

J.J COLLEGE OF ARTS AND SCIENCE (Autonomous)**Master of Computer Applications – M.C.A.****Course Structure based on U.G.C. - LOCF and TANSCH (CBCS)****(Applicable for the candidates admitted during the Academic year 2023 - 2024 onwards)**

SEMESTER – I								
Sem	Course Code	Course Title	Hrs/ Week	Credit	Exam Hrs	Marks		Total
						Int	Ext	
I	P1R3CACC1	Discrete Mathematics	7	5	3	25	75	100
	P1R3CACC2	Linux and Shell Programming	7	5	3	25	75	100
	P1R3CACC3	Python Programming	6	4	3	25	75	100
	P1R3CADSE 1:1 / 1:2 / 1:3 / 1:4	1:1 Data Engineering & Management 1:2 Architectural Frameworks 1:3 Network Protocols 1:4 Dot Net Technologies	5	3	3	25	75	100
	P1R3CADSE2: 1P / 2:2P / 2:3P / 2:4P	2:1P.Data Engineering & Management Lab 2:2P Architectural Frameworks Lab 2:3P Network Protocols Lab 2:4P Dot Net Technologies Lab	5	3	3	40	60	100
		Total	30	20	-	-	-	500

SEMESTER – II								
Sem	Course Code	Course Title	Hrs/ Week	Credit	Exam Hrs	Marks		Total
						Int	Ext	
II	P2R3CACC4	Data Structures and Algorithms	6	5	3	25	75	100
	P2R3CACC5	Big Data Analytics	6	5	3	25	75	100
	P2R3CACC6P	Data Structure and Algorithm & Big Data Analytics Lab	6	4	3	40	60	100
	P2R3CADSE 3:1 / 3:2	3:1 Software Development Technologies 3:2 Soft Computing	5	3	3	25	75	100
	P2R3CADSE 4:1 / 4:2	4:1 Social Networks 4:2 High Performance Computing	5	3	3	25	75	100
	P2R3CASEC 1:1 / 1:2	1:1 Internet of Things 1:2 Computer Vision	2	2	3	25	75	100
		Total	30	22	-	-	-	600
SEMESTER – III								
III	P3R3CACC7	Management Information System	5	5	3	25	75	100
	P3R3CACC8	Compiler Design	5	5	3	25	75	100
	P3R3CACC9	Data Base Management System	5	5	3	25	75	100
	P3R3CACC10P	RDBMS Practical	5	5	3	40	60	100
	P3R3CADSE 5:1 / 5:2	5:1 Data Communication Networks 5:2 Network Security	5	3	3	25	75	100
	P3R3CASEC 2:1 / 2:2	2:1 Software Engineering 2:2 Software Project Management	5	2	3	25	75	100
	P3R3CAINT	Internship	--	3	--	--	100	100
		Total	30	28	-	-	-	700

SEMESTER – IV								
IV	P4R3CACC11	E-Commerce	06	5	3	25	75	100
	P4R3CACC12	Software Quality Assurance and Testing	06	5	3	25	75	100
	P4R3CACC13PW	Project Work	18	10	--	-	100	100
		Total	30	20	-	-	-	300
	Grand Total	21 – Courses		90	-	-	-	2100

Master of Computer Applications (M.C.A.)

List of Elective Courses

(To be followed from the Academic Year 2023-2024)

ELECTIVE – I

(Theory -Any 01 in Semester – I)

- P1R3CAEC1:1. Data Engineering and Management
- P1R3CAEC1:2. Architecture and Frameworks
- P1R3CAEC1:3. Network Protocols
- P1R3CAEC1:4. Dot Net Technologies

ELECTIVE – II

(Lab -Any 01 in Semester – I based on Elective - I)

- P1R3CAEC1:1P. Data Engineering and Management Lab
- P1R3CAEC1:2P. Architecture and Frameworks lab
- P1R3CAEC1:3P. Network Protocols Lab
- P1R3CAEC1:4P. Dot Net Technologies lab

Title of the Course : DISCRETE MATHEMATICS

Category of the Course : CORE CC

Course Code : P1R3CACC1

Nature of the Course : EMPLOYABILITY

Max.Marks: 25+75=100

Hrs/Week: 07

Credit: 05

Total Inst. Hours: 105

COURSE OBJECTIVES:

1. To know the concepts of relations and functions
2. To distinguish among different normal forms and quantifiers
3. To solve recurrence relations and permutations & combinations
4. To know and solve matrices, rank of matrix & characteristic equations
5. To study the graphs and its types

Unit-I -RELATIONS

(Inst. Hrs: 21)

Relations- Binary relations-Operations on relations- properties of binary relations in a set – Equivalence relations— Representation of a relation by a matrix -Representation of a relation by a digraph – **Functions**-Definition and examples-Classification of functions-Composition of functions-Inverse function

Unit-II –MATHEMATICAL LOGIC

(Inst.Hrs: 21)

Mathematical Logic-Logical connectives-**Well formed formulas** – Truth table of well formed formula –Algebra of proposition –Quine's method- **Normal forms of well formed formulas**- Disjunctive normal form-Principal Disjunctive normal form-Conjunctive normal form-Principal conjunctive normal form-**Rules of Inference for propositional calculus** – **Quantifiers**- Universal Quantifiers- Existential Quantifiers

Unit-III- RECURRENCE RELATIONS

(Inst.Hrs: 21)

Recurrence Relations- Formulation -solving recurrence Relation by Iteration- solving Recurrence Relations- Solving Linear Homogeneous Recurrence Relations of Order Two-

Solving Linear Non homogeneous Recurrence Relations. Permutations-**Cyclic permutation-**

Permutations with repetitions- permutations of sets with indistinguishable objects- Combinations- Combinations with repetition

Unit-IV-MATRICES

(Inst. Hrs: 21)

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

Unit-V-GRAPHS

(Inst. Hrs: 21)

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

TEXT BOOK (S)

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

REFERENCE BOOK (S)

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

COURSE OUTCOMES:

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

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

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

Title of the Course : LINUX AND SHELL PROGRAMMING

Category of the Course : CORE COURSE

Course Code : P1R3CACC2

Nature of the Course : EMPLOYABILITY

Max.Marks: 25+75=100

Hrs/Week: 07

Credit: 05

Total Inst. Hours: 105

COURSE OBJECTIVES :

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

Unit-I : BASIC BASH SHELL COMMANDS

(Inst.Hrs : 21)

Basic bash Shell Commands: Interacting with the shell-Traversing the file system-Listing files and directories-Managing files and directories-Viewing file contents. **Basic Script Building:** Using multiple commands-Creating a script file-Displaying messages-Using variables-Redirecting input and output-Pipes-Performing math-Exiting the script. **Using Structured Commands:** Working with the if-then statement-Nesting ifs-Understanding the test command-Testing compound conditions-Using double brackets and parentheses-Looking at case.

Unit-II: STRUCTURED COMMANDS

(Inst.Hrs : 21)

More Structured Commands: Looping with for statement-Iterating with the until statement-Using the while statement-Combining loops-Redirecting loop output. **Handling User Input:** Passing parameters-Tracking parameters-Being shifty-Working with options-Standardizing options-Getting user input. **Script Control:** Handling signals-Running scripts in the background-Forbidding hang-ups -Controlling a Job-Modifying script priority-Automating script execution.

Unit-III : **FUNCTIONS**

(Inst.Hrs : 21)

Creating Functions: Basic script functions-Returning a value-Using variables in functions-Array and variable functions-Function recursion-Creating a library-Using functions on the command line.

Writing Scripts for Graphical Desktops: Creating text menus-Building text window widgets-Adding X Window graphics. **Introducing sed and gawk:** Learning about the sed Editor-Getting introduced to the gawk Editor-Exploring sed Editor basics.

Unit-IV : **REGULAR EXPRESSIONS**

(Inst.Hrs : 21)

Regular Expressions: Defining regular expressions-Looking at the basics-Extending our patterns-Creating expressions. **Advanced sed:** Using multiline commands-Understanding the hold space-Negating a command-Changing the flow-Replacing via a pattern-Using sed in scripts-Creating sed utilities. **Advanced gawk:** Reexamining gawk-Using variables in gawk-Using structured commands-Formatting the printing-Working with functions.

Unit-V : **WORKING WITH ALTERNATIVE SHELLS**

(Inst.Hrs : 21)

Working with Alternative Shells: Understanding the dash shell-Programming in the dash shell-Introducing the zsh shell-Writing scripts for zsh.**Writing Simple Script Utilities:** Automating backups-Managing user accounts-Watching disk space. **Producing Scripts for Database, Web, and E-Mail:** Writing database shell scripts-Using the Internet from your scripts-Emailing reports from scripts. **Using Python as a Bash Scripting Alternative:** Technical requirements-Python Language-Hello World the Python way-Pythonic arguments-Supplying arguments-Counting arguments-Significant whitespace-Reading user input-Using Python to write to files-String manipulation.

TEXT BOOK (S):

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

REFERENCE BOOK (S):

1. ClifFlynt,SarathLakshman,ShantanuTushar, “Linux Shell Scripting Cookbook ”, Packt Publishing, 3rd Edition, 2017.

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

COURSE OUTCOMES:

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

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

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

MAPPING WITH PROGRAMME OUTCOMES

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

S- Strong; M-Medium; L-Low

Title of the Course : PYTHON PROGRAMMING

Category of the Course : CORE COURSE

Course Code : P1R3CACCC3

Nature of the Course : EMPLOYABILITY

Max.Marks: 25+75=100

Hrs/Week: 06

Credit: 04

Total Inst.Hours: 90

COURSE OBJECTIVES:

1. To acquire programming skills in core Python
2. To learn Strings and function
3. To develop object oriented skills in Python
4. To comprehend various Python Packages
5. To develop web applications using Django

Unit I : INTRODUCTION TO PYTHON

(Inst. Hrs: 18)

Introduction : Fundamental ideas of Computer Science - Strings, Assignment, and Comments - Numeric Data types and Character sets – Expressions – Loops and Selection Statements: Definite iteration: the for Loop - selection: if and if-else statements - Conditional iteration: the while Loop

Unit II : STRINGS AND TEXT FILES

(Inst. Hrs: 18)

Strings and Text Files: Accessing Characters and substrings in strings - Data encryption-Strings and Number systems- String methods – Text - Lists and Dictionaries: Lists – Dictionaries – Design with Functions: A Quick review - Problem Solving with top-Down Design - Design with recursive Functions - Managing a Program's namespace - Higher-Order Functions

Unit III : CLASSES

(Inst. Hrs: 18)

Design with Classes: Getting inside Objects and Classes – Data-Modeling Examples – Building a New Data Structure – The Two – Dimensional Grid - Structuring Classes with Inheritance and Polymorphism – Graphical User Interfaces – The Behavior of terminal –

Based programs and GUI – Based programs Coding Simple GUI - Based programs - Windows and Window Components - Command Buttons and responding to events

Unit IV : PYTHON PACKAGES

(Inst. Hrs: 18)

Working with Python Packages: NumPy Library-Ndarray – Basic Operations – Indexing, Slicing and Iteration – Array manipulation - Pandas –The Series – The DataFrame - The Index Objects – Data Vizualization with Matplotlib – The Matplotlib Architecture – pyplot – The Plotting Window – Adding Elements to the Chart – Line Charts – Bar Charts – Pie charts

Unit V : DJANGO

(Inst. Hrs: 18)

Django: Installing Django – Building an Application – Project Creation – Designing the Data Schema - Creating an administration site for models - Working with QuerySets and Managers – Retrieving Objects – Building List and Detail Views

TEXT BOOK (S):

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

COURSE OUTCOMES:

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

- | | | |
|------------|---|---------------|
| CO1 | Comprehend the programming skills in python and develop applications using conditional branches and loop | |
| CO2 | Create python applications with strings and functions | |
| CO3 | Understand and implement the Object Oriented Programming paradigm with the concept of objects and classes, Inheritance and polymorphism | K1- K6 |
| CO4 | Evaluate the use of Python packages to perform numerical computations and data visualization | |
| CO5 | Design interactive web applications using Django | |

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

MAPPING WITH PROGRAMME OUTCOMES:

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

S- Strong; M-Medium; L-Low

Title of the Course : DATA ENGINEERING AND MANAGEMENT

Category of the Course : ELECTIVE I

Course Code : P1R3CAEC1:1

Nature of the Course : EMPLOYABILITY

Max.Marks: 25+75=100

Hrs/Week: 05

Credit: 03

Total Inst. Hours: 75

COURSE OBJECTIVES:

1. To understand Data Management concepts
2. To get brief knowledge on Data Modeling
3. To analyse the techniques used in Distributed Databases
4. To assess Distributed database and Business Modeling
5. To get familiar with CRM tools

UNIT-I - DATABASE DEVELOPMENT

(Inst. Hrs: 15)

DATABASE DEVELOPMENT: Database architecture of an information system-Overview of the database development process-Conceptual data modeling-Relational data analysis-Roles of a data model-Physical database design. DATA MANAGEMENT: Problems encountered without data management-Data management responsibilities-Data management activities-Roles within data management-Benefits of data management-Relationship between data management and enterprise

UNIT-II- CORPORATE DATA MODELLING

(Inst. Hrs: 15)

CORPORATE DATA MODELLING: Need for a corporate data model-Nature of a corporate data model- Develop a corporate data model - Corporate data model principles. DATA DEFINITION AND NAMING: Elements of a data definition-Data naming conventions. DATA QUALITY: Issues associated with poor data quality-Causes of poor data quality-Dimensions of data quality-Data model quality-Improving data quality. DATA ACCESSIBILITY: Data security-Data integrity-Data recovery

UNIT-III- USE OF PACKAGED APPLICATION SOFTWARE

(Inst. Hrs: 15)

USE OF PACKAGED APPLICATION SOFTWARE: Application software packages-Impact on data management. DISTRIBUTED DATA AND DATABASES: Rationale for distributing data-Perfect distributed database system-Top down fragmentation and partitioning. Bottom up integration-The management of replication. BUSINESS INTELLIGENCE: Data warehousing-Multidimensional

model of data-Standard reporting tools-Online analytical processing OLAP-Relational schema for a data warehouse.

UNIT-IV: CRM

(Inst. Hrs: 15)

CRM: Three main pillars of CRM. GETTING TO KNOW YOUR CUSTOMER: 360-degree client view. UTILIZING ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN YOUR CRM STRATEGY: Evolution of AI-Current state of AI-Teaming up AI with people-Applying AI to your CRM solution-ethical aspects of AI-An example of AI in CRM processes.

UNIT-V: CLOUD VERSUS ON PREMISE VERSUS HYBRID

(Inst. Hrs: 15)

CLOUD VERSUS ON PREMISE VERSUS HYBRID: Factors influencing vendor selection-Hybrid deployment-what are your options. CRM DIFFERENTIATORS: It's not about the feature list; it's about the ecosystem-Fourth industrial revolution and CRM-AI and smart cloud-To cloud or not to cloud-Leveraging smart cloud into CRM-Big data-Social selling and advertising-Implementation tools-Sustainable CRM platform.

TEXT BOOK (S):

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

REFERENCE BOOK (S):

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

COURSE OUTCOME (S):

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

Course Outcomes	Description	Knowledge Level
CO1	Comprehend the Data Management concepts and analyse the relationship with the enterprise	K1- K6
CO2	Analyze Data Modelling concepts and assess its quality	
CO3	Understand and implement business modelling techniques	
CO4	Evaluate the use of Artificial Intelligence and Machine Learning in CRM	
CO5	Develop CRM applications in cloud	

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

MAPPING WITH PROGRAMME OUTCOMES:

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

L - Low, M- Medium, S – Strong

Title of the Course : ARCHITECTURE AND FRAMEWORKS

Category of the Course : ELECTIVE I

Course Code □□ : P1R3CAEC1:2

Nature of the Course : EMPLOYABILITY

Max.Marks: 25+75=100

Hrs/Week: 05

Credit: 03

Total Inst. Hours: 75

COURSE OBJECTIVES:

1. To understand the basics, benefits and purpose of software architecture
2. To Understand the quality attributes to fulfil the software requirements
3. To Explore the design patterns, best practice and paradigms of efficient software
4. To Understand the performance and security measures of software architecture
5. To Enable the developers to advance their career in software domain

UNIT – I- SOFTWARE ARCHITECTURE INTRODUCTION (Inst. Hrs: 15)

Software architecture introduction – Importance of Software architecture –Software architecture consumers – Architect role - software architecture in an organization – Types of software architects – Software development methodologies – Project management – Office politics – Software risk management – Configuration management – Software product lines

UNIT – II- DOMAIN KNOWLEDGE (Inst. Hrs: 15)

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

UNIT – III- SOFTWARE ARCHITECTURES DESIGN (Inst. Hrs: 15)

Software Architectures design – Importance - Top-down Versus bottom-up design approaches – Architectural drivers – Documenting the Software architecture design – Systematic approach - Attribute-driven design – Microsoft's technique for architecture and design –Architecture-centric design method – Architecture development method – Tracking the progress of the software architecture's design.

UNIT – IV- ORTHOGONAL SOFTWARE SYSTEMS**(Inst. Hrs: 15)**

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

UNIT – V- ARCHITECTING MODERN APPLICATIONS**(Inst. Hrs: 15)**

Architecting Modern Applications.- Importance of Performance – Performance improvement - Server side caching – Web application performance – Database performance -Securing software systems – Threat modelling – Secure by design

TEXT BOOK (S):

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

REFERENCE BOOK (S):

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

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

CO1	Understand, analyze and evaluate the purpose of Software architecture and development methodologies with consideration of risk management	K1-K6
CO2	Comprehend, apply and evaluate the domain knowledge for software development process and determine the impact of quality attributes.	K1-K6
CO3	Understand, track and examine the systematic approach for various software design models with effective document process	K1-K6
CO4	Illustrate and summarize the functions of orthogonal systems with complexity, design principles and design pattern for software architecture	K1-K6
CO5	Comprehend, analyze and evaluate the performance and security measures for Server, Web and Database applications in order to create the secure software systems for various domain applications	K1-K6

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

MAPPING WITH PROGRAMME OUTCOMES:

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

S- Strong; M-Medium; L-Low

Title of the Course : NETWORK PROTOCOLS

Category of the Course : ELECTIVE I

Course Code □□ : P1R3CAEC1:3

Nature of the Course : EMPLOYABILITY

Max.Marks: 25+75=100

Hrs/Week: 05

Credit: 03

Total Inst. Hours: 75

COURSE OBJECTIVES:

1. To understand the basic concepts of Transmission Control Protocol/Internet Protocol
2. To describe the internet architecture and its processes with the data transfer
3. To understand technologies and services associated with network protocols
4. Learners will understand the importance and functioning of Routing Protocols
5. Empower the learners to manage the issues associated with IP protocols

UNIT I - TRANSMISSION CONTROL PROTOCOL

(Inst. Hrs: 15)

Transmission Control Protocol/Internet Protocol : Fundamental Architecture - Internet Protocol Basics - Routing - Transport-Layer Protocols : Transmission Control Protocol - User Datagram Protocol - Stream Control Transmission Protocol - Real-Time Transport Protocol.

UNIT II - INTERNET ARCHITECTURE

(Inst. Hrs: 15)

Internet Architecture: Internet Exchange Point - History of Internet Exchange Points - Internet Service Provider Interconnection Relationships - Peering and Transit - IP Routing Protocols: Overview of Routing Protocols - Routing Information Protocol - Open Shortest Path First - Border Gateway Protocol - Multiprotocol Label Switching.

UNIT III- IP QUALITY OF SERVICE

(Inst. Hrs: 15)

IP Quality Of Service : Introduction - Quality of Service in IP Version 4 - Integrated Services - Differentiated Services - Quality of Service with Nested Differentiated Services Levels - IP Multicast and Anycast: Addressing - Multicast Routing - Routing Protocols –Anycasting- IPv6 Anycast Routing Protocol: Protocol Independent Anycast—Sparse Mode - Transport over Packet: Draft-Martini Signaling and Encapsulation - Layer-2 Tunneling Protocol.

UNIT IV - VIRTUAL PRIVATE WIRED SERVICE**(Inst. Hrs: 15)**

Virtual Private Wired Service - Types of Private Wire Services - Generic Routing Encapsulation - Layer-2 Tunneling Protocol - Layer-3 Virtual Private Network 2547bis, Virtual Router - IP and Optical Networking: IP/Optical Network Evolution - Challenges in Legacy Traditional IP/Optical Networks - Automated Provisioning in IP/Optical Networks - Control Plane Models for IP/Optical Networking - Next-Generation MultiLayer Network Design Requirements - Benefits and Challenges in IP/Optical Networking - IP Version 6: Addresses in IP Version 6 - IP Packet Headers - IP Address Resolution - IP Version 6 Deployment: Drivers and Impediments.

UNIT V - IP TRAFFIC ENGINEERING**(Inst. Hrs: 15)**

IP Traffic Engineering: Models of Traffic Demands - Optimal Routing with Multiprotocol Label Switching - Link-Weight Optimization with Open Shortest Path First - Extended Shortest-Path-Based Routing Schemes - IP Network Security: Introduction - Detection of Denial-of-Service Attack - IP Trace back- Edge Sampling Scheme - Advanced Marking Scheme - Mobility Support for IP: Mobility Management Approaches - Security Threats Related to IP Mobility - Mobility Support in IPv6 - Reactive Versus Proactive Mobility Support - Relation to Multihoming - Protocols Supplementing.

TEXT BOOK (S):

1. “Advanced Internet Protocols, Services and Applications”, Eiji Oki, Roberto Rojas-Cessa, Mallikarjun Tatipamula, Christian Vogt, Copyright © 2012 by John Wiley & Sons, Inc.

REFERENCE BOOK (S) :

1. “TCP/IP Protocol Suite”, Behrouz A. Forouzan, Fourth Edition, Tata Mcgraw-Hill Edition 2010.
2. “Computer Communications and Networking Technologies” - Michael A. Gallo & William M. Hancock- BROOKS&COLE
3. “Computer Networks and Internets” -Douglas E. Comer- PEARSON.
4. Data and Computer Communications- Eighth Edition- William Stallings- Pearson Education.
5. Network Security Bible, 2nd edition, Eric Cole, Wiley Publishers.
6. Data communication and networks –James Irvine and David Harley- Publishers: Wiley India

COURSE OUTCOME (S):

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

CO1	Understand, analyse and examine the concepts of Communication Protocols with its architecture and functions	K1- K6
CO2	Illustrate and apply the appropriate internet architecture along with efficient protocol models for the user defined communication environment	K1- K6
CO3	Comprehend, categorize and formulate the appropriate IP routing protocol to establish a efficient data transfer	K1- K6
CO4	Comprehend, analyse and evaluate the concepts of Virtual wired service and IP/optical networking with its functions and deployment	K1- K6
CO5	Elucidate, analyse and inspect the IP traffic engineering and its models along with the security mechanisms	K1- K6

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

MAPPING WITH PROGRAMME OUTCOMES:

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

S- Strong; M-Medium; L-Low

Title of the Course : DOT NET TECHNOLOGIES

Category of the Course : ELECTIVE I

Course Code : P1R3CAEC1:4

Nature of the Course : EMPLOYABILITY

Max.Marks: 25+75=100

Hrs/Week: 05

Credit: 03

Total Inst. Hours: 75

COURSE OBJECTIVES :

1. To get strong understanding of .NET Framework and C# programming.
2. To get advanced programming skills in Visual Studio with C# language.
3. To get advanced methods of manipulating data using Microsoft SQL Server.
4. To get clear idea of how to developing real-time standalone, web applications using .NET Technologies.
5. To get clear understanding and get experience in Microsoft Azure.

Unit-I : INTRODUCING C#: .NET FRAMEWORK

(Inst. Hrs: 15)

Introducing C#: .NET Framework - C# language - Visual Studio 2017 - Writing a C# Program: Visual Studio 2017 Development Environment - Console Applications - Desktop Applications - Variables and Expressions: Basic C# Syntax - Basic C# Console Application Structure - Variables - Expressions - Flow Control: Boolean Logic – Branching - Looping.

Unit-II: FUNCTIONS

(Inst.Hrs:15)

More About Variables: Type Conversion - Complex Variable Types - String Manipulation – Functions: Defining and Using Functions - Variable Scope - The Main Function - Struct Functions - Overloading Functions - Using Delegates - Debugging and Error Handling: Debugging in Visual Studio - Error Handling - Introduction to Object Oriented Programming: Object-Oriented Programming - OOP Techniques - OOP in Desktop Applications.

Unit-III : CLASSES

(Inst. Hrs: 15)

Defining Classes: Class Definitions in C# - System.Object - Constructors and Destructors - OOP Tools in Visual Studio - Class Library Projects - Interfaces Versus Abstract Classes - Struct Types - Shallow Copying Versus Deep Copying - Defining Class Members: Member Definitions - Additional Class Member Topics - Interface Implementation - Partial Class Definitions - Partial Method Definitions - The Call Hierarchy Window - Basic Cloud Programming: Cloud, Cloud Computing, and the Cloud Optimized Stack - Cloud Patterns and Best Practices - Using Microsoft Azure C# Libraries to Create a

Storage Container - Creating an ASP.NET 4.7 Web Site That Uses the Storage Container - Advanced Cloud Programming and Deployment: Creating an ASP.NET Web API - Deploying and Consuming an ASP.NET Web API on Microsoft Azure - Scaling an ASP.NET Web API on Microsoft Azure.

Unit-IV: .NET STANDARD AND .NET CORE

(Inst. Hrs: 15)

.NET Standard and .NET Core: Cross-Platform Basics and Must Know Terms – Need of .NET - Referencing and Targeting Frameworks - .NET Core - Building and Packaging a .NET Standard Library - Building a .NET Core Application with Visual Studio - Porting from .NET Framework to .NET Core - ASP.NET and ASP.NET Core: Overview of Web Applications – Use of ASP.NET - ASP.NET Web Forms - Creating ASP.NET Core Web Applications – Files: File Classes for Input and Output – Streams - Monitoring the File System - XML and JSON: XML Basics - JSON Basics - XML Schemas - XML Document Object Model - Converting XML to JSON - Searching XML with XPath.

Unit-V: LINQ

(Inst. Hrs: 15)

LINQ: LINQ to XML - LINQ Providers - LINQ Query Syntax - LINQ Method Syntax - Ordering Query Results - Understanding the orderby Clause - Querying a Large Data Set -Using Aggregate Operators - Using the Select Distinct Query - Ordering by Multiple Levels -Using Group Queries - Using Joins – Databases: Using Databases - Installing SQL Server - Express - Entity Framework - Code First Database - Finding the Database - Navigating Database Relationships - Handling Migrations - Creating and Querying XML from an Existing Database - Universal Apps: Windows Universal Apps - App Concepts and Design - App Development - Common Elements of Windows Store Apps - Windows Store.

TEXT BOOK (S):

1. Benjamin Perkins, Jacob Vibe Hammer, Jon D. Reid, “Beginning C#7 Programming with Visual Studio 2017”, Wiley Publishing, 2018.Chapters: 1 to 10, 16 to 23, and 25.

REFERENCE BOOK (S):

1. Nagel, Christian, “Professional C# 7 and .NET Core 2.0”, Wrox Publishing, 2018.
2. Mehboob Ahmed Khan, Ovais, “C# 7 and .NET Core 2.0 High Performance”, Packt Publishing, 2018

COURSE OUTCOMES:

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

CO1	Understand and learn .NET Framework and C# .NET	K1, K2	LO
CO2	Apply the concepts to develop the applications for real-time problem in C# .NET and ASP .NET	K3	IO
CO3	Analyze the feasibility of using .NET for real time problems	K4,K5	HO

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

MAPPING WITH PROGRAMME OUTCOMES:

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

L - Low, M- Medium, S - Strong

Title of the Course : DATA ENGINEERING AND MANAGEMENT LAB

Category of the Course : ELECTIVE II

Course Code : P1R3CAEC1:1P

Nature of the Course : EMPLOYABILITY

Max.Marks: 40+60=100

Hrs/Week: 05

Credit: 03

Total Inst. Hours: 75

COURSE OBJECTIVES:

1. To acquire basic scripting knowledge in MongoDB
 2. To learn CRUD Operation on MongoDB database
 3. To comprehend MongoDB using DbVisualizer
 4. To be familiar with Zoho CRM features
 5. To customize your application using Zoho CRM
-
1. Write a script to **create a MongoDB database** and perform insert operation
 2. Write a MongoDB script to perform query operations
 3. Write a **MongoDB Script to perform update operations**
 4. Write a MongoDB Script to update documents with aggregation pipeline
 5. Write a MongoDB script to delete single and multiple documents
 6. Write a **MongoDB script to perform string aggregation operations**
 7. Design a Data Model for MongoDB using DbVisualizer
 8. Perform **CRUD operations** using DbVisualizer
 9. Create a **Zoho CRM account and organize your Tasks, Meetings and Deals**
 10. Create and maintain a project using Zoho CRM features

COURSE OUTCOME (S):

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

Course Outcome	Description	Knowledge Level
CO1	Comprehend the scripting knowledge in MongoDB and perform basic operations in shell prompt	K1- K6
CO2	Implement, Create, Read, Update and Delete Operations on MongoDB database	
CO3	Analyze MongoDB using DbVisualizer	
CO4	Assess Zoho CRM features for managing the customer relationships	
CO5	Create a customized application in Zoho CRM	

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

MAPPING WITH PROGRAMME OUTCOMES:

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

S- Strong; M-Medium; L-Low

Title of the Course : ARCHITECTURE AND FRAMEWORKS - LAB

Category of the Course : ELECTIVE II

Course Code : P1R3CAEC1:2P

Nature of the Course : EMPLOYABILITY

Max.Marks: 40+60=100

Hrs/Week: 05

Credit: 03

Total Inst. Hours: 75

COURSE OBJECTIVES:

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

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

Implement the following using Linux / Windows environments

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

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

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

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

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO 11	PO 12
CO1	S	S	M	L	M	S	-	-	-	-	-	-
CO2	S	M	S	S	S	M	-	-	-	-	-	-
CO3	S	M	S	M	S	M	-	-	-	-	-	-
CO4	S	M	L	S	M	L	-	-	-	-	-	-
CO5	M	S	M	L	S	L	-	-	-	-	-	-

S- Strong; M-Medium; L-Low

Title of the Course : NETWORK PROTOCOLS LAB

Category of the Course : ELECTIVE II

Course Code : P1R3CAEC1:3P

Nature of the Course : EMPLOYABILITY

Max.Marks: 40+60=100

Hrs/Week: 05

Credit: 03

Total Inst. Hours: 75

COURSE OBJECTIVES:

1. To understand and implement the basic concepts of Transmission Control Protocol/Internet Protocol and associated functions.
2. To acquire programming skills in Implement various technologies and services associated with network protocols along with the challenges of data transfer.
3. Implement the importance and functioning of Routing Protocols over communication service.
4. To acquire skills to connect two routers and any two switches.
5. To comprehend related to SSH protocols and accessing the remote device.

Implement the following using Linux / Windows environments

1. Implement the following commands

- ipconfig
- ping
- traceroute
- netsat
- nslookup

2. Implement the following server commands

- ifconfig
- ip
- tracepath
- ss

- tcpdump

3. Connect and place the given file in the FTP server
4. Install packet tracer and connect a computer to router, switch and get a Icmp request
5. Implement the SSH protocols and accessing the remote device
6. Connect any two switches and get the status of each switches
7. Connect two routers and get packets from the routers.
8. Get the access of the router by connecting with working computer
9. Identify the route password of server and get the connection using telnet
10. Install wire shark for capture and analyse the packets (TCP /UDP)

COURSE OUTCOME (S): On the successful completion of the course, students will be able to

CO1:	Comprehend the programming skills the SSH protocols and accessing the remote device	K1-K6
CO2:	Understand and implement the various functioning of Routing Protocols over communication service.	K1-K6
CO3:	Evaluate the use of FTP server	K1-K6
CO4:	Design to Connect any two switches and get the status of each switches	K1-K6
CO5:	Solve to Connect two routers and get packets from the routers.	K1-K6

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

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	S	-	-	-	-	L	-	-	-	-	-	-
CO2	S	-	M	-	M	L	-	-	-	-	-	-
CO3	S	-	S	-	S	L	-	-	-	S	S	S
CO4	S	-	S	-	S	L	-	-	-	S	S	S
CO5	S	-	S	-	S	L	-	-	-	S	S	S

S- Strong; M-Medium; L-Low

Title of the Course : DOT NET TECHNOLOGIES LAB

Category of the Course : ELECTIVE II

Course Code : P1R3CAEC1:4P

Nature of the Course : EMPLOYABILITY

Max.Marks: 40+60=100

Hrs/Week: 05

Credit: 03

Total Inst. Hours: 75

COURSE OBJECTIVES:

1. To get strong understanding of .NET Framework and C# programming.
2. To get advanced programming skills in C# .NET OOPs Concepts
3. To get advanced methods of manipulating data using Microsoft SQL Server.
4. To get clear idea of how to developing real-time standalone, web applications using ASP .NET.
5. To get clear understanding and get experience in Microsoft Azure.

Implement the following problems using C# with Visual Studio 2017

1. Demonstrate method overloading and method overriding
2. Class and Objects
3. Multilevel Inheritance
4. Interfaces
5. Demonstrate multiple type of Exceptions
6. Azure Storage Container Using the Microsoft Azure Storage Client Library
7. Demonstrate Read and Write a Data using Random Access Files
8. Employee management database using LINQ
9. Student management system using ASP.NET
10. Demonstrates simple Universal App.

COURSE OUTCOME (S):

1. Get a strong understanding of .NET Visual Studio platform
2. Become a strong knowledge in C# .NET.
3. Getting real-time application developing using .NET Cloud Technologies.

MAPPING WITH PROGRAMME OUTCOMES:

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

L - Low, M- Medium, S - Strong

Title of the Course : Data Structures and Algorithms

Category of the Course : CORE COURSE

Course Code : P2R3CACC4

Nature of the Course : SKILL DEVELOPMENT

Max.Marks: CIA : 25 + Ext : 75 = 100

Hours/Week : 06

Credit: 05

Total Inst. Hours: 90

Course Objectives:

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

UNIT I: Introduction to Data Structures and Algorithms

(Inst. Hours: 18)

Introduction to Data Structures –Elementary of Data organization- Classification of Data Structures- Operation on Data Structures - Abstract Data Types - Experimental Studies-The Seven Functions in Analysis of Algorithms

UNIT II: Recursion and Arrays

(Inst. Hours: 18)

Recursion: Illustrative Examples-Factorial-Binary search file system-The Towers of Hanoi - Analyzing Recursive Algorithms-Linear Recursion- Binary Recursion-Multiple Recursion.

Array based sequences: Python sequence types-lower level Arrays-Dynamic Arrays

UNIT III: Stacks, Queues, and Deques and Linked List

(Inst. Hours: 18)

Stacks, Queues, and Deques: Stacks-Stacks-Array based stack implementation- Queues ADT- Array based Queue Implementation- Double-Ended Queues -**Linked Lists:** Singly Linked Lists-Doubly Linked Lists.

UNIT IV: Trees and Graphs

(Inst. Hours: 20)

Trees: General Trees-Binary Trees-Implementing Trees-Tree Traversal Algorithms –Binary search trees- **Graph Algorithms:** Graphs - Data Structures for Graphs-Graph Traversals-Depth First Search-Breadth First Search

UNIT V: Sorting Algorithms:**(Inst. Hours: 16)**

Sorting Algorithms: Merge sort-Quick sort –sorting with priority queue-selection sort-insertion sort-heap sort.

Text book:

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

Reference books:

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

Course Outcome:

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

CO1	Understand various ADT concepts	K1-K6
CO2	Familiar with implementation of ADT models with Python language and understand how to develop ADT for the various real-time problems	
CO3	Apply with proper ADT models with problem understanding	
CO4	Apply and Analyze right models based on the problem domain	
CO5	Evaluate modern data structures with Python language	

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

Mapping with Programme Outcomes:

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

L - Low, M- Medium, S - Strong

Title of the Course : Big Data Analytics

Category of the Course : CORE COURSE

Course Code : P2R3CACC5

Nature of the Course : EMPLOYABILITY

Max.Marks: CIA : 25 + Ext : 75 = 100

Hours/Week : 06

Credit: 05

Total Inst. Hours: 90

Course Objectives

- To introduce big data tools & Information Standard formats
- To understand the basic concepts of big data
- To learn Hadoop, HDFS and MapReduce concepts
- To teach the importance of No SQL
- To explore the big data tools such as Hive, HBase and Pig

UNIT I:

(Inst. Hours: 18)

Big Data and Analytics: Classification of Digital Data: Structured Data- Semi Structured Data and Unstructured Data.

Introduction to Big Data: Characteristics – Evolution – Definition - Challenges with Big Data - Other Characteristics of Data - Big Data - Traditional Business Intelligence versus Big Data - Data Warehouse and Hadoop.

Environment Big Data Analytics: Classification of Analytics – Challenges - Big Data Analytics important - Data Science - Data Scientist - Terminologies used in Big Data Environments – Basically Available Soft State Eventual Consistency - Top Analytics Tools

UNIT II:

(Inst. Hours: 18)

Technology Landscape:NoSQL, Comparison of SQL and NoSQL, Hadoop -RDBMS Versus Hadoop - Distributed Computing Challenges – Hadoop Overview - Hadoop Distributed File System - Processing Data with Hadoop - Managing Resources and Applications with Hadoop YARN - Interacting with Hadoop Ecosystem

UNIT III:

(Inst. Hours: 18)

Mongodb and Mapreduce Programming: MongoDB: Mongo DB - Terms used in RDBMS and Mongo DB - Data Types - MongoDB Query Language.

MapReduce: Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression

UNIT IV:

(Inst. Hours: 18)

Hive: Introduction – Architecture - Data Types - File Formats - Hive Query Language Statements – Partitions – Bucketing – Views - Sub- Query – Joins – Aggregations - Group by and Having – RCFile - Implementation - Hive User Defined Function - Serialization and Deserialization.

UNIT V:

(Inst. Hours: 18)

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

Text Book:

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

Reference Book:

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

Course Outcomes

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

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

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

Mapping with Programme Outcomes

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

S - Strong; M - Medium; L - Low

Title of the Course : Data Structures and Algorithms & Big Data Analytics Lab

Category of the Course : CORE COURSE

Course Code : P2R3CACC6P

Nature of the Course : EMPLOYABILITY

Max.Marks: CIA : 40 + Ext : 60 = 100

Hours/Week : 06

Credit: 04

Total Inst. Hours: 90

Course Objectives:

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

List of Programs – Data Structures and Algorithms - Use Python

1. Stack ADT.
2. Quick sort.
3. Binary Search Tree.

List of Programs – Big Data Analytics

4. Implement File System Shell Commands for HDFS in Hadoop Environment
5. Write a Mapreduce program using single reduce function for finding Maximum and Minimum Number
6. Write a Mapreduce program using multiple reduce function for Word Count in an given Text document
7. Implement the following using Pig Latin Input and Output Operations Relational Operations
8. Implement the following using Pig Latin User Defined Functions Advanced Relational Operations
9. Write a Word Count program using Pig Latin Script
10. Write a program to find a maximum temperature using Pig Latin Script

Course Outcomes

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

CO1:	Understand and develop conceptually how Big Data is stored and implement it using different tools	K1-K6
CO2:	Comprehend and implement programs for data storage in HDFS and table manipulation using Big Data tools in Hadoop environment	K1-K6
CO3:	Understand and Critically analyse existing Big Datadatasets and implementations the solutions for it using MongoDB	K1- K6
CO4:	Understand and examine existing Big Datadatasets and implementations the solutions using HIVE database	K1- K6
CO5:	Comprehend and review existing datasets and implementations the solutions to handle it using PIG	K1- K6

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

Mapping with Programme Outcomes

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

S - Strong; M - Medium; L - Low

Title of the Course : SOFTWARE DEVELOPMENT TECHNOLOGIES

Category of the Course :DISCIPLINE SPECIFIC ELECTIVE

Course Code : P2R3CADSE 3:1

Nature of the Course : EMPLOYABILITY

Max.Marks: CIA : 25 + Ext : 75 = 100

Hours/Week : 05

Credit: 03

Total Inst. Hours: 75

Course Objectives

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

UNIT I:

(Inst. Hours: 15)

Implementing Microservices: Client to microservices communication, Interservice communication, data considerations, security, monitoring, microservices hosting platform options. Azure Service Fabric: Introduction, core concepts, supported programming models, service fabric clusters, develop and deploy applications of service fabric.

UNIT II:

(Inst. Hours: 15)

Azure Kubernetes Service (AKS): Introduction to kubernetes and AKS, AKS development tools, Deploy applications on AKS. Monitoring AKS: Monitoring, Azure monitor and analytics, monitoring AKS clusters, native kubernetes dashboard, Prometheus and Grafana.

UNIT III:

(Inst. Hours: 15)

.NET DevOps for Azure: DevOps introduction, Problem and solution. Professional Grade DevOps Environment: The state of DevOps, professional grade DevOps vision, DevOps architecture, tools for professional DevOps environment, DevOps centered application.

UNIT IV:

(Inst. Hours: 15)

Building the code: Structure of build, using builds with .NET core and Azure pipelines, Validating the code: Strategy for defect detection, Implementing defect detection. Release candidate creation: Designing release candidate architecture, Azure artifacts workflow for release candidates.

UNIT V:**(Inst. Hours: 15)**

Deploying the release: Designing deployment pipeline, Implementing deployment in Azure pipelines. Operating and monitoring release: Principles, Architectures for observability, Jumpstarting observability.

Text Book

1. Harsh Chawla and Hemant Kathuria, Building Microservices Applications on Microsoft Azure- Designing, Developing, Deploying, and Monitoring, Apress, 2019.
2. Jeffrey Palermo , NET DevOps for Azure A Developer's Guide to DevOps Architecture the Right Way, Apress, 2019.

Reference Books

1. Karl Matthias and Sean P. Kane, Docker: Up and Running, O'Reilly Publication, Second Edition 2018.
2. Len Bass, Ingo Weber, Liming Zhu, "DevOps, A Software Architects Perspective", Addison Wesley-Pearson Publication, First Edition 2015.
3. John Ferguson Smart, "Jenkins, The Definitive Guide", O'Reilly Publication, First Edition 2011.

Course Outcomes

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

CO1:	To understand, apply and summarize the basic concepts of Micro services communication Microsoft Azure and Dev Ops for software development life cycle	K1-K6
CO2:	To illustrate, and implement Azure Kubernetes Service tools for software development life cycle	K1-K6
CO3:	To recognize, analyse and summarize the functionalities of .NET Dev Ops for Azure applications	K1-K6
CO4:	To understand, design and evaluate the principles and architecture service tools for software development life cycle.	K1-K6
CO5:	To comprehend, implement and review the functionalities of API and API gateways for cloud and Azure applications	K1-K6

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

K 6 - Create

Mapping with Programme Outcomes

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

S - Strong; M - Medium; L - Low

Title of the Course : SOFT COMPUTING

Category of the Course : DISCIPLINE SPECIFIC ELECTIVE

Course Code : P2R3CADSE 3:2

Nature of the Course : SKILL DEVELOPMENT

Max.Marks: CIA : 25 + Ext : 75 = 100

Hours/Week : 05

Credit: 03

Total Inst. Hours: 75

COURSE OBJECTIVES:

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

UNIT I:

(Inst. Hours: 15)

INTRODUCTION TO SOFT COMPUTING: Artificial Neural Networks- Biological Neurons- Basic Models of Artificial Neural Networks-Connections-Learning-Activation Functions- Important Terminologies of ANNs- Muculloch and Pitts Neuron-Linear Separability- Hebb Network-Flowchart of Training Process-Training Algorithm.

UNIT II:

(Inst. Hours: 15)

SUPERVISED LEARNING NETWORK : Perceptron Networks–Perceptron Learning Rule-Architecture-Flowchart for Training Process-Perceptron Training Algorithms for Single Output Classes-Perceptron Training Algorithm for Multiple Output Classes-Perceptron Network Testing Algorithm - Adaptive Linear Neuron-Delta Rule for Single Output Unit-Flowchart for training algorithm-Training Algorithm – Testing Algorithm - Multiple Adaptive Linear Neurons-Architecture-Flowchart of Training Process-Training Algorithm-Back Propagation Network-Architecture-Flowchart for Training Process-Training Algorithm-Learning Factors of Back-Propagation Network-Radial Basis Function Network- Architecture-Flowchart for Training Process-Training Algorithm.

UNIT III:

(Inst. Hours: 15)

UNSUPERVISED LEARNING NETWORK: Associative Memory Networks - Auto Associative Memory Network-Architecture-Flowchart for Training Process-Training Algorithm-Testing Algorithm- Bidirectional Associative Memory- Architecture-Discrete Bidirectional Associative

Memory-Iterative Auto Associative Memory Networks - Linear AutoAssociative Memory-Kohonen Self-Organizing Feature Map- Architecture-Flowchart for Training Process-Training Algorithm.

UNIT IV:

(Inst. Hours: 15)

INTRODUCTION TO FUZZY LOGIC: Classical Sets –Operations on Classical Sets-Fuzzy sets - Fuzzy Sets- Properties of Fuzzy Sets- Fuzzy Relations –Membership Functions: Fuzzification- Methods of Membership Value Assignments – Defuzzification – Lambda-Cuts for Fuzzy sets and Fuzzy Relations – Defuzzification Methods–Max-Membership Principle-Centroid Method-Weighted Average Method-Mean Max Membership-Center of Sums-Center of Largest Area-First of Maxima - Fuzzy Set Theory - Fuzzy Arithmetic And Fuzzy Measures: Fuzzy Measures – Belief and Plausibility Measures-Probability Measures-Possibility and Necessity Measures- Formation of Rules –Fuzzy Inference Systems (FIS) – Fuzzy Decision Making – Fuzzy Logic Control Systems.

UNIT V:

(Inst. Hours: 15)

GENETIC ALGORITHM: Introduction - Biological Background - Traditional Optimization and Search Techniques -Gradient Based Local Optimization Method-Random Search-Stochastic Hill Climbing-Simulated Annealing-Symbolic Artificial Intelligence-Operators in Genetic Algorithm - Encoding-Selection-Crossover-Mutation - Stopping Conditions for Genetic Algorithm Flow-Genetic Programming-Working of Genetic Programming-Characteristics of Genetic Programming-Data Representation.

TEXT BOOKS

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

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

REFERENCE BOOKS

1. Das, A. (2018). Artificial Intelligence and Soft Computing for Beginners.

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

COURSE OUTCOMES:

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

CO1	To provide an introduction to the basic principles, techniques, and applications of soft computing	K- 1 K2
CO2	To get familiar with Neural network architectures and supervised learning algorithms	K3
CO3	To understand the architectures and algorithms of Unsupervised Learning techniques	K3- K4
CO4	Develop the skills to gain a basic understanding of fuzzy logic theory and fuzzy inference systems	K4
CO5	Ability to learn traditional optimization and search techniques and genetic programming	K5

MAPPING WITH PROGRAMME OUTCOMES

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

S- STRONG; M-MEDIUM; L-LOW

Title of the Course : SOCIAL NETWORKS

Category of the Course : DISCIPLINE SPECIFIC ELECTIVE

Course Code : P2R3CADSE 4:1

Nature of the Course : EMPLOYABILITY

Max.Marks: CIA : 25 + Ext : 75 = 100

Hours/Week : 05

Credit: 03

Total Inst. Hours: 75

Course Objectives

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

UNIT I:

(Inst. Hours: 16)

Introduction: Social Media Strategy-Important First Decisions -Websites, Blogs - RSS Feeds Mapping -Preparation - **Multimedia Items Gathering** Content for Blog Posts RSS Feeds & Blogs-RSS Feeds-The Feed Reader-The Feed-Options for Creating an RSS Feed-Planning Feed-Blogs-Options for Starting. Blog and RSS Feed-Feed or Blog Content-Search Engine Optimization (SEO)-Feed Burner-RSS Feed and Blog Directories-An Optimization Plan for Blog or RSS Feed

UNIT II:

(Inst. Hours: 14)

Building a Word Press Powered Website: Word Press as A CMS - Diversity of Word Press Sites-The Anatomy of a Word Press Site. **Podcasting, Vidcasting, & Webcasting**- Publishing Options for Podcast-Creating and Uploading Podcast Episodes-Publishing Podcast Optimizing Podcast- **Webcasting.**

UNIT III:

(Inst. Hours: 15)

Social Networking & Micro-Blogging: Facebook-The Facebook Profile -Myspace LinkedIn-Twitter-Niche Social Networking Sites-Creating Own Social Network-Promoting Social Networking Presence-Social Bookmarking-**A Social Bookmarking Strategy-** Crowd-Sourced News Sites-Image Sharing Strategy-Video Sharing Sites-Video Sharing Strategy-**Searching And Search Engine** Placement-Connecting With Others.

UNIT IV:

(Inst. Hours: 18)

Widgets & Badges: **Highlighting Social Web Presence-Sharing And Syndicating** Content Making Site More Interactive-Promoting Products And Making Money- Working Widgets Into Strategy Social Media Newsrooms-Building Social Media Newsroom - **More Social Tools-Social Calendars**-Social Pages Wikis-Social Search Portals-Virtual Worlds.

Unit V:

(Inst. Hours: 12)

Website optimization: A Website Optimization Plan-Streamlining Web Presence-An Integration Plan-Looking to the Future-Life streaming: The Future of Blogging-Distributed Social Networking-Social Ranking, Relevancy, and —Defriending.

Text Book:

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

Reference Books:

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

Course Outcomes

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

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

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

Mapping with Programme Outcomes

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

S - Strong; M - Medium; L - Low

Title of the Course : HIGH PERFORMANCE COMPUTING

Category of the Course : DISCIPLINE SPECIFIC ELECTIVE

Course Code : P2R3CADSE 4:2

Nature of the Course : SKILL DEVELOPMENT

Max.Marks: CIA : 25 + Ext : 75 = 100

Hours/Week : 05

Credit: 03

Total Inst. Hours : 75

Course Objectives:

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

UNIT I:

(Inst. Hours: 15)

Modern processors: Stored-program computer architecture-General purpose cache based microprocessor architecture-Memory hierarchies-Multicore processors-Multithreaded processors-Vector processors. **Basic optimization techniques for serial code:** Scalar profiling-Common sense optimizations-Simple measures, large impact-The role of compilers-C++ optimizations.

UNIT II:

(Inst. Hours: 15)

Data access optimization: Balance analysis and light speed estimates-Storage order-Algorithm classification and access optimizations-The Jacobi algorithm-Algorithm classification and access optimizations-Sparse matrix-vector multiply. **Parallel computers:** Taxonomy of parallel computing paradigms-Shared-memory computers-Distributed memory computers-Hierarchical systems-Networks.

UNIT III:

(Inst. Hours: 15)

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

UNIT IV:

(Inst. Hours: 15)

Efficient OpenMP programming: Profiling OpenMP programs-Performance pitfalls-Parallel sparse matrix-vector multiply. **Locality optimizations on ccNUMA architectures:** Locality of access on

ccNUMA-ccNUMA optimization of sparse MVM-Placement pitfalls-ccNUMA issues with C++.

UNIT V:

(Inst. Hours: 15)

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

Text book:

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

Reference books:

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

Course Outcome:

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

CO1	Understand of the HPC and ccNUMA concepts	K1 - K6
CO2	Design and develop a parallel programming with modern C, C++ and new version of FORTRAN	
CO3	Apply with parallel computing	
CO4	Develop an efficient OpenMP programming	
CO5	Evaluate an efficient MPI programming	

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

Mapping with Programme Outcomes:

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

L - Low, M - Medium, S - Strong

Title of the Course : INTERNET OF THINGS

Category of the Course : SKILL ENHANCEMENT COURSE

Course Code : P2R3CASEC 1:1

Nature of the Course : EMPLOYABILITY

Max.Marks: CIA : 25 + Ext : 75 = 100

Hours/Week : 02

Credit: 02

Total Inst. Hours: 30

Course Objectives:

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

UNIT I : FUNDAMENTALS OF IOT

(Inst. Hours: 06)

Evolution of Internet of Things – Enabling Technologies – IOT Architectures: oneM2M, IOT World Forum (IOTWF) and Alternative IOT models – Simplified IOT Architecture and Core IOT Functional Stack — Fog, Edge and Cloud in IOT – Functional blocks of an IOT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects.

UNIT II: IOT PROTOCOLS

(Inst. Hours: 06)

IOT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks.

UNIT III: DESIGN AND DEVELOPMENT

(Inst. Hours: 06)

Prototyping Embedded Devices: Electronics - Embedded Computing Basics – Arduino - Raspberry Pi - Beagle Bone Black - Electric Imp. Prototyping the Physical Design: Non digital Methods - Laser Cutting - 3D printing.

UNIT IV:**(Inst. Hours: 06)**

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

UNIT V:**(Inst. Hours: 06)**

Business Models: History of Business Models – Model – Internet of Starting up – Lean Startups. Moving to **Manufacture: Designing Kits - Designing Printed circuit boards** – Certification – Costs - Scaling Up Software. Ethics: Privacy – Control – Environment – Solutions.

Text Books:

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

Reference Books:

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

Course Outcomes

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

CO1:	Comprehend the IoT evolution with its architecture and sensors	K1- K6
CO2:	Understand the networking concepts for communication and underlying IoT protocols	
CO3:	Assess the embedded technologies and develop prototypes for the IoT products	
CO4:	Evaluate the use of Application Programming Interface and design an API for IoT in real time	
CO5:	Recognize the ethics of business models and perform security analysis	

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

Mapping with Programme Outcomes

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

S - Strong; M - Medium; L - Low

Title of the Course	:	COMPUTER VISION
Category of the Course	:	SKILL ENHANCEMENT COURSE
Course Code	:	P2R3CASEC 1:2
Nature of the Course	:	EMPLOYABILITY

Max.Marks: CIA : 25 + Ext : 75 = 100

Hours/Week : 02

Credit: 02

Total Inst. Hours: 30

Course Objectives:

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

Unit-I

(Inst. Hours: 06)

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

Unit-II

(Inst. Hours: 06)

Image to Image Mappings: Homographies - Warping images - Creating Panoramas. **Camera Models and Augmented Reality:** The Pin-hole Camera Model - Camera Calibration - Pose Estimation from Planes and Markers - Augmented Reality.

Unit-III

(Inst. Hours: 06)

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

Unit-IV

(Inst. Hours: 06)

Searching Images: Content based Image Retrieval - Visual Words - Indexing Images - Searching the Database for Images - Ranking Results using Geometry - Building Demos and Web Applications. **Classifying Image Content:** K- Nearest Neighbors - Bayes Classifier - Support Vector Machines - Optical Character Recognition.

Unit-V

(Inst. Hours: 06)

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

Course Outcome:

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

CO1	To understand and recall computer vision and its application areas	K1-K6
CO2	To develop build a computer vision system	
CO3	To apply and analyze a design range of algorithms for image processing and computer vision	
CO4	To develop incorporate machine learning techniques with computer vision system	
CO5	To apply and analyze image segmentation and image registration	

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

Mapping with Programme Outcomes:

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

L - Low, M - Medium, S - Strong

Title of the Course	:	MANAGEMENT INFORMATION SYSTEM
Category of the Course	:	SKILL ENHANCMENT COURSE
Course Code	:	P3R3CACC7
Nature of the Course	:	EMPLOYABILITY

Max.Marks: CIA : 25 + Ext : 75 = 100

Hours/Week : 05

Credit: 05

Total Inst. Hours: 75

COURSE OBJECTIVES:

1. Upon successfully completing this course, a student will be able to do the following:
2. Identify managerial challenges and opportunities for organizational advancement that may be resolved by the application of current new technologies.
3. Identify opportunities for and successfully apply various information technologies to gain competitive advantage.
4. Define and recognize key enabling technologies that may advance organizations now and in the future.
5. Explain applications as groupware, the Internet, executive information systems, telecommunications, and other organizational support technologies and relate them to solving organization problems.
6. Make required personal and organizational changes to implement the new technologies in established and in new organizations.
7. Identify new opportunities and champion the introduction and application of advancing technologies in an organization.

Unit – I: Introduction of MIS

(15 hrs)

Introduction of MIS: Definition of MIS – Systems approach – meaning and objectives of MIS – MIS and use of computer – limitations of MIS.

Unit – II: Computer Software for information systems

(15 hrs)

Computer Software for information systems: introduction – system software – Application software – Software Trends.

Unit – III: Information system in Business

(15 hrs)

Information system in Business: introduction – Functional areas of Business – marketing information system – Human Resource Information System.

Unit – IV: Application of Information Technology in Business (15 hrs)

Application of Information Technology in Business: Introduction of E-Commerce, Mobile Commerce, E-Governance, E-enterprises, From PC to the Web.

Unit – V: Information Security, Ethics and Society (15 hrs)

Information Security, Ethics and Society: Challenges of Securing Computer systems – Types of Security Breaches, Cyber Laws and IT Act 2000 – Ethical and Social Dimensions of Information Technology.

Text Books:

1. Management, Information System A.K. Gupta – S. Chand and Company.
2. Management Information system Dr. S.P. Rajagopalan – Margham Publications, Chennai

Reference Books:

1. Management Information System P. Mohan – Himalaya Publishing House. Mumbai
2. Management Information System, Managerial Perspectives – D.P. Goyal – Macmilan.

COURSE OUTCOMES:

After the successful completion of the Course the Students shall be able to,

CO1. Evaluate the role of information systems in today's competitive business environment.

K1-K6

CO2. Identify and describe important features of organizations in order to build and use information systems successfully. **K1-K6**

CO3. Demonstrate systems analysis, design and decision making in a business setting.

K1-K6

CO4. Define and describe the fundamentals of hardware, software, database management, data communications and systems related to the management activities of an organization.

K1-K6

CO5. Assess how information systems support the activities of managers and end-users in organizations. **K1-K6**

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

Mapping with Programme Outcomes:

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

L - Low, M - Medium, S - Strong

Title of the Course	:	COMPILER DESIGN
Category of the Course	:	SKILL ENHANCEMENT COURSE
Course Code	:	P3R3CACC8
Nature of the Course	:	EMPLOYABILITY

Max.Marks: CIA : 25 + Ext : 75 = 100

Hours/Week : 05

Credit: 05

Total Inst. Hours: 75

COURSE OBJECTIVES:

1. To understand the basics of compiler design.
2. To get the knowledge about different types of parsing.
3. To understand the concept of intermediate code generation.
4. To gain the knowledge about code generation.
5. To understand the concept of optimization.

UNIT - I: Introduction

(Inst Hrs: 15)

Compilers – Analysis of the source program – Phases of a Compiler – Cousins of the Compiler – Grouping of Phases – Compiler construction tools- Lexical Analysis- Role of Lexical analyzer- Issues in Lexical analysis - Input Buffering **(ICT)** – Specification of Tokens.

UNIT - II: Different Types of Parsing

(Inst Hrs: 15)

Role of Parser, Writing Grammars - Context-Free Grammars - Top Down parsing – Recursive Descent Parsing – Predictive parsing – Bottom-up parsing – Shift Reduce Parsing **(Seminar)** – Operator Precedent Parsing – LR Parser – SLR Parser.

UNIT - III: Intermediate Code Generation

(Inst Hrs: 15)

Intermediate Languages –Types of three address Statement –Syntax – Directed Translation into three address code – Implementation of three address Statements – Declarations – Assignment Statements - Boolean Expressions – Methods of translating Boolean Expression – Case Statements – Back patching **(Assignment)** – Procedure calls.

UNIT - IV: Code Generation

(Inst Hrs: 15)

Issues in the design of code generator – The target machine - Runtime storage management – Basic Blocks and Flow Graphs **(ICT)** – Transformation of Basic Blocks - A simple code Generator – DAG representation of Basic Blocks - Peephole optimization.

UNIT - V: Optimization

(Inst Hrs: 15)

Introduction – Principles Sources of Optimization – Optimization of basic Blocks – Introduction

to Global Data Flow Analysis – Runtime Environments (**ICT**) – Source Languages Issues - Storage Organization - Storage Allocation strategies – Access to non-local names - Parameters Passing.

TEXT BOOK (S):

1. Alfred Aho, Ravi Sethi, Jeffy D.Ullman, “Compilers- Principles , Techniques and tools”, Pearson Education Asia,2007.

Unit - I : Chapter 1, 3.1 - 3.3; Unit - II: Chapter 4.1 - 4.7;

Unit - III : Chapter 8.1 - 8.7; Unit - IV: Chapter 9.1 - 9.6 & 9.8, 10.3;

Unit - V : Chapter 10.1, 10.2, 10.4, 10.6, 7.

REFERENCE BOOK (S):

1. Mohan H. S., “Compiler Design”, Narosa Publications, 2014.
2. Chattopadhyay & Shantanu, “Compiler Design”, PHI Learning, 2013.

ONLINE RESOURCE (S):

1. <https://www.geeksforgeeks.org/compiler-design-tutorials/>

COURSE OUTCOMES:

After the successful completion of the Course the Students shall be able to,

CO1. Understand the various phases of a compiler	K1-K6
CO2. Know the role of parser	K1-K6
CO3. Get Knowledge on intermediate code generation	K1-K6
CO4. Gain knowledge on actual code generation	K1-K6
CO5. Understand various code optimization issues	K1-K6

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

Mapping with Programme Outcomes:

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

L - Low, M - Medium, S - Strong

Title of the Course : DATABASE MANAGEMENT SYSTEM

Category of the Course : SKILL ENHANCEMENT COURSE

Course Code : P3R3CACC9

Nature of the Course : EMPLOYABILITY

Max.Marks: CIA : 25 + Ext : 75 = 100

Hours/Week : 05

Credit: 05

Total Inst. Hours: 75

COURSE OBJECTIVES:

1. To understand the basics of database management system.
2. To understand the concept of relationship model.
3. To get the knowledge about relational model.
4. To understand the concept of structured query language.
5. To gain the knowledge about PL/SQL.

UNIT - I: Introduction to Database Management Systems (Inst Hrs: 15)

Introduction: Database Management System – Database System Applications -Database System versus File System - View of Data - Database Languages - Users and Administrators - Database System Structure - Application Architectures (ICT).

UNIT - II: Entity Relationship Model (Inst Hrs: 15)

Basic concepts: Entity Sets – Relationship Sets – Constraints – Keys - Entity Relationship Diagram (Seminar) - Weak Entity Sets – Extended E-R Features: Specialization – Generalization - Attribute Inheritance – Constraints – Aggregation.

UNIT - III: RELATIONAL MODEL (Inst Hrs: 15)

Basic Structure – Relational Algebra: Fundamental Operations – Outer Join (Assignment). Functional Dependencies: Basic Concepts – Closure - Closure of Attribute Sets – Decomposition – First Normal Form – Second Normal Form – Second Normal Form - Third Normal Form – Boyce-Codd Normal Form.

UNIT - IV: Structured Query Language (Inst Hrs: 15)

Basic Queries in SQL - Aggregate Functions (ICT) – Joins – Set Operations – Sub Queries - DML Commands - DDL Commands –Tables - Views.

UNIT - V: PL/SQL (Inst Hrs: 15)

Introduction - Advantages of PL/SQL – The Generic PL/ SQL Block – PL/SQL : Data types – Variables – Constants – Control Structures – Cursors – Exception Handling – Procedures and Functions

- Packages – Triggers (ICT) – Types of Triggers.

TEXT BOOK (S):

1. H. F. Korth & A. Silberschatz, “Database System Concepts”, Tata McGraw Hill, New Delhi. 5th Edition, 2002.

Unit - I: Chapter 1; Unit - II: Chapter 6; Unit – III: Chapter 2, 7;

2. Ivan Bayross, “SQL, PL/SQL, The programming language of Oracle”, BPB Publication, 3rd Edition, 2009.

Unit - IV: section III Part - 1, 2, 3; Unit - V: section V- Part - 15, 16.

ONLINE RESOURCE (S):

1. <https://www.tutorialspoint.com/dbms/>

REFERENCE BOOK (S):

1. Elmasri & Navathe, “Fundamentals of Database systems”, Addison & Wesley, Pearson Education, 2006.

2. C. J. Date, “An Introduction to Database Systems”, Pearson Education, New Delhi, 8th Edition, 2006.

COURSE OUTCOMES:

After the successful completion of the Course the Students shall be able to,

CO1. Understand the basics of database management system	K1-K3
CO2. Understand the meaning and purpose of Entity Relationship model	K1-K6
CO3. Improve the knowledge about relationship model concepts	K1-K6
CO4. Understand the basic concept of Structured Query Language	K1-K6
CO5. Use PL/SQL Commands with ease	K5-K6

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

Mapping with Programme Outcomes:

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

L - Low, M - Medium, S - Strong

Title of the Course	:	RDBMS PRACTICAL
Category of the Course	:	SKILL ENHANCMENT COURSE
Course Code	:	P3R3CACC10P
Nature of the Course	:	EMPLOYABILITY

Max Marks : 40 + 60 = 100

Hrs / Week : 05

Credit : 05

Total Inst. Hrs: 75

1. Creating, Updating and Inserting records into the database using simple queries.
2. Use of Select statement – for queries.
 - a) AND, OR, NOT Operators, WHERE clause.
 - b) UNION, INTERSECTION, MINUS
3. Sorting and Grouping.
4. Nested queries using SQL.
 - a) Sub queries
 - b) Join
5. Built-in-Functions of SQL
6. Use of Indexes creating views and querying in views.
7. Cursors, triggers and stored procedures and functions.
8. Using PL/SQL perform the following operations:
 - a. Student evaluation systems.
 - b. Payroll system.
 - c. Income tax calculations.
 - d. Seat reservation problems.
 - e. Mark-Sheet preparation.

Title of the Course	:	DATA COMMUNICATION NETWORKS
Category of the Course	:	SKILL ENHANCMENT COURSE
Course Code	:	P3R3CADSE5:1
Nature of the Course	:	EMPLOYABILITY

Max Marks : 25 + 75 = 100

Hrs / Week : 05

Credit : 03

Total Inst. Hrs: 75

COURSE OBJECTIVES:

1. To understand the basics of data and communication networks.
2. To understand the concept of OSI model.
3. To understand the concept of transmission media.
4. To get the knowledge about switching techniques.
5. To gain the knowledge about routing algorithms.

UNIT - I: Introduction

(Inst Hrs: 15)

Networks – Protocols and Standard – Line Configuration – Topology (ICT) – Transmission Mode – Categories of Networks – Inter Networks.

UNIT - II: OSI Model

(Inst Hrs: 15)

Functions of the layers – TCP/IP Protocol Suite – Signals – Analog and Digital Signal – Periodic and A-periodic Signals – Analog Signals (Seminar) – Digital Signal – Data Transmission – Data Terminal Equipment – Data Circuit terminals Equipment – Modems.

UNIT - III: Transmission Media

(Inst Hrs: 15)

Guided media – Unguided Media (Assignment) – Transmission impairments – Media Comparison. Multiplexing – FDM – TDM – WDM. Error Detection and correction – Types of Errors–Detection – Vertical Redundancy Check (VRC) – Longitudinal Redundancy Check (LRC) – Cyclic Redundancy Check (CRC) – Checksum – Error Correction.

UNIT - IV: Switching Techniques

(Inst Hrs: 15)

Circuit switching – Packet Switching – Message Switching – Networking and Internetworking Devices – Repeaters – Bridges – Routers – Gateways (ICT).

UNIT - V: Routing Algorithms

(Inst Hrs: 15)

Distance Vector Routing – Link State Routing – Data Link Control – Line Discipline – Flow Control – Error Control(ICT).

TEXT BOOK (S):

1. William Stallings, “Data & Computer Communications”, Sixth Edition, Pearson Education, 2001.

Unit – I: Chapter 1, 2; Unit - II: Chapter 3, 4, 5 ; Unit - III: Chapter 6, 7, 8;

Unit - IV: Chapter 10, 11, 12, 13; Unit - V: Chapter 18, 19, 20.

REFERENCE BOOK (S):

1. Fred Halsall, “Data Communications, Computer Networks and Open Systems”, Addison Wesley, 1995.

2. Mousavi & Massoud, “Data Communication and Networking A Practical Approach”, Australia Cenage, 2012.

ONLINE RESOURCE (S):

1. https://www.tutorialspoint.com/data_communication_computer_network/

COURSE OUTCOMES:

After the successful completion of the Course the Students shall be able to,

CO1. Learn the basis of data and communication network	K1-K6
CO2. Understand the concept of OSI model	K1-K6
CO3. Get the knowledge about transmission media	K1-K6
CO4. Get the knowledge about the switching techniques	K1-K6
CO5. Learn the routing algorithms	K1-K6

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

Mapping with Programme Outcomes:

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

L - Low, M - Medium, S - Strong

Title of the Course : NETWORK SECURITY

Category of the Course : SKILL ENHANCMENT COURSE

Course Code : P3R3CADSE5:2

Nature of the Course : EMPLOYABILITY

Max Marks : 25 + 75 = 100

Hrs / Week : 05

Credit : 03

Total Inst. Hrs: 75

COURSE OBJECTIVES:

1. To understand the basics of network security.
2. To get the knowledge about public-key encryption and hash functions.
3. To get the knowledge about network security applications.
4. To gain the knowledge about IP security.
5. To understand the concept of system security.

UNIT - I: Symmetric Ciphers

(Inst Hrs: 15)

Introduction: Security Trends – The OSI Security Architecture – Security Attacks – Security Services – Security Mechanisms – A Model for Network Security – Symmetric Ciphers: Classical Encryption Techniques (**ICT**) – Symmetric Cipher Model – Substitution Techniques – Transposition Techniques – Rotor Machines – Steganography.

UNIT - II: Public-key Encryption and Hash Functions

(Inst Hrs: 15)

Symmetric Ciphers: Block Ciphers and The Data Encryption Standards – Block Cipher Principles – The Data Encryption Standard (**Seminar**) – The Strength of DES – Differential and Linear Cryptanalysis – Block Cipher Design Principles – Public-key Encryption and Hash Functions: Public-key Cryptography and RSA – Principles of Public-key Cryptosystems – The RSA Algorithm.

UNIT - III: Network Security Applications

(Inst Hrs: 15)

Network Security Practices: Authentication Applications: Kerberos – X.509 Authentication Service – Public-key Infrastructure – Electronic Mail Security (**Assignment**) – Pretty Good Privacy – S/MIME.

UNIT - IV: IP Security

(Inst Hrs: 15)

Network Security Practices : IP Security Overview – IP Security Architecture – Authentication Header – Encapsulating Security Payload – Combining Security Associations – Key Management – Web Security: Web Security Considerations (**ICT**) – Secure Socket Layer and Transport Layer Security – Secure Electronic Transaction.

UNIT - V: System Security

(Inst Hrs: 15)

Intruders – Intrusion Detection – Password Management – Malicious Software: Viruses and Related Threats – Virus Countermeasures – Distributed Denial of Service Attacks – Firewalls: Firewall Design Principles (ICT) – Trusted Systems – Common Criteria for Information Technology Security Evaluation.

TEXT BOOK (S):

1. William Stallings, “Cryptography and Network Security Principles and Practices”, Prentice-Hall, Third Edition, 2003.

Unit I: Chapter 1, 2; Unit - II: Chapter 3, 9; Unit - III: Chapter 14, 15;

Unit - IV: Chapter 16, 17; Unit - V: Chapter 18, 19, 20.

REFERENCE BOOK (S):

1. Johannes A. Buchaman, “Introduction to Cryptography”, Springer – Verlag 2000.
2. Atul Kahate, “Cryptography and Network Security”, Tata McGraw Hill. 2007.

ONLINE RESOURCE (S):

1. https://www.tutorialspoint.com/information_security_cyber_law/network_security.htm

COURSE OUTCOMES:

After the successful completion of the Course the Students shall be able to,

CO1. Gain the knowledge about the basic components and principles of cryptography **K1-K6**

CO2. Gain the knowledge to design their own cryptographic algorithm **K1-K6**

CO3. Learn the knowledge of network security in different and dynamic environment **K1-K6**

CO4. Obtain the knowledge to classify the threats and can design their own database of threats to avoid the VIRUS **K1-K6**

CO5. Get the job as network security professionals **K1-K6**

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

Mapping with Programme Outcomes:

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



➤ **L - Low, M - Medium, S - Strong**

Title of the Course	:	SOFTWARE ENGINEERING
Category of the Course	:	SKILL ENHANCMENT COURSE
Course Code	:	P3R3CASEC2:1
Nature of the Course	:	EMPLOYABILITY

Max Marks : 25 + 75 = 100

Hrs / Week : 05

Credit : 02

Total Inst. Hrs: 75

COURSE OBJECTIVES:

1. To understand the basics of software engineering.
2. To understand the concepts of requirement engineering tasks.
3. To get the knowledge about design process.
4. To gain the knowledge about software testing.
5. To get the knowledge about software quality concepts.

UNIT - I: Introduction to software engineering

(Inst Hrs: 15)

A process framework- CMMI- Process Patterns-Process Assessments- Personal and Team Process Model – Process Technology – Product and Process – Process Models : Waterfall Model – Incremental Process Model – Evolutionary Process Model – Specialized Process Model (ICT) – Unified Process – Computer Based Systems – System Engineering Hierarchy – Business Process Engineering – Product Engineering – System Modeling.

UNIT - II: Requirement Engineering

(Inst Hrs: 14)

Requirement Engineering Tasks – Initiating the Requirements Engineering Process – Eliciting Requirements – Developing Use Cases (Seminar) – Building the Analysis Model – Validating Requirements – Negotiating Requirements – Requirements Analysis – Analysis Modeling Approaches – Data Modeling Concepts – Object Oriented Analysis – Scenario Based Modeling – Flow Oriented Modeling – Class Based Modeling – Creating a Behavioral Model.

UNIT - III: System Design

(Inst Hrs: 16)

Design process and Design Quality – Design Concept – Design Model – Pattern Based Software Design – Software Architecture – Data Design – Architectural styles and Patterns – Architectural Design – Assessing alternative Architectural Designs – Mapping Data Flow into a Software Architecture – Components (Assignment) – Designing class Based Components – Conducting Component Level Design – Object Constraint Language – Designing Conventional Components.

UNIT-IV: Software Testing

(Inst Hrs: 14)

A Strategic Approach to Software Testing – Test for Conventional Software – Test for Object Oriented Software – Validation Testing – System Testing – The Art of Debugging – Software Testing Fundamentals – Black Box and White Box Testing (ICT) – Object Oriented Testing Methods – Interclass Test Case Design.

UNIT-V: Software Quality Assurance and Risk Management (Inst Hrs: 16)

Quality Concept – Software Quality Assurance – Software Reviews – Formal Technical Reviews – Formal Approaches to SQA – Statistical SQA – Software Reliability Risk: Software Risks – Risk Identification – Risk Projection – Risk Refinement – Risk Mitigation, Monitoring and Management – RMMM Plan (ICT).

TEXT BOOK (S):

1. Roger S. Pressman, “Software Engineering – A Practioner's Approach”, McGraw Hill, 6th Edition, 2009

Unit-I: Chapter 1, 2, 3, 6; Unit-II: Chapter 7, 8; Unit-III: Chapter 9, 10, 11;

Unit- IV: Chapter 13, 14; Unit-V: Chapter 25, 26.

REFERENCE BOOK (S):

1. Richard Fairley, “Software Engineering Concepts” , McGraw Hill 2016.
2. Ian Sommerville, “Software Engineering”, Pearson Education, 10th Edition.

ONLINE RESOURCE (S):

1. www.wisdomjobs.com/e-university/software-engineering-tutorial-338.html

COURSE OUTCOMES:

After the successful completion of the Course the students shall be able to,

CO1. Know the different process model	K1-K6
CO2. Understand software requirements of the client to design the software	K1-K6
CO3. Assess the software design quality	K1-K6
CO4. Gain the knowledge of software testing and design process	K1-K6
CO5. Acquire a job as a software programmer or tester	K1-K6

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

Mapping with Programme Outcomes:

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

L - Low, M - Medium, S - Strong

Title of the Course	:	SOFTWARE PROJECT MANAGEMENT
Category of the Course	:	SKILL ENHANCMENT COURSE
Course Code	:	P3R3CASEC2:2
Nature of the Course	:	EMPLOYABILITY

Max Marks : 25 + 75 = 100

Hrs / Week : 05

Credit : 02

Total Inst. Hrs: 75

COURSE OBJECTIVES:

1. To understand the basics of software project management.
2. To understand the software management, project management, process frame work.
3. To get the knowledge about management disciplines.
4. To gain the knowledge about project control.
5. To get the knowledge about risk management.

UNIT-I: Software Management Renaissance

(Inst Hrs: 15)

Software Management Renaissance: Conventional Software Management – Evolution of Software Economics – Improving Software Economics (ICT) – The Old Way and the New.

UNIT-II: A Software Project Management

(Inst Hrs: 16)

A Software Management Project Management Process Framework: Life-Cycle Phases (Seminar) - Artifacts of the Process – Model – Based Software Architectures – Work Flows of the Process (ICT) – Check Points of the Process.

UNIT-III: Software Management Disciplines

(Inst Hrs: 14)

Software Management Disciplines: Iterative Process Planning – Project Organizations and Responsibilities- Process Automation(Assignment).

UNIT-IV: Software Management Disciplines

(Inst Hrs: 16)

Software Management Disciplines: Project Control and Process Instrumentation – Tailoring the Process (ICT).

UNIT-V: Risk Management

(Inst Hrs: 14)

Risk Management: Introduction – Risk – Categories of Risk – A Framework for Dealing with Risk – Risk Identification – Risk Assessment – Risk Planning – Risk Management – Evaluating Risk to Schedule (ICT) – Applying the PERT Technique – Monte Carlo Simulation – Critical Chain Concepts.

TEXT BOOK (S):

1. Walker Royce, “Software Project Management”, 2006 Edition, Pearson Education,
Unit-I: Chapter 1, 2, 3, 4; Unit-II: Chapter 5, 6, 7, 8;
Unit-III: Chapter 10, 11, 12, 13, 14; Unit-IV: Chapter 15, 16, 17;
2. Software Project Management, bob Hughes & Mike Cotterell, Rajib Mall, Tata McGraw Hill, 5th edition, 2014.
Unit-V: Chapter 7.

REFERENCE BOOK (S):

1. Kelkar S.N., ”Software Project Management A Concise study, PHI Learning Pvt Ltd, 2008

ONLINE RESOURCE (S):

1. <https://www.geeksforgeeks.org/software-engineering-project-management-process/>

COURSE OUTCOMES:

After the successful completion of the Course the students shall be able to,

CO1. Identify the factors to improving software cost	K1,K2
CO2. Listing the Artifacts sets produced throughout the development process	K1-K6
CO3. Acquire and practice process automation	K1-K6
CO4. Applying the software management disciplines	K5,K6
CO5. Enlisting the various risks involved in software development process	K1-K6

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

Mapping with Programme Outcomes:

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

L - Low, M - Medium, S - Strong

Title of the Course	:	E-COMMERCE
Category of the Course	:	SKILL ENHANCEMENT COURSE
Course Code	:	P4R3CACC11
Nature of the Course	:	EMPLOYABILITY

Max Marks : 25 + 75 = 100

Hrs / Week : 06

Credit : 05

Total Inst. Hrs: 90

COURSE OBJECTIVES:

1. To understand the basics of e-commerce.
2. To gain the knowledge about network infrastructure.
3. To understand the electronic commerce and World Wide Web.
4. To understand the concept of electronic payment system.
5. To understand the consumer search and resource discovery.

Unit - I: Welcome to Electronic Commerce

(Inst Hrs: 18)

Electronic Commerce Framework - Electronic Commerce and Media Convergence – The Anatomy of E-Commerce Applications - Electronic Commerce Consumer – Applications Electronic Commerce Organization Applications (**ICT**). The Network Infrastructure for Electronic Commerce: Components of the High Way – Network Access Equipment – Global Information Distribution Networks.

Unit - II: Internet as a Network Infrastructure

(Inst Hrs: 19)

The Internet Terminology – Chronological History – NSFNET Architecture and Components – National Research and Education Network – Globalization of the academic Internet – Internet Governance – An Overview of Internet Applications (**Seminar**) . The Business of Internet Commercialization: Telco/Cable/On-Line Companies – National Independent ISPs – Regional Level ISPs – Local – Level ISPs – Service Provider – Service Provider Connectivity – Logistics of Being an Internet Service Provider – Internet Connectivity Options.

Unit - III: Electronic Commerce and The World Wide Web

(Inst Hrs: 17)

Architectural Framework for Electronic Commerce – World Wide Web as the Architecture (**Assignment**) – Web Background – Technology behind the web – Security and the Web, Consumer – Oriented Electronic Commerce :Consumer – Oriented Applications – Mercantile Process Model – Mercantile Models from the Consumers Perspective – Mercantile Models from the Merchants Perspective.

Unit - IV: Electronic Payment Systems**(Inst Hrs: 18)**

Types of Electronic Payment Systems – Digital Token based Electronic Payment Systems – Smart cards and Electronic Payment System – Credit card – Based Electronic Payment Systems – Risk and Electronic Payment Systems **(ICT)** – Designing Electronic Payment Systems. Inter Organizational Commerce and EDI: Electronic Data Interchange – EDI Applications in Business – EDI: Legal, Security and Privacy issues – EDI and Electronic Commerce.

Unit - V: Consumer Search and Resource Discovery**(Inst Hrs: 18)**

Information Search and Retrieval – Electronic Commerce Catalogs – Information Filtering – Consumer – Data Interface – Emerging Tools .on Demand Education and Digital Copyrights: Computer-Based Educational and Training – Technological Components of Education on Demand – Digital Copyrights and Electronic Commerce. Software Agents – Applets, Browsers and Software Agents **(ICT)**.

TEXT BOOK (S):

1. “Frontiers of Electronic Commerce” , Ravikalakota & Andrew Whinston,Adison Wesley 2000.(Reprint -2013)

Unit - I: Chapter 1, 2 – 2.2, 2.3, 2.5; Unit - II: Chapter 3,4; Unit - III: Chapter 6,7; Unit - IV: Chapter 8, 9; Unit - V: Chapter 14, 15, 16-16.2, 16.3, 16.6.

REFERENCE BOOK (S):

1. Jaiswal.S,”Doing Business on the internet- E-Commerce”,2010,Galgotia
2. Murthy C.S.V,”E- Commerce Concepts,Models,Strategies “,2004, Himalaya Publications.

ONLINE RESOURCE (S):

1. <https://www.htmlgoodies.com/beyond/webmaster/projects/electronic-commerce-tutorial.html>

COURSE OUTCOMES:

After the successful completion of the Course the students shall be able to,

CO1. Understand the infrastructure for E-Commerce	K1,K2
CO2. Manage the Business of internet commercialization	K1-K6
CO3. Develop the insight about WWW	K4,K5
CO4. Learn the benefits and risk of e-payment system	K1-K6
CO5. Utilize the software agents	K1-K6

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

Mapping with Programme Outcomes:

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

L - Low, M - Medium, S - Strong

Title of the Course	:	SOFTWARE QUALITY ASSURANCE AND TESTING
Category of the Course	:	SKILL ENHANCEMENT COURSE
Course Code	:	P4R3CACC12
Nature of the Course	:	EMPLOYABILITY

Max Marks : 25 + 75 = 100

Hrs / Week : 06

Credit : 05

Total Inst. Hrs: 90

COURSE OBJECTIVES:

1. To understand the basics software quality assurance and testing.
2. To get the knowledge about types of testing.
3. To understand the testing fundamentals and specialized testing.
4. To gain the knowledge about test management.
5. To get the knowledge about test automation.

Unit I : Introduction (Inst Hrs: 18)

Principles of Testing - Software Development Life Cycle Models (ICT).

Unit II : Types of Testing (Inst Hrs: 19)

White Box Testing - Integration Testing (Seminar) - System and acceptance testing.

Unit III : Testing Fundamentals - 2 & Specialized Testing (Inst Hrs: 19)

Testing Performance Testing - Regression testing (Assignment) - Testing of Object Oriented Systems - Usability and Accessibility Testing.

Unit IV : Test Management (Inst Hrs: 17)

Testing Planning, Management (ICT), Execution and Reporting.

Unit V : Test Automation (Inst Hrs: 17)

Software Test Automation - Test Metrics and Measurements (ICT).

TEXT BOOK (S):

1. "Software Testing" - Srinivasan Desikan, Gopalaswamy Ramesh, Pearson Education, 2006.

Unit-I: Chapters 1, 2; Unit-II: Chapters 3, 5, 6; Unit-III: Chapters 7, 8, 11, 12;

Unit-IV: Chapter 15; Unit-V: Chapters 16, 17.

REFERENCE BOOK (S):

1. Limaye M.G, "Software Testing Principles Techniques and Tools",2009, TMH Publications.

ONLINE RESOURCE (S):

1. <https://www.tutorialride.com/software-testing/software-quality-assurance.htm>
2. <https://www.javatpoint.com/software-testing-tutorial>

COURSE OUTCOMES:

After the successful completion of the Course the students shall be able to,

CO1. Analyze the various software development model	K1-K6
CO2. Practicing white box testing method	K1-K6
CO3. List out the scenarios in Usability and Accessibility testing	K1-K6
CO4. Develop a test plan	K1-K6
CO5. Practicing the acquired test metrics	K1-K6

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

Mapping with Programme Outcomes:

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

L - Low, M - Medium, S - Strong