2. Create Anonymous and Named PL / SQL Procedure
3. Create PL / SQL Function Procedure
4. Create PL / SQL Cursors
5. Create PL / SQL Triggers

EXERCISES:
1. Create an Anonymous PL/SQL block and exhibit control statement usage in it.

2. Create a Stored Procedure using PL/SQL to increase the Basic pay of an employee with a specific amount.

3. Create a Stored Procedure using PL/SQL to exhibit Exception handling in PL/SQL.

4. Create a Function procedure using PL/SQL to calculate and return the Net pay of an employee .The function must receive necessary inputs as parameters.

5. Create a Cursor using PL/SQL to exhibit manipulation of the result of a Select query.

6. Create a Trigger using PL/SQL to validate Basic pay given in Insert Query. Allow insertion only if Basic Pay is greater than 5000.

7. Create a Trigger using PL/SQL to exhibit BEFORE trigger

8. Create a Trigger using PL/SQL to exhibit AFTER trigger

9. Create a Trigger using PL/SQL to exhibit COLUMN LEVEL trigger

10. Create a Trigger using PL/SQL to exhibit ROW LEVEL trigger

CORE -5

PRACTICAL - II: OPEN SOURCE TECHNOLOGY LAB

SUBJECT CODE : 20PMCA305P	PRACTICAL	MARKS : 100
SEMESTER : I	CREDITS : 2	No. OF HOURS PER WEEK : 4

COURSE FRAMEWORK:
- To have hands-on experience in Open Source Platforms and Frameworks
- At the end of this course students will be able to create front end web pages and connect to the back end databases.

COURSE OUTCOMES:
1. Analyse given problem
2. Create web page using HTML and CSS
3. Create web application using JavaScript
4. Creating web page and handling forms using PHP
5. Create simple PHP Programs

EXERCISES:

1. Create a web page using html5 to create forms to accept values from the users.

2. Generate a dynamic web page using css3 to have coloring features.

3. Write a HTML code that enables CSS design to create blocks and inline function.

4. Write a program using java script for sorting numbers and strings.

5. Generate a java script to calculate the hit ratio of a web page.

6. Generate a java script to validate an Email ID

7. Write a VB script to display a digital clock.

8. Write a program using java script to demonstrate the mouse events.

9. Write a program using java script to design an employee database.

10. Generate a program using css3 for 2D and 3D transformation.

11. Design a webpage that should compute one's age on a given date using PHP.

12. Design a webpage to generate multiplication table for a given number.

13. Design an authentication web page in PHP with MySQL to check user name andpassword.

14. Design a program using session

15. Develop a program using cookie and session

16. Write PHP code to implement Query string (passing variables using URL) concept.

17. Write PHP code to develop E-mail registration form and store all the submitted datain database table.

18. Write a program to develop student registration form and display all the submitted data on another page.

19. Write a program to read customer information like Cust_no, Cust_name,Item_purchased and Mob_no from Customer table and display all these informationin table format on output screen.

20. Write a program that keeps track of how many times a visitor has loaded the page.

21. Write a program for editing and deleting a particular record from database.

22. Write a PHP program to calculate the bonus of an employee.

SOFT SKILL – 1

LANGUAGE AND COMMUNICATION SKILL

SUBJECT CODE : 20PGSL402	SOFT SKILL	MARKS : 100
SEMESTER : I	CREDITS : 2	No. OF HOURS PER WEEK : 2

COURSE FRAMEWORK:
- Students are trained in basic communication skills and this helps them to have command over the language.
- At the end of this course, students will be able to communicate well and this will help them to grow in real world.

UNIT-I: Twinning Functions of Listening and Speaking.　　　　　　**(6 Hours)**

UNIT-II: Twinning Functions of Reading and Writing.　　　　　　**(6 Hours)**

UNIT-III: Individual Communication.　　　　　　**(6 Hours)**

UNIT-IV: Intermediary Communication.　　　　　　**(6 Hours)**

UNIT-V: Social Communication.　　　　　　**(6 Hours)**

PRESCRIBED BOOKS:
1. Windshuttle, Keith and Elizabeth Elliot, 1999, Writing, Researching and Communicating: Communication Skills for the Information Age, 3rd Reprint. Tata McGraw-Hill Australia.
2. Dignen, Flinders and Sweeney, English 365, Cambridge University Press.
3. Goleman, Daniel, 1998, Working with Emotional intelligence, Bantam Books, New York.

REFERENCE BOOKS:
1. Jones, Leo and Richard Alexander, 2003, New International Business English. Cambridge University Press.

WEB LINKS :
1. www.tatamcgrawhill.com/sites/0070600988

SEMESTER II

CORE - 6

DATA SCIENCE USING R

SUBJECT CODE : 20PMCA307	THEORY	MARKS : 100
SEMESTER : II	CREDITS : 4	No. OF HOURS PER WEEK : 4

COURSE FRAMEWORK:
- To introduce R programming for Data Science and Analytics
- At the end of this course students will be able to work effectively in Data Science Projects

COURSE OUTCOMES
1. Understand the need for data analytics in various verticals
2. Demonstrate the role of statistics in analytics
3. Apply various data structures of R in applications
4. Construct codes in R using function.
5. Deploy appropriate statistical concept to apply analytics to real time problems

UNIT-I : Introduction to Big Data Analytics-Big Data Overview-Data Structures-Analyst Perspective on Data Repositories-State of the Practice in Analytics: BI Versus Data Science, Current Analytical Architecture, Drivers of Big Data, Emerging Big Data Ecosystem and a New Approach to Analytics, Key Roles for the New Big Data Ecosystem-Examples of Big Data Analytics. **(12 Hours)**

UNIT-II: Data Analytics Lifecycle: Key Roles for a Successful Analytics Project, Overview of Data Analytics Lifecycle: Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalize. Using R in Statistical Works- Interactive Mode- Batch Mode- Introduction to Functions- R programming structure- Control Statements- Arithmetic and Boolean operators- Default values for Arguments- return values-Functions as objects.

(12 Hours)

UNIT-III: Vectors: Scalars, Vectors, Arrays, and Matrices- Declarations, Recycling. Common Vector Operations - Using all() and any()- Vectorized Operations- NA and NULL Values- Filtering- Matrices and Arrays: Creating Matrices- General Matrix Operations- Applying Functions to Matrix Rows and Columns- Adding and Deleting Matrix Rows and Columns- More on the Vector/Matrix Distinction. **(12 Hours)**

UNIT-IV : List: Creating Lists- General List Operations- Accessing List Components and Values- Applying Functions to Lists Data Frames: Creating Data Frames- Other Matrix-Like Operations- Merging Data Frames- Applying Functions to Data Frames-Factors and Tables-Factors and Levels- Common Functions Used with Factors. **(12 Hours)**

UNIT-V : Descriptive Statistics – Reading Data File-basic statistics-Types of Data-mean, median, mode, standard deviation – Normal distribution – Data Visualization- using ggplot2()-

Inferential statistics-sampling-correlation-Hypothesis – t-Test - chi-square test- Anova-Regression: Linear, Logistics- overview of clustering- K Medans- A prior Algorithm-Decision Trees. **(12 Hours)**

PRESCRIBED BOOKS:
1. Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data Published by John Wiley & Sons, Inc. 10475 Crosspoint Boulevard Indianapolis, by John Wiley & Sons, Inc., Indianapolis, Indiana
2. THE ART OF R PROGRAMMING, A Tour of Statistical Software Design by Norman Matloff - no starch Press Sanfrancisco
3. Learn R for Applied Statistics With Data Visualizations, Regressions, and Statistics Eric Goh Ming Hui-Copyright © 2019 by Eric Goh Ming Hui.

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CORE – 7

ARTIFICIAL INTELLIGENCE

SUBJECT CODE : 20PMCA308	THEORY	MARKS : 100
SEMESTER : II	CREDITS : 4	No. OF HOURS PER WEEK : 4

COURSE FRAMEWORK:
- To understand the basic concepts of Artificial Intelligence.
- At the end of this course, students will be having deep insight in basic concepts ofArtificial Intelligence.

COURSE OUTCOMES:
1. Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations
2. Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
3. Analyse and formalize the problem as a state space, graph, design heuristics and select amongst different search or game based techniques to solve them.
4. Demonstrate awareness and a fundamental understanding of various applications of AI
5. Ability to apply knowledge representation, reasoning, and machine learning techniques to real-world problems

UNIT-I : Problems and Search : What is AI – AI problems – AI Techniques – Level of Model – **Problems, Problem Space and Search :** Defining the problem as a State Space Search – Production Systems – Depth First Search - Breadth First Search **(12 Hours)**

UNIT-II: Heuristic Search Techniques: Generate-and-Test - Hill Climbing – Breadth first Search- Best First Search- The A* algorithm - Problem **Reduction**: AND –OR graphs – the AO* algorithm. **(12 Hours)**

UNIT-III: Knowledge Representation: Representation and Mappings – approaches to knowledge representation – **Using Predicate Logic:** Representing Instance and Isa Relationship – Computable functions and Predicates- Resolution – The Unification Algorithm Resolution in Predicate Logic - Question Answering. **(12 Hours)**

UNIT-IV: Representing Knowledge using Rules: Procedural vs. Declarative Knowledge – Logic programming - Forward vs Backward reasoning - Matching **(12 Hours)**

UNIT-V: Introduction to Non-monotonic Reasoning – Minimalist Reasoning - **Expert Systems:** Representing and using Domain Knowledge – Expert System shells – Knowledge Acquisition. **(12 Hours)**

PRESCRIBED BOOKS:
 1. Kevin Knight, Elaine Rich, B. Nair, "Artificial Intelligence (SIE)", Mc-Graw HillPublication.

REFERENCE BOOKS:
   1. Denis Rothman, "Artificial Intelligence By Example", Packt Publishing Ltd.

CORE – 8

SOFTWARE DEVELOPMENT OPERATIONS (DEVOPS)

SUBJECT CODE : 20PMCA309	THEORY	MARKS : 100
SEMESTER : II	CREDITS : 4	No. OF HOURS PER WEEK : 4

COURSE FRAMEWORK:
- To introduce DevOps in Software Development Process
- At the end of this course students will be able an effectively DevOps Developer

COURSE OUTCOMES:
1. Understand the fundamental of DevOps in real world applications
2. Analyze Measurements and Metrics in Software projects
3. Design and development project and analyze the steps need for its operations
4. Identify and evaluate various testing aspects of DevOps
5. Deploy real time applications using various tools.

Unit - I: DevOps Definition- DevOps for Developers –Term DevOps- Introduction to DevOps-Tradition and Agile Project Settings- Dev vs OPS – conflicts during and after deployments- conflicts in performance. Operations as bottleneck: Horizontal Optimization, Operation and ITSM- DevOps to rescue-essence of DevOps: values and processes, Tools. **(12 Hours)**

Unit - II : Building blocks in DevOps: Measurement and Metrics, Traditional use of Metrics- Agile approach to metrics: Definition, broken agile metrics, quality changes. Improving flow offeatures: cycle, lead, takt time, throughput- Improve and accelerate delivery: Automatics Releasing-Pitfalls of Automation- Decoupled deployment and release- Metrics and Measurement view- Quality and Testing-teams and working agreements. (**12 Hours)**

Unit-III: DevOps Area Matrix-Extend Development to Operations and vice versa, Embed development to Operation and vice versa. Unified and Holistic approach: starting concepts, Origins of conceptual deficit, Attributes of unified approach. Automatics Releasing:Prerequisite, Patterns with Appropriate Tools, Infrastructure as code: Test Environment with Vagrant, Provisioning with Puppet. **(12 Hours)**

Unit–IV: Getting started with acceptance testing- defining acceptance criteria-Test Outcomes-Configuration Management System: Installing Ansible – Install virtual box and Vagrant, Inventory file, Configurations options in inventory-inventory groups- inventory variable registration-dynamic and multiple inventory-installing word press. **(12 Hours)**

Unit - V: Installing dependencies: MySQL, PHP, nginx - Task and Handlers- Ansible roles: Role Structure-Splitting up word press- Role Dependencies-wrapper Roles-variable locations- Ansible modules-writing module using Python. **(12 Hours)**

PRESCRIBED BOOKS:
1. DevOps for Developers, Michael Hutterman, Apress

2. Ansible from Beginners to Pro-Michael Heap –Apress

REFERENCE BOOKS:
1. DevOps Automation Cookbook, Michael Duffy Copyright © 2015 Packt Publishing

ELECTIVE – II

ADVANCED JAVA TECHNOLOGY

SUBJECT CODE : 20PMCA310	THEORY	MARKS : 100
SEMESTER : II	CREDITS : 3	No. OF HOURS PER WEEK : 4

COURSE FRAMEWORK:
- To understand the advanced concepts of Java technologies.
- At the end of this course students will be able to write programs in Advanced Java Technologies.

COURSE OUTCOMES:
1. Apply concepts of Java servlet and create efficient applications that use Java Servlet.
2. Apply concepts of Java Server Pages and create efficient applications that use Java
   i. Server pages
3. Employ RMI and create efficient applications
4. Experiment with EJB and create efficient applications that use EJB
5. Recognize Spring Framework and Beans

UNIT-I : Understanding Object Oriented Programming-classes and Inheritance – Abstract classes – Inner classes and Lambda- working with string, Array and classes: Array list- Linked list- Generic collection classes – Handling bulk data operation with collections-Files and Databases : working with files- JDBC connectivity- working with XML. **(12 Hours)**

UNIT-II: Power of servlets –Http Basics- Servlet API –Page Generation- Server Side Includes-Servlet chaining and Filters-Servlet Life Cycle: Basic Aspects- Servlet Reloading – Init and Destroy Method - Single Thread Model-Background Processing. Retrieving information-Initialization parameters, The Server, Client, and Request. **(12 Hours)**

UNIT-III: Session Tracking: User Authorization- Hidden form fields-URL Rewriting-Persistent Cookies-Session Tracking API. Security-HTTP authentication- Digital Certificates – Secure Socket Layer- Data Base Connectivity – Internationalization: European Languages - Conforming to Local Customs -Multiple Languages. **(12 Hours)**

UNIT-IV : JSP Basics – Declarations – Expressions – Scriptlets - Implicit objects - Standard actions- Directives- Declarations- Expressions – Scriptlets- Implicit objects- Standard actions - JSP Standard Tag Library (JSTL) : JSTL Core Library - General-purpose actions- Conditional actions. **(12 Hours)**

UNIT-V: Spring Basics-Exploring Spring's Architecture-The Application context- Beans-The Spring Life cycle -Understanding Bean Scopes - Dependency Injection and Inversion of Control-Setter-Based Dependency Injection – Hibernate: Understanding object/relational persistence-persistence - Persistence in object-oriented applications- Persistence layers and alternatives-Object/relational mapping (ORM). **(12 Hours)**

PRESCRIBED BOOKS:

1. Java All-In-One for Dummies, Doug Lowe, 4th Edition, Published by John Wiley& Sons Inc.
2. Java ™ Servlet Programming- Jason Hunter with William Crawford, Published by O'Reilly & Associates, Inc.
3. Learn Java for Web Development, Vishal Layka, Apress publication.
4. Hibernate in Action, Christian Bauer Gavin King, Manning Publications Co

REFERENCE BOOKS:

1. Murachs, Java Servlet and JSP, 2nd Edition, Joel Murach Andrea Steelman, Mike Murach & Associates Inc.

ELECTIVE –II
ANDROID APPLICATIONS DEVELOPMENT

SUBJECT CODE : 20PMCA326	THEORY	MARKS : 100
SEMESTER : II	CREDITS : 3	No. OF HOURS PER WEEK : 4

COURSE FRAMEWORK:
- To understand mobile application development trends and Android platform.
- At the end of this course students will be able to write simple applications, gamedevelopment, Location map based services.

COURSE OUTCOMES:
1. Explain about Mobile application development and basics of Android application development.
2. Demonstrate Android user interface creating using different controls and layouts.
3. Explain about File handling, Internal and External storage of data in Android.
4. Discuss about Messaging, Networking and Android services.
5. Explain and Examine Location based services and publishing Android Applications.

UNIT-I : ANDROID FUNDAMENTALS : Mobile Application development and trends – Android overview and Versions – Android open stack, features – Setting up Android environment (Eclipse, SDK, AVD)- Simple Android application development – Anatomy of Android applications – Activity and Life cycle – Intents, services and Content Providers.

(12 Hours)

UNIT-II : ANDROID USER INTERFACE: Layouts: Linear, Absolute, Table, Relative, Frame, Scrollview, Resize and reposition - Screen orientation – Views: Textview, EditText, Button, ImageButton, Checkbox, ToggleButton, RadioButton, RadioGroup, ProgressBar, AutocompleteText, Picker, Listviews and Webview– Displaying pictures with views: Gallery and ImageView, ImageSwitcher, Gridview – Displaying Menus: Helper methods, Option and Context. **(12 Hours)**

UNIT-III : DATA PERSISTENCE: Shared User preferences – File Handling: File system, System partition, SD card partition, user partition, security, Internal and External Storage – Managing data using SQLite –User defined content providers. **(12 Hours)**

UNIT-IV: MESSAGING, NETWORKING AND SERVICES
SMS Messaging: Sending and Receiving – Sending email and networking – Downloading binary and text data files – Access Web services – Developing android services: create your own services, performing long running task in a service-performing repeated task in a service
(12 Hours)

UNIT-V: LOCATION ACCESS AND PUBLISH ANDROID APPLICATION: Location based services: Display map, zoom control, view and change, Marking, Geocoding, Get location - Publish Android applications and Deployment. **(12 Hours)**

PRESCRIBED BOOKS:
   1. WeiMeng Lee (2012), "Beginning Android Application Development",Wrox Publications (John Wiley, New York)

REFERENCE BOOKS:
   1. Ed Burnette (2010), "Hello Android: Introducing Google's Mobile Development Platform", The Pragmatic Publishers, 3rd edition, North Carolina USA
   2. Reto Meier (2012), "Professional Android 4 Application Development", Wrox Publications (John Wiley, New York).

ELECTIVE – II

LINUX ADMINISTRATION AND NETWORK PROGRAMMING

SUBJECT CODE : 20PMCA327	THEORY	MARKS : 100
SEMESTER : II	CREDITS : 3	No. OF HOURS PER WEEK : 4

COURSE FRAMEWORK:
- To understand background on the UNIX and LINUX system call interface and network programming.
- At the end of this course, it will enable the learner to become Unix System Analyst/ Unix Administrator in the IT Industries.

COURSE OUTCOMES:
1. Explain about basic concepts of Linux, Linux Shell and File Structure of Linux.
2. Examine and discuss about managing services, FTP and working with Apache Web Server.
3. Explain and Examine files and process creation.
4. Discuss about Signals and Inter Process Communication.
5. Explain and Examine Socket Programming and Daemon process

UNIT-I : LINUX SHELL AND FILE STRUCTURE: Introduction to Linux- Linux distribution-operating systems and Linux-History of Linux and Unix –Linux Overview-Open source software –Linux Software -The shell- The shell Scripts and programming-Shell configuration-Linux files- Directories and archives**.** **(12 Hours)**

UNIT-II: INTERNET AND NETWORK SERVICES: Managing services -system startup files-starting services-service management-service scripts-FTP server-The FTP user account- Running vsftpd-configuring vsftpd- vsftpd access controls-web servers-apache web server-apache configuration files-apache configuration and directives –apache configuration tools. **(12 Hours)**

UNIT-III : FILES AND PROCESS CREATION: Study of Open, Close, Read, Write, Lseek, Dup,stat, fstat, and lstat functions-.File Types - File Access Permissions -Study of Access, Link and Unlink Functions-Reading Directories - Time and Date Routines- Setjmp and Longjmp Functions-fork and Vfork –wait-waitpid. **(12 Hours)**

UNIT-IV: SIGNALS AND INTER PROCESS COMMUNICATION
Signal concepts, signal function -kill and raise – alarm and pause – abort and sleep – Pipes – FIFO-System V IPC – Message Queue- – Example Program -Semaphores - Example Program - Shared Memory- Example Program. **(12 Hours)**

UNIT-V : SCOCKET PROGRAMMING AND DAEMON PROCESS: Sockets – Elementary TCP Sockets -TCP Echo Client/ Server -Elementary UDP Sockets -UDP Echo Client/ Server-gethostbyname& gethostbyaddr, getservbyname& getservbyport – getaddrinfo- Syslogd Daemon -syslog function -inetd Daemon –Broadcast Addresses – Unicast Versus Broadcast -Multicast Addresses -Multicasting Versus Broadcasting on LAN, Multicasting on WAN .   **(12 Hours)**

PRESCRIBED BOOKS:
1. Richard Petersen - Linux: The Complete Reference, Sixth edition.
2. Richard Stevens .W & Stephen Rago (2005), Advanced Programming in the UNIX Environment, 2nd Edition, Pearson Education, New Delhi
3. Richard Stevens .W (1999), UNIX Network Programming, Volume II, Prentice Hall, New Delhi.

REFERENCE BOOKS:
1. Stephen A.Rago (1993), UNIX System V Network Programming, Addison Wesley, New York.

STATISTICS FOR DATA ANALYTICS

SUBJECT CODE : 20PMCA311	THEORY	MARKS : 100
SEMESTER : II	CREDITS : 3	No. OF HOURS PER WEEK : 4

COURSE FRAMEWORK:
- To understand the Essential Statistical Concepts for Analytics.
- At the end of this course, students will have required knowledge in Statistics for Data Analytics.

COURSE OUTCOMES:
1. Analyze and solve problems based on Measures of location, Measures of dispersion
2. Apply the fundamental concepts of Probability to the real world need.
3. Experiment problems based on Bivariate, Discrete and Continuous distributions
4. Analyze problems and solve using concepts of Correlation and Regression.
5. Apply the concepts of Sampling , Test of Significance based on t, F and Chi-Square with respect to mean and Variance.

UNIT-I : Measures of location – Arithmetic Mean, Median, Mode, Geometric Mean, Harmonic Mean, and their properties, Merits and demerits - Measures of Dispersion -- Range, Mean Deviation, Quartile Deviation, Standard deviation, Coefficient of variation, Skewness and Kurtosis. **(12 Hours)**

UNIT-II: Sample spaces - events - Axiomatic approach to probability - conditional probability - Independent events - Baye's formula **(12 Hours)**

UNIT-III : - Random Variables : Continuous and Discrete random variables – Probability Mass Function, Probability Density Function, Cumulative Distribution Function - Probability Distributions – Expectation, Mean and Variance- Bivariate distribution - Conditional and Marginal distributions - Discrete distributions -, Binomial, Poisson Distributions - Continuous distributions - Normal distribution . **(12 Hours)**

UNIT-IV: Correlation, Regression – Rank Correlation Coefficient – Curve fitting by the Method of Least Squares. **(12 Hours)**

UNIT-V: Concepts of Sampling, Sampling distribution – Standard Error – Theory of Estimation – Test of Hypotheses – Two types of Errors - Test of level of Significance- Exact tests based on based on t, Chi-Square and F-distributions with respect to Mean and Variance. **(12 Hours)**

PRESCRIBED BOOKS:

1. Dr. S.P. Gupta - Sultan Chand & Sons, "Statistical Methods".
2. P.R.Vittal & V.Malini, Statistical and Numerical methods, Margham Publications.
3. Snedecor, G.W., & Cochran, W.G.(1967): Statistical Methods, Oxford andIBH,Prentice Hall

REFERENCE BOOKS :

1. Fundamental of Mathematical Statistics - S.C. Gupta & V.K. Kapoor - Sultan Chand
2. Wilks, S.S.: Elementary Statistical Analysis - Oxford and IBH Mode, E.B.: Elements ofStatistics - Prentice Hall.

CORE – 12

PRACTICAL - III: DATA SCIENCE LAB

SUBJECT CODE : 20PMCA312P	PRACTICAL	MARKS : 100
SEMESTER : II	CREDITS : 2	No. OF HOURS PER WEEK : 4

COURSE FRAMEWORK:
- To have hands-on experience in R programming.
- At the end of this course students will be able to write R programs in Data Science

COURSE OUTCOMES:
1. Analyze Data and find the insight of the same using R Language
2. Demonstrate Data preprocessing in R
3. Construct Data modeling in R
4. Analyze various algorithm in R and apply it for real time applications
5. Deploy R packages for handling applications

EXERCISES:
1. Write an R program to construct a calculator.

2. R program for Fibonacci series

3. R program to find whether a given number is prime or not.

4. R Programming Using ggplot() to construct (Histogram, Scatter plots, box plots etc)

5. Data Pre-processing in R

6. Implementing A prior algorithm in R

7. Implementing Linear Regression R

8. Implementing Multiple Linear Regression in R

9. Implementing Logistic Regression in R

10. Implementing Nearest Neighbors in R

11. Implementing Decision Tree in R

12. Write a R program to create a Data frames which contain details of 5 employees anddisplay the details.

13. Write a R program to add and delete a row from the data frame

14. Write a R program to add and delete a column from the data frame

15. R Program to implement basic statistical operations.

CORE – 13

PRACTICAL - IV: ADVANCED JAVA TECHNOLOGY LAB

SUBJECT CODE : 20PMCA313P	PRACTICAL	MARKS : 100
SEMESTER : II	CREDITS : 2	No. OF HOURS PER WEEK : 4

COURSE FRAMEWORK:
- To have hands-on experience in Advanced Java Programming.
- At the end of this course students will be able to develop server side applications basedon Java Technologies and good at debugging.

COURSE OUTCOMES:
1. Create interactive web application using HTML and Servlet
2. Create interactive web application using HTML and JSP
3. Create interactive web services using RMI
4. Evaluate the correctness of syntax and debug errors if any.
5. Examine the output to verify correctness of the logic

EXCERCISES
1. HTML to Servlet Applications.

2. Applet to Servlet Communication.

3. Designing online applications with JSP.

4. Creating JSP program using JavaBeans.

5. Working with Enterprise JavaBeans.

6. Performing Java Database Connectivity.

7. Creating Web services with RMI.

8. Creating and Sending Email with Java.

9. Building web applications.

SOFTSKILL –II

QUANTITATIVE APTITUDE

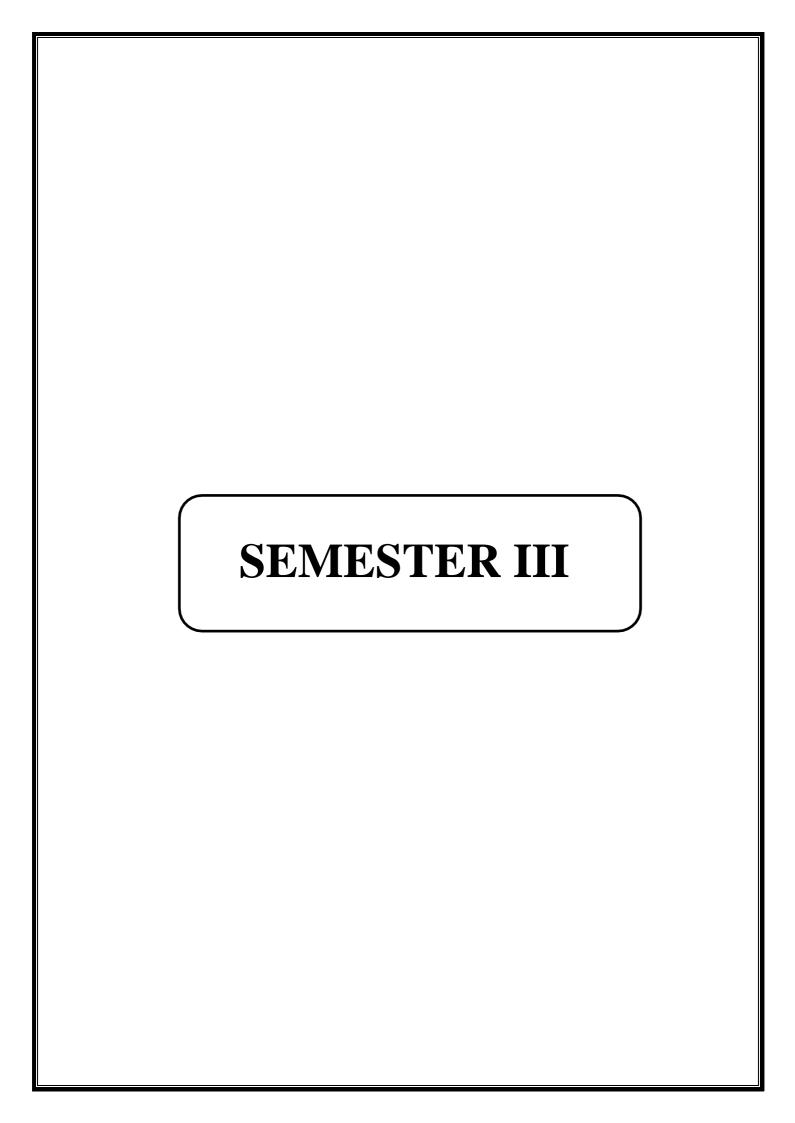| SUBJECT CODE : 19PGSL407	SOFT SKILL	MARKS : 100
SEMESTER : II	CREDITS : 2	No. OF HOURS PER WEEK : 2

COURSE FRAMEWORK:
- Students are trained in Aptitude which includes numerical problems.
- At the end of this course, students will be able to clear aptitude tests conducted byseveral agencies.

UNIT- I : Numbers, HCF, LCM, Decimal Fractions, Simplification, Square Roots, Cube roots, Averages. **(3 Hours)**

UNIT- II : Problems in numbers and ages, Surds, Indices, Percentages, Profit and Loss, Ratio and Proportion, Partnership, Chain Rule. **(3 Hours)**

UNIT- III: Time and Work, Pipes and Distances. Time and distance, Problems on Trains.
(3 Hours)

UNIT- IV : Boats and Streams, Alligation, Simple Interest, Compound Interest, Logarithms, Area, Volume and Surface Area. **(3 Hours)**

UNIT- V : Races and Games of Skill, Calendar, Clocks, Stocks and Shares, Permutation and Combination, Probability, True discount, Banker's Discount, Height and Distances, Old man out and Series, Tabulation, Bar graphs, Pie charts, Line Graphs. **(3 Hours)**

PRESCRIBED BOOKS:
1. R.S. Aggarwal, "Quantitative Aptitude for Competitive Examinations", Seventh Revised Edition, S. Chand and Co. Ltd., New Delhi, 2005.

REFERENCE BOOKS:
1. Barron's Guide for GMAT, Galgotia Publications, New Delhi, 2006.

SEMESTER III

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CORE - 11

MACHINE LEARNING

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SUBJECT CODE : 20PMCA314	THEORY	MARKS : 100
SEMESTER : III	CREDITS : 4	No. OF HOURS PER WEEK : 4

COURSE FRAMEWORK:
- To understand the basic concepts of Machine Learning
- At the end of this course students will be able to Implement Machine Learning using Python.

COURSE OUTCOMES:
1. Understand the fundamental issues and challenges of machine learning.
2. Analyse the strengths and weaknesses of many popular machine learning approaches .
3. Demonstrate the statistical relationships within and across Machine Learning algorithms and the paradigms of Supervised and Un-supervised learning.
4. Deploy Algorithm for Regression Models to Implement Regression, Classification and Decision Trees
5. Apply Artificial Neural Network models to handle uncertainty and solve problems.

UNIT-I : The Machine Learning Landscape : Introduction , Types of Machine Learning Systems, Supervised/Unsupervised Learning, Batch and Online Learning, Instance-Based Versus Model-Based Learning, Main Challenges of Machine Learning, Non-representative Training Data, Poor-Quality Data, Underfitting the Training Data, Testing and Validating - Frame the Problem, Select a Performance Measure, Check the Assumptions, Create a Test Set, Visualizing Geographical Data-correlation- Prepare the Data for Machine Learning Algorithms.
(12 Hours)

UNIT-II : Data Cleaning- Handling Text and Categorical Attributes- Feature Scaling- Transformation Pipelines- Select and Train a Model- Training and Evaluating on the Training Set- Fine-Tune Your Model- Grid Search- Randomized Search. Classification: MNIST- Training a Binary Classifier- Performance Measures- Measuring Accuracy Using Cross- Validation- Confusion Matrix- Precision and Recall. Multiclass, multilabel and multioutput classification.
(12 Hours)

UNIT-III : Training Models: Linear Regression- The Normal Equation- Computational Complexity- Gradient and batch gradient Descent- Stochastic Gradient Descent- Mini-batch Gradient Descent- Polynomial Regression- Learning Curves- Ridge Regression- Lasso Regression- Logistic Regression- Estimating Probabilities- Training and Cost Function- Decision Boundaries. **(12 Hours)**

UNIT-IV: Decision Trees: Training and Visualizing a Decision Tree- Making Predictions- Estimating Class Probabilities- The CART Training Algorithm- Unsupervised Learning Techniques- Clustering-K-Means-Limits of K-Means-Using clustering for image segmentation, preprocessing, Semi supervised Learning- DBSCAN. **(12 Hours)**

UNIT-V: Neural Networks and Deep Learning - Introduction to Artificial Neural Networks with Keras-Biological to Artificial Neurons-Biological Neurons-Logical Computations with Neurons- The Perceptron- Multi-Layer Perceptron and Back propagation- Regression MLPs-Classification MLPs-Implementing MLPs with Keras.   **(12 Hours)**

PRESCRIBED BOOKS:
1. Hands-on Machine Learning with Scikit-Learn, Keras, and TensorFlow by Aurélien Géron,O'Reilly Media, Inc.

REFERENCE BOOKS:
1. Machine Learning, "Step-by-Step Guide to Implement Machine Learning Algorithms with Python", By Rudolph Russell, 2018.
2. Introduction to Machine Learning Second Edition by Ethem Alpaydın, The MIT Press - Cambridge, Massachusetts-London.

ADVANCED PYTHON

SUBJECT CODE : 20PMCA317	THEORY	MARKS : 100
SEMESTER : III	CREDITS : 3	No. OF HOURS PER WEEK : 4

COURSE FRAMEWORK:
- Work with Advanced Python
- Use Python for effective machine language implementation

COURSE OUTCOMES:
1. Discuss and Explain about the fundamental concepts of Python programming language.
2. Explain and Demonstrate Data Wrangling, handling numerical data.
3. Discuss about handling Categorical data and Data Visualization extensively.
4. Explain and Discuss about implementing Machine learning using python.
5. Create a full-fledged Python application to solve the given Problem.

UNIT-I : Introduction to Python - basic of Python – Data Types – Operators- List- Dictionaries Tuple-series- Data frame-Panels -Vectors, Matrices, and Arrays : creating a vector, matrix, sparse matrix, applying operation to elements, Average, Variance, and Standard Deviation, Reshaping Arrays, Addition subtraction and multiplication with matrix. Loading Data: Datasets, Creating a Simulated Dataset, Loading a CSV, Excel, JSON file, querying a SQL Database.
(12 Hours)

UNIT-II: Data Wrangling: creating and working with data frames- Finding unique values, handling missing values - working with rows and column-merging data frames. **-** Handling Numerical Data: Normalizing Observations, Transforming Features, Detecting Outliers, Handling Outliers, Grouping Observations Using Clustering, Deleting Observations with Missing Values, Imputing Missing Values **(12 Hours)**

UNIT-III: Handling Categorical Data: Encoding Nominal, ordinal Categorical and dictionaries of features. Handling Text: Cleaning Text, Tokenizing Text **-**Handling Dates and Times: Converting Strings to Dates, Handling Time Zones, Selecting Dates and Times, Encoding Days of the Week. Handling Images: Loading, Saving, Resizing, Cropping, Blurring Images.
(12 Hours)

UNIT-IV: Implementing Machine Learning using python: supervised and unsupervised learning, Regression: Linear Regression, Multiple Linear Regression, Decision Trees, Classification: Logistic Regression, K Nearest Neighbors, Decision Tree classification. Clustering: Goals and Uses of clustering, K-Means clustering. Reinforcement learning.
(12 Hours)

UNIT-V: Data Visualization: Direct Plotting - Seaborn Plotting System - Matplotlib Plot – Naive Bayes basics- Neural Networks – preprocessing data for neural networks-designing a neural network- training a binary and multi class classifiers **(12 Hours)**

PRESCRIBED BOOKS:

1. Machine Learning with Python Cookbook Practical Solutions from Preprocessing to Deep Learning, by Chris Albon. All rights reserved.
   Printed in the United States of America. Published by O'Reilly Media, Inc.,
2. Data Analysis From Scratch With python ,Step By Step Guide by Peters Morgan
3. Data Analysis and Visualization Using Python Analyze Data to Create Visualizations for BI Systems by Dr. Ossama Embarak-Apress .

REFERENCE BOOKS :

1. Head First Python Programming By Paul Barry and David Griffythis OReilly.

ELECTIVE – III

OBJECT ORIENTED ANALYSIS, DESIGN AND UML

SUBJECT CODE : 20PMCA328	THEORY	MARKS :
SEMESTER : III	CREDITS : 3	No. OF HOURS PER WEEK : 4

COURSE FRAMEWORK:
- To understand Object Oriented Analysis and UML concepts.
- At the end of this course students should be able to design UML diagrams for object oriented programming.

COURSE OUTCOMES:
1. Describe Objects, Object Oriented System development, Patterns and Frameworks
2. Analyze Objects, identify their attributes, methods, relationships, responsibilities
3. Design classes based on Design Axioms, Describe about Object Storage and Object Interoperability.
4. Design User Interface, View Layer classes and View layer interface
5. Define basic concepts of UML and create Use Case Diagrams, Sequence Diagrams, State Chart Diagrams, Class Diagrams, Component Diagrams, Deployment diagrams using UML editor Star UML

UNIT-I: System Development - Object Basics - Development Life Cycle - Methodologies - Patterns -Frameworks - Unified Approach. **(12 Hours)**

UNIT-II: Use-Case Models - Object Analysis - Object relations - Attributes - Methods – Class and Object responsibilities. **(12 Hours)**

UNIT-III: Design Processes - Design Axioms - Class Design - Object Storage - Object Interoperability. **(12 Hours)**

UNIT-IV: User Interface Design - View layer Classes - Micro-Level Processes - View Layer Interface. **(12 Hours)**

UNIT-V: UML Basics – UML Specifications –Drawing Usecase Diagrams, Sequence Diagrams, State Chart Diagrams, Class Diagrams, Component Diagrams, Deployment diagrams using UML editor – Working with Star UML. **(12 Hours)**

PRESCRIBED BOOKS:
1. Ali Bahrami, Reprint 2009, Object Oriented Systems Development, Tata McGraw Hill International Edition.
2. UML 2.0 in a Nutshell: A Desktop Quick Reference, By Dan Pilone, Neil Pitman, O'Reilly Media, Inc." 2005

REFERENCE BOOKS:
1. G. Booch, 1999, Object Oriented Analysis and design, 2nd Edition, Addison Wesley, Boston.
2. R. S. Pressman, 2010, Software Engineering a Practitioner's approach, Seventh Edition, Tata McGraw Hill, New Delhi.
3. Rumbaugh, Blaha, Premerlani, Eddy, Lorensen, 2003, Object Oriented Modeling And design, Pearson education, Delhi.

ELECTIVE - III

DESIGN AND ANALYSIS OF ALGORITHM

SUBJECT CODE : 20PMCA329	THEORY	MARKS : 100
SEMESTER : III	CREDITS : 3	No. OF HOURS PER WEEK : 4

COURSE FRAMEWORK:
- To understand about the basic concepts of algorithms.
- At the end of this course, students will be able to understand how to design and analyze algorithms.

COURSE OUTCOMES;
1. Ability to analyze the performance of algorithms.
2. Ability to choose appropriate algorithm design techniques for solving problems.
3. Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs.
4. To clear up troubles the usage of set of rules design methods including the grasping approach, divide and overcome, dynamic programming, backtracking and department and certain.
5. To understand the variations among tractable and intractable problems

UNIT-I : Introduction – Definition of Algorithm – pseudo code conventions – recursive algorithms – time and space complexity –big-"oh" notation – practical complexities – randomized algorithms – repeated element – primality testing **-** Divide and Conquer: General Method - Finding maximum and minimum. **(12 Hours)**

UNIT-II: Merge sort - Quicksort, Selection, Strassen's matrix multiplication – Greedy Method: General Method –knapsack problem - Tree vertex splitting. **(12 Hours)**

UNIT-III: Job sequencing with deadlines – optimal storage on tapes, Dynamic Programming: General Method - multistage graphs – all pairs shortest paths – single source shortest paths. **(12 Hours)**

UNIT-IV: String Editing – 0/1 knapsack. Search techniques for graphs – DFS-BFS-connected components – biconnected components. **(12 Hours)**

UNIT-V: Back Tracking: General Method – 8-queens - Sum of subsets - Graph Coloring – Hamiltonian cycles. Branch and Bound: General Method - Traveling Salesperson problem. **(12 Hours)**

PRESCRIBED BOOKS:
1. E. Horowitz, S. Sahni and S. Rajasekaran, 1999, Computer Algorithms, Galgotia,New Delhi.

REFERENCE BOOKS:
1. G. Brassard and P. Bratley, 1997, Fundamentals of Algorithms, PHI, New Delhi.
2. A.V. Aho, J.E. Hopcroft, J.D. Ullmann, 1974, The design and analysis ofComputer Algorithms, Addison Wesley, Boston.
3. S.E.Goodman and S.T.Hedetniemi, 1977, Introduction to the Design and Analysisof algorithms, Tata McGraw Hill Int. Edn, New Delhi.

WEB LINKS:
1. http://www.cise.ufl.edu/~raj/BOOK.html

ELECTIVE - IV

ROBOTIC PROCESS AUTOMATION

SUBJECT CODE : 20PMCA316	THEORY	MARKS : 100
SEMESTER : III	CREDITS : 3	No. OF HOURS PER WEEK : 4

COURSE FRAMEWORK:
- To understand the business functionalities that can be automated using RPA
- At the end of this course students will be able to easily create useful RPA scripts to automate their own desktop processes, without coding or programming knowledge.

COURSE OUTCOMES:
1. Explain and Discuss about Scope and Techniques of Automation, Benefits and Applications of Robotic Process Automation.
2. Explain about the key aspects like User interface of projects, Advanced UI Interactions, methods and output methods and sequence of activities using Flow charts etc.
3. Examine and understand Sequence Control flow, Delay and Break activity.
4. Examine and understand Data manipulation using arrays, Data scarping , File management and Data table.
5. Examine and understand Taking Control Of The Controls and Exception Handling

UNIT-I : RPA Basics :History of Automation, What is RPA,RPA vs Automation, Processes & Flowcharts, Programming Constructs in RPA, What Processes can be Automated, Benefits of RPA, The Future of Automation, Types of Bots. RPA Development methodologies – Difference from SDLC – Robotic control flow architecture – RPA business case, Risks & Challenges with RPA, Installation : Installing Studio community edition, The User Interface – Workflow Design Panels- Task Recorder. **(12 Hours)**

UNIT-II: Data Manipulation: Variables, Data Types, Managing Arguments, Sequence , Flowchart and Control Flow: Sequence, Activities, Using activities with workflows, What Flowcharts are and when to use them, Control Flow – Types of Control flow Activities: The Assign activity,The Delay activity, The Break activity, The While activity, The Do While activity, The For each activity, The If activity, The Switch activity. Step-by-step example using Sequence and Flowchart, Step-by-step example using Sequence and Control flow.

(12 Hours)

UNIT-III: Data Manipulation: Variables and scope ,Collections, Arguments – Purpose and use , Data table usage with examples, Building a data table, Building a data table using data scraping, Clipboard management, File operations : Read cell, Write cell, Read Range, Write Range, Append Range, CSV/Excel to data table and vice versa. **(12 Hours)**

UNIT-IV: Taking Control of the Controls: Finding and attaching windows, Finding the control, Act on controls, mouse and keyboard activities, Handling Events. Recording using UiPath Studio – Types of Recording: Basic recording, Desktop recording ,Web recording, Citrix recording. Screen Scraping - When to use OCR, Types of OCR available, How to use OCR, Data Scraping.
(12 Hours)

UNIT-V: Email Automation : Email Automation, Incoming Email automation, Sending Email automation. Exception Handling - Debugging techniques - Setting breakpoints -Slow step – Highlighting, Break. Managing and Maintaining the code – Project Organization, Nesting workflows, Reusability of workflows, Commenting techniques, Sate Machine-When to use Flowchart, State Machine, or Sequence.   **(12 Hours)**

PRESCRIBED BOOKS:
1. Alok Mani Tripath , "Learning Robotic Process Automation", 2018 Packt Publishing

WEBSITE
1. https://academy.uipath.com/

ELECTIVE - IV

MATLAB PROGRAMMING

SUBJECT CODE : 20PMCA330	THEORY	MARKS : 100
SEMESTER : III	CREDITS : 3	No. OF HOURS PER WEEK : 4

COURSE FRAMEWORK:
- To understand the basic aspects of MATLAB and working principles in MATLAB IDE.
- At the end of this course students will be able to work in MATLAB projects.

COURSE OUTCOMES:
1. Discuss about the Matlab Programming environment and fundamentals.
2. Explain and Demonstrate variable workspace, number and string functions usage
3. Explain about Vecors, Statistical functions, Mfiles and demonstrate creating and running Script files.
4. Demonstrate and Explain about Data import and Output, Plotting graphs and manipulating graphs.
5. Create Bar Graph, Histogram, Graphical User Interface.

UNIT-I : Introduction to MATLAB- Programming Environment- Matlab IDE- Manipulating Windows- Variables- Expressions, Constants –Control Flow Commands.   **(12 Hours)**

UNIT-II: Variable workspace-Number functions. Writing Simple Matlab Script- Solving Simple Equations- Strings-String functions.   **(12 Hours)**

UNIT-III: Vector- Creating Vector- Operations on Vector- Statistical functions Matrices- Matrix Operations- Built-in functions- user defined functions-M files- Creating and Running Script files.   **(12 Hours)**

UNIT-IV : Data import and Data Output-Matlab Plotting- Graphing with ezplot- Modifying Graphs- Graphing with plot- Adding Title, Labels, Grid Lines and Scaling on the Graph – Setting Colors on Graph.   **(12 Hours)**

UNIT-V: Two Dimensional Plots: Bar Graph and Histogram-Building Graphical User Interface- User Interface Controls- Building a Graphical User Interface.   **(12 Hours)**

PRESCRIBED BOOKS:
1. Brian R. Hunt, Ronald L. Pipsman, Jonathan M. Rosenberg " A Guide to Matlab for Beginners and Experienced Users", Cambridge.
2. Craig S. Lent "Learn to Program with Matlab".

REFERENCE BOOKS:
1. MATLAB: A Practical Introduction to Programming and Problem Solving, 3rd edition, Stormy Attaway, Elsevier, 2013.

ELECTIVE – IV

VISUAL PROGRAMMING USING C# AND VB.NET

SUBJECT CODE : 20PMCA331	THEORY	MARKS : 100
SEMESTER : III	CREDITS : 3	No. OF HOURS PER WEEK : 4

COURSE FRAMEWORK:
- To gain knowledge in the concepts of the .NET framework as a whole and the technologies that constitute the framework
- At the end of this course students will gain programming skills in C# both in basic and advanced levels.

COURSE OUTCOMES:
1. Discuss basics of .NET Framework and VB.NET.
2. Examine the usage of Control Statements and Methods.
3. Examine additional controls and Database Connectivity in VB.NET
4. Discuss about object oriented aspects of C#.
5. Demonstrate application development ON .NET.

UNIT-I: .NET FRAMEWORK AND VB.NET: Evolution of the .NET Framework – Overview of the .Net Framework – VB.NET – Simple VB.Net Program. VARIABLES, CONSTANTS AND EXPRESSIONS: Value Types and Reference Types – Variable Declarations and Initializations – Value Data Types – Reference Data Types – Boxing and Unboxing – Arithmetic Operators – Textbox Control – Label Control – Button Control.

(12 Hours)

UNIT-II : CONTROL STATEMENTS AND METHODS : If Statements – Radio Button Control – Check Box Control – Group Box Control – Listbox Control – Checked List Box Control – Combo box Control – Select Case Statement – While Statement – Do Statement – For Statement. METHODS AND ARRAYS: Types of Methods – One Dimensional Array – Multi Dimensional Arrays – Jagged Arrays. CLASSES: Definition and Usage of a Class – Constructor Overloading – Copy Constructor.**(12 Hours)**

UNIT-III : ADDITIONAL CONTROLS AND DATABASE CONNECTIVITY : Timer – ProgressBar – LinkLabel – Panel – TreeView – Splitter – Menu – SDI & MDI – Dialog Boxes – Toolbar – StatusBar. DATABASE CONNECTIVITY: Advantages Of ADO.NET – Managed Data Providers – Developing a Simple ADO.NET Based Application – Creation of Data Table Retrieving Data From Tables – Table Updating – Disconnected Data Access Through Dataset Objects.**(12 Hours)**

UNIT-IV : OBJECT ORIENTED ASPECTS OF C#: Introducing C#-Overview of C#-Literals-Variables-Data types-Expressions- Methods -Classes- Objects- Inheritance-Polymorphism- Interfaces- Operator Overloading- Delegates- Events- Errors and Exceptions.

(12 Hours)

UNIT-V : APPLICATION DEVELOPMENT ON .NET : Building Windows Applications-Building Windows Applications using DLL- Accessing Data with ADO.NET -Web Based Application Development on .NET -Programming Web applications with Web Forms-Programming Web Services.   **(12 Hours)**

PRESCRIBED BOOKS:
1. Muthu C. (2008), "Visual Basic.NET", 2nd Ed., Vijay Nicole Imprints Pvt.Ltd.,
2. Programming in C#, E.Balagurusamy.

ELECTIVE – V

CLOUD COMPUTING

SUBJECT CODE : 20PMCA317	THEORY	MARKS : 100
SEMESTER : III	CREDITS : 3	No. OF HOURS PER WEEK : 4

COURSE FRAMEWORK:
- To understand about the basics of Cloud Computing
- At the end of this course, students will have a deep in-sight about Amazon Cloud Platform.

COURSE OUTCOMES:
1. Discuss basics, services offered, advantages, interacting with and needs of Amazon Web Services -Cloud Computing.
2. Explain Working with AWS
3. Discuss about monitoring and debugging and work with a virtual machine
4. Explain and Discuss about creating virtual machine and work with AWS.
5: Explain and Discuss about storing Data in the Cloud

UNIT-I: Amazon Web Services-cloud computing- Hosting a web shop-Implementing a highly available system-Innovative and fast-growing platform- Services solve common problems-Enabling automation-Flexible capacity (scalability)- Built for failure (reliability)- Reducing time to market- Global infrastructure-Free Tier-Pay-per-use opportunities- Comparing alternatives-Exploring and Interacting with AWS services. **(15 Hours)**

UNIT-II: Creating an AWS account-Signing In-Creating a key pair-Create a billing alarm to keep track of your AWS bill- simple example: WordPress- Creating and exploring your infrastructure- Resource groups-Load balancer-MySQL database- Network filesystem- Using virtual machines: EC2 and exploring them-Launching a virtual machine- Connecting to your virtual machine. **(15 Hours)**

UNIT-III: Monitoring and debugging a virtual machine-Changing the size of a virtual machine-Starting a virtual machine in another data center. Programming your infrastructure - Infrastructure as Code- Installing and configuring the CLI- Controlling virtual machines with SDK: nodecc- nodecc create and list virtual machines-CloudFormation, Elastic Beanstalk,-Deploying applications in a flexible cloud environment **(15 Hours)**

UNIT-IV: Creating a virtual machine and run a deployment script on startup with AWS CloudFormation- Deploying a simple web application with AWS Elastic Beanstalk-Components of AWS Elastic Beanstalk- Securing your system: IAM, security groups, and VPC- Securing your AWS account-Creating a private network in the cloud: Amazon Virtual Private Cloud (VPC)- Executing your code with AWS Lambda- Building a website health check with AWS Lambda. **(15 Hours)**

UNIT-V: STORING DATA IN THE CLOUD: Storing your objects: S3 and Glacier- Amazon S3-Backing up your data on S3 with AWS CLI-Using S3 for static web hosting-Elastic Block Store (EBS):- Sharing data volumes between machines: EFS-Creating a filesystem-Using CloudFormation to describe a filesystem-Mounting the EFS share on EC2 instances-Sharing files between EC2 instances- Tweaking performance **(15 Hours)**

PRESCRIBED BOOKS:
1. Amazon Web Services in Action, Second Edition ,MICHAEL WITTIG ANDREAS WITTIG FOREWORD BY BEN WHALEY MANNING.

REFERENCE BOOKS:
1. Beginning Serverless Computing
2. Developing with Amazon Web Services,Microsoft Azure, and Google Cloud.
   Amazon Web Services™ For Dummies® Published by: John Wiley & Sons.

E-COMMERCE

SUBJECT CODE : 20PMCA332	THEORY	MARKS : 100
SEMESTER : III	CREDITS : 3	No. OF HOURS PER WEEK : 4

COURSE FRAMEWORK:
- To understand the basics of E-commerce and its intricacies.
- At the end of this course, students will be able to understand the basic aspects ofEcommerce to develop their own E-commerce sites.

COURSE OUTCOMES:
1. Explain basic concepts of Electronic Commerce..
2. Discuss the role of Internet as Network Infrastructure.
3. Explain the need of Network security and Firewalls, architectural framework for ecommerce
4. Discuss about different Electronic Payment systems..
5. Discuss about Advertising and Marketing on the Internet.

UNIT-I: Introduction to Electronic Commerce: Electronic Commerce Framework – Electronic Commerce and Media Convergence – The Anatomy of E-Commerce Applications – Electronic Commerce Consumer Applications – Electronic Commerce Organization Applications. The Network Infrastructure for Electronic Commerce: Components of the I way – Network Access Equipment – Global information Distribution Networks. **(12 Hours)**

UNIT-II : The Internet as a Network Infrastructure: The Internet Terminology – NSFNET: Architecture and Components – National Research and Education Network – Globalization of the Academic Internet - Internet Governance – An overview of Internet Applications. The Business of Internet Commercialization: Telco/Cable/On-Line Companies - National Independent ISPs – Regional Level ISPs – Local –level ISPs – Service Provider Connectivity -Internet Connectivity options. **(12 Hours)**

UNIT-III: Network Security and Firewalls: Client Server Network Security and Threats. Electronic Commerce and the World Wide Web: Architectural Framework for Electronic commerce – World Wide Web (WWW) as the Architecture – Hypertext Publishing - Technology behind the Web – Security and the Web. Consumer-Oriented Electronic Commerce: Consumer-Oriented Applications – Mercantile process models – Mercantile Models from the Consumers and the Merchant' Perspective. **(12 Hours)**

UNIT-IV: Electronic Payment Systems: Types of Electronic Payment Systems – Digital Token based Electronic Payment Systems – Smart Cards and Credit Card – Based Electronic Payment Systems – Risk and Electronic Payment Systems – Designing Electronic Payment Systems. Inter-organizational Commerce and EDI: Electronic Data Interchange –Applications in Business –Legal, Security and Privacy issues - Internet – Based EDI. **(12 Hours)**

UNIT-V : Advertising and the Marketing on the Internet: The New Age of Information based marketing and Advertising on the Internet – Consumer Search and Resource Discovery Paradigms and Retrieval -Electronic Commerce Catalogs or Directories – Information filtering – Consumer – Data Interface : Emerging Tools. On DemandEducation and Digital Copyrights: Computer based Education and Training – Technological Components of Education on demand. Software Agents: Characteristics and Properties – The Technology behind – Applets, Browsers and Software Agents- Software Agents in Action. **(12 Hours)**

PRESCRIBED BOOKS:
   1. Ravi Kalakota and Andrew B. Whinston, Eleventh Impression, 2011, Frontiers of Electronic Commerce, Pearson Education Inc., Delhi.

REFERENCE BOOKS :
   1. Daniel Minoli, and Emma Minoli, Web commerce Technology Handbook, TMH...

ELECTIVE - V
HUMAN RESOURCE MANAGEMENT

SUBJECT CODE : 20PMCA333	THEORY	MARKS : 100
SEMESTER : III	CREDITS : 3	No. OF HOURS PER WEEK : 4

COURSE FRAMEWORK:
- To understand the basic concepts of Human Resource Management.
- At the end of this course, students will be able to understand the HR activities.

COURSE OUTCOMES:
1. Explain Perspectives ,Evolution, objectives and role of Human Resource Management.
2. Discuss about Best Fit employee, selection process of employee and practices.
3. Explain Training and methods of training Executive development and Self Development.
4. Discuss about sustaining employee, compensation plan, rewards and motivation.
5. Examine performance evaluation and control process.

UNIT-I : Perspectives In Human Resource Management-Evolution Of Human Resource Management – The Importance Of The Human factor – objectives of human resource management – role of human resource manager – human resource policies – computer applications in human resource management. **(12 Hours)**

UNIT-II: The Concept of Best Fit Employee - Importance of human resource planning – forecasting human resource requirement – internal and external sources. Selection process-screening – tests - validation – interview - medical examination – recruitment introduction – importance – practices – socialization benefits. **(12 Hours)**

UNIT-III: Training And Executive Development - Types of training, methods, purpose, benefits and resistance. Executive development programme – common practices - benefits – self-development – knowledge management. **(12 Hours)**

UNIT-IV: Sustaining Employee Interest - Compensation plan – reward – motivation – theories of motivation – career management – development, mentor – protege relationships.
(12 Hours)

UNIT-V: Performance Evaluation And Control Process - Method of performance evaluation – feedback – industry practices. Promotion, demotion, transfer and separation – implication of job change. The control process – importance – methods – requirement of effective control systems grievances – causes – implications – redressal methods.
(12 Hours)

PRESCRIBED BOOKS:
1. Decenzo and Robbins, Human Resource Management, Wilsey, 6th edition, 2001.
2. Biswajeet Pattanayak, Human Resource Management, Prentice Hall of India, 2001.

REFERENCE BOOKS:

1. Human Resource Management, Eugence Mckenna and Nic Beach, Pearson EducationLimited, 2002.
2. Dessler Human Resource Management, Pearson Education Limited, 2002.
3. Mamoria C.B. and Mamoria S.Personnel Management, Himalaya Publishing Company,1997.
4. Wayne Cascio, Managing Human Resource, McGraw Hill, 1998.
5. Ivancevich, Human Resource Management, McGraw Hill 2002.

SOFTWARE TESTING

SUBJECT CODE : 20PMCA318	THEORY	MARKS : 100
SEMESTER : III	CREDITS : 3	No. OF HOURS PER WEEK : 4

COURSE FRAMEWORK:
- Understand the importance of testing and the way of using testing in real time scenario.
- After completion one can work in software testing industry.

COURSE OUTCOMES:
1. Discuss about Purpose, of Testing, differentiate between Testing and Debugging, Differentiate between Verification and Validation and different testing approaches and types of testing.
2. Explain and Examine Flow Graphs and Path Testing concepts and techniques.
3. Explain and Examine Domain Testing concepts and techniques.
4. Explain and Examine Syntax Testing concepts and techniques.
5. Discuss about the Software testing tool Selenium and work with it

UNIT-I : Introduction: Purpose – Productivity and Quality in Software – Testing Vs Debugging – Model for Testing – Bugs – Types of Bugs – Testing and Design Style - Verification and Validation - Levels of Testing – Testing Approaches – Types of Testing – Test Plan. **(12 Hours)**

UNIT-II : : Flow/Graphs and Path Testing – Achievable paths – Path instrumentation – Application – Transaction Flow Testing Techniques – Data Flow Testing Strategies.
(12 Hours)

UNIT-III : Domain Testing: Domains and Paths – Domains and Interface Testing – Linguistic Metrics – Structural Metric – Path Products and Path Expressions. **(12 Hours)**

UNIT-IV : Syntax Testing – Formats – Test Cases – Logic Based Testing – Decision Tables – Transition Testing – States, State Graph, State Testing. **(12 Hours)**

UNIT-V : – **Selenium :** Introduction – Advantages and Disadvantages - Selenium IDE : Installation , Introduction to available items in IDE – Rules for Automation - Recording test using Selenium IDE and playing it back - Updating a test to assert items are on the page- adding Selenium IDE comments - working with multiple windows - Selenium tests against AJAX applications - Storing information from the page in the test - Debugging tests - creatingTest Suites - Saving tests- What you cannot record. **(12 Hours)**

PRESCRIBED BOOKS :
1. B. Beizer , 2003, Software Testing Techniques, II Ed., DreamTech India, New Delhi.
2. David Burns, 2012, Selenium 2 Testing Tools Beginner's Guide, Packt Publishing Ltd., Birmingham B3 2PB, UK.

REFERENCE BOOKS:
1. Burnstein, 2003, Practical Software Testing, Springer International Edn.
2. E. Kit, 1995, Software Testing in the Real World: Improving the Process, Pearson Education, Delhi.
3. R.Rajani, and P.P.Oak, 2004, Software Testing, Tata Mcgraw Hill, New Delhi.
4. M.G.Limaye, "Software Testing Principles,Techniques and Tools," 2009, TataMc.Graw Hill Education Private Limited, NewDelhi.

REFRERECE WEB LINKS :
1. http://www.amazon.com/gp/reader/0201877562/ref=sib_dp_pt/102-1957971-9723354#reader -link

CORE – 12

PRACTICAL - V : ROBOTIC PROCESS AUTOMATION LAB

SUBJECT CODE : 20PMCA319P	PRACTICAL	MARKS : 100
SEMESTER : III	CREDITS : 2	No. OF HOURS PER WEEK : 4

COURSE FRAMEWORK:
- To have hands-on experience in rpa.
- At the end of this course students will be able to create RPA Scripts.

COURSE OUTCOMES:
1. Installation of RPA Packages
2. Create projects that interacts with user and do some simple data manipulations.
3. Create projects that demonstrates usage of decision making statements.
4. Create projects that demonstrates usage of looping statements.
5. Create simple automation that does recording, Scrapping, Image, Email and text automation.

EXERCISES:

1. Installation of RPA packages.

2. Variables and data types

3. Control flow

a. Conditional Statements b. Iteration

4. Data Manipulation- scalar variables, collections, tables, text manipulation

5. Recording-basic, desktop and web

6. Scrapping

a. Screen scrapping b. Data scrapping

7. Selectors

8. Image and text automation

9. Excel and Data tables

10. Email Automation

CORE – 13

PRACTICAL - VI: ADVANCED PYTHON LAB

SUBJECT CODE : 20PMCA320P	PRACTICAL	MARKS : 100
SEMESTER : III	CREDITS : 2	No. OF HOURS PER WEEK : 4

COURSE FRAMEWORK:
- To have hands-on experience in Data Analysis using Python.
- At the end of this course students will be able to analyze data efficiently using Python.

COURSE OUTCOMES:
1. Analyze the given problem with Object Oriented approach
2. Formulate Algorithm for solving the given advanced problems like Data
   pre processing, Regression related problems, Searching with different techniques
3. Construct Python program based on the algorithm
4. Evaluate the correctness of syntax and debug errors if any.
5. Examine the output to verify correctness of the logic

EXERCISES
1. Write a Python program for Data Preprocessing
2. Implementing A prior algorithm in Python
3. Implementing Linear Regression using Python
4. Implementing Multiple Linear Regression in Python
5. Implementing Logistic Regression in Python
6. Implementing Nearest Neighbors in Python
7. Implementing Decision Tree in Python
8. Write a Python Program to perform Linear Search
9. Write a Python Program to perform Binary Search
10. Write a Python Program to perform Merge sort
11. Write a Python Program to selection sort
12. Write a Python Program to perform insertion sort
13. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
14. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples
15. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

SOFT SKILL – 3

DATA VISUALIZATION TOOL

SUBJECT CODE : 20PGSL405	SOFT SKILL	MARKS : 100
SEMESTER : III	CREDITS : 2	No. OF HOURS PER WEEK : 2

COURSE FRAMEWORK:
- To help students to understand the foundational principles of Tableau.
- To enlighten about the basics of connecting to data, exploring and analyzing the datavisually, and finally putting it all together in a fully interactive dashboard.

UNIT-I: Tableau Foundations (6 Hours)
- The cycle of analytics
- Connecting to Data
- Measures & Dimensions
- Discrete and Continuous Fields

UNIT-II: Working with Data in Tableau
- Connecting to data on a file
- Connecting to data on a server
- Connecting to data in the cloud
- Joining Tables

UNIT-III: CHARTS
- Bar Chart
- Line Chart
- Pie Chart
- Histogram
- Scatter Plot

UNIT-IV: Geographical Visualization
- Filled maps
- Symbol Maps
- Density Maps
- Using Show Me

UNIT-V: Calculated field – Formatting and Dashboard Interface
- Working with String Functions
- Basic Arithmetic Calculations
- Building the Dashboard
- Combining multiple visualizations into a dashboard

Recommended Texts:
1. Joshua N.Milligan, "Learning Tableau 2019", 3rd Edition, Packt .

INTERNSHIP

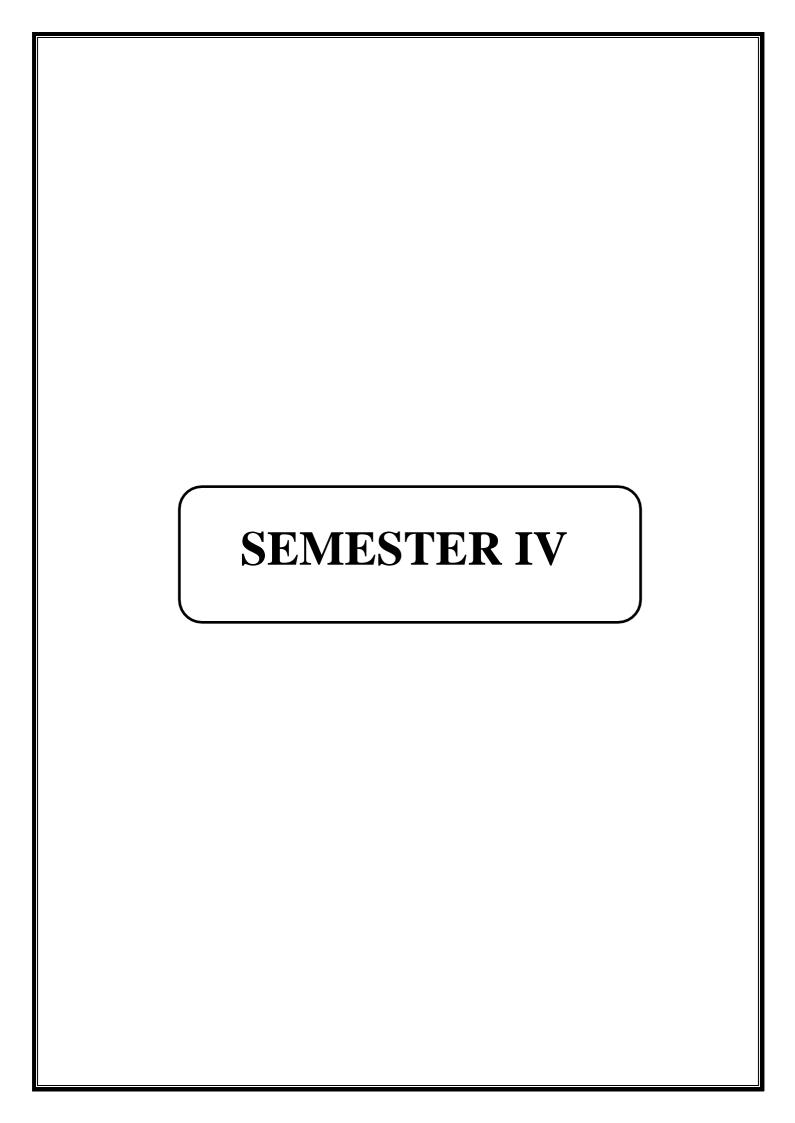| SUBJECT CODE : 20PINT401	INTERNSHIP	MARKS : 100
SEMESTER : III	CREDITS : 2	DURATION: 4 to 6 Weeks (During Summer Vacation of II Semester)

COURSE FRAMEWORK:
- Students will be able to understand the working aspects and important features of organizations.
- At the end of this course, students will have awareness in practices that are followed in the corporate environment.

COURSE OUTCOMES:
1. Understand about Real world business operations in the Industry
2. Improve awareness about work culture in real world.
3. Understand the working style and responsibilities of an end user or Client
4. Analyze the day to day activities and problems faced by the end user or Client
5. Suggest solutions to client's problems and improvements to be made in the application utilized by them.

Internship Program:

During summer vacation of First year each student should undergo training in software or software related industry for 25 working days and they have to present theirlearning soon after the college is reopened.

SEMESTER IV

CORE – 14
(LATEST TECHNOLOGY - 1)

SUBJECT CODE :	THEORY	MARKS : 100
SEMESTER : IV	CREDITS : 3	TOTAL No. OF HOURS : 60

COURSE FRAMEWORK:

- To make the student industry-ready latest technology will be introduced in that academic year.

CORE – 15

(LATEST TECHNOLOGY - 2)

SUBJECT CODE :	THEORY	MARKS : 100
SEMESTER : IV	CREDITS : 3	TOTAL No. OF HOURS : 60

COURSE FRAMEWORK:
- To make the student industry-ready latest technology will be introduced in that academic year.

PROJECT

PROJECT AND VIVA-VOCE

SUBJECT CODE : 20PMCA323	PROJECT	MARKS : 100
SEMESTER : IV	CREDITS : 17	No. OF HOURS PER WEEK : 20

COURSE FRAMEWORK:
- Students are expected to work in real time projects. The project work is to be carried out either in a software industry or in an academic institution for the entire semester.
- Project work shall be carried out individually in an R&D section of any Industry or University or in the Institute in which the candidate is studying. The Project Work/Dissertation report shall be submitted through the guides/supervisors to the Head of the Department.

COURSE OUTCOMES:
1. Analyze the problem requirements of the Organization in which they do the project and document them.
2. Develop appropriate architectural and detailed designs to build software components using Object Oriented Analysis and UML diagrams.
3. Construct a Real Time Application based on the design made by them.
4. Evaluate the Application in all aspects
5. Deploy them in Client Environment

SOFT SKILL – 4

ARCHITECTURAL DESIGN USING STAR UML

SUBJECT CODE : 20PGSL406	SOFT SKILL	MARKS : 100
SEMESTER : IV	CREDITS : 2	No. OF HOURS PER WEEK : 2

COURSE FRAMEWORK:
- Students are trained to work with the tool STAR UML to draw UML Diagrams
- At the end of this course, students will be able to draw UML diagrams based on the given context during Software Engineering.

UNIT-I: Introduction to UML DIAGRAMS: Usecase Diagram – Sequence Diagram, Activity Diagram – State Chart Diagram – Class Diagram – Component Diagram – Deployment Diagram.   **(6 Hours)**

UNIT-II: Introduction to STAR UML - Managing Project - Editing Elements and Diagrams
                                                                                              (6 Hours)

UNIT-III: Modeling with STAR UML: Designing Usecase Diagram – Sequence Diagram - Class Diagram   **(6Hours)**

 UNIT-IV: Modeling with STAR UML: Designing Activity Diagram – State Chart Diagram
                                                                                              (6 Hours)

UNIT-V: Modeling with STAR UML: Designing   Component Diagram – Deployment Diagram
                                                                                              (6 Hours)

PRESCRIBED BOOKS:
1. **UML for the IT Business Analyst 2nd Edition** by Howard Podeswa (Author)
2. https://buildmedia.readthedocs.org/media/pdf/staruml/latest/staruml.pdf
3. https://docs.staruml.io/

REFERENCE BOOKS:
1. **Software Architecture in Practice (SEI Series in Software Engineering) 3rd Edition,** by Len Bass (Author), Paul Clements (Author), Rick Kazman (Author)
2. **Head First Object-Oriented Analysis and Design 1st Edition** by Brett D. McLaughlin (Author), Gary Pollice (Author), Dave West (Author)

WEB LINKS:
1. https://www.tutorialspoint.com/software_architecture_design/architecture_models.htm
2. https://www.tutorialspoint.com/uml/index.htm
3. https://docs.staruml.io/working-with-diagrams/class-diagram
4. https://www.clear.rice.edu/comp201/07-spring/info/staruml/