

FATIMA COLLEGE (AUTONOMOUS)



**Re-Accredited with “A” Grade by NAAC (3rd Cycle)
74th Rank in India Ranking 2020 (NIRF) by MHRD
Maryland, Madurai- 625 018, Tamil Nadu, India**

**NAME OF THE DEPARTMENT: PG DEPARTMENT OF COMPUTER
APPLICATIONS**

NAME OF THE PROGRAMME : MCA

PROGRAMME CODE : MCA

ACADEMIC YEAR : 2020 – 2021

FATIMA COLLEGE (AUTONOMOUS), MADURAI-18**DEPARTMENT OF MCA***(For those who joined in June 2020 onwards)***PROGRAMME CODE : MCA**

COURSE CODE	COURSE TITLE	HRS / WK	CREDIT	CIA Mks	ESE Mks	TOT. MKs
SEMESTER – I						
20MCA101	Mathematical Foundation of Computer Science	4	4	50	50	100
20MCA102	Software Engineering	4	4	50	50	100
20MCA103	Operating Systems	4	4	50	50	100
20MCA104	Programming in Python	4	4	50	50	100
*	Elective I – General	4	4	50	50	100
20MCA105	Lab I – Python Programming	4	2	50	50	100
20MCA106	Lab II - RDBMS	4	2	50	50	100
20MCA107	Skill Based lab I–Linux	2	1	25	25	50
20MCA108	Soft Skills I- Professional Communication	2	1	25	25	50
20MCA109	Comprehensive Viva - I	-	1	-	50	50
SEMESTER - II						
20MCA201	Data Structures and Algorithms	4	4	50	50	100
20MCA202	Web Technologies	4	4	50	50	100
20MCA203	Programming in Java	4	4	50	50	100
20MCADA01 20MCADA02	Data Mining Techniques Data Analytics and Visualization	4	4	50	50	100

COURSE CODE	COURSE TITLE	HRS / WK	CREDIT	CIA Mks	ESE Mks	TOT. MKs
20MCADS01 20MCADS02 20MCAAM01 20MCAAM02	using Spreadsheets Data Communication & Networking Wireless Communication & Security Artificial Intelligence & Expert System Soft Computing					
*	Elective II – General	4	4	50	50	100
20MCA204	Lab III – Web Technologies	4	2	50	50	100
20MCA205	Lab IV- Java Programming	4	2	50	50	100
20MCA206	Skill Based Lab II - R Programming	2	1	25	25	50
20MCA207	Soft Skills II- Aptitude Training	2	1	25	25	50
20MCA208	Comprehensive Viva - II	-	1	-	50	50

SEMESTER - III

COURSE CODE	COURSE TITLE	HRS / WK	CREDIT	CIA Mks	ESE Mks	TOT. MKs
19MCA301	Graph Theory	4	4	50	50	100
19MCA302	Data Communication & Networking	4	4	50	50	100
19MCA303	Programming in Java	4	4	50	50	100
19MCADS01	Big Data Analytics					
19MCANW01	Cryptography & Network Security	4	4	50	50	100
19MCAAD01	Web Programming Techniques					
**	Elective IV - General	4	4	50	50	100
19MCA304	Lab V - PHP & MYSQL	6	3	50	50	100
19MCA305	Lab VI- Java Programming	6	3	50	50	100
19MCA306	Skill Based Lab III- Networking Tools	2	1	25	25	50
19MCA307	Soft Skills III – Quantitative Aptitude	2	1	25	25	50
19MCA308	Comprehensive Viva - III	-	1	-	50	50

SEMESTER - IV

19MCA401	Compiler Design	4	4	50	50	100
19MCA402	Mobile Communication & Application development	4	4	50	50	100
19MCA403	Programming in Python	4	4	50	50	100
19MCADS02	Big Data Security					
19MCANW02	Wireless Sensor Networks	4	4	50	50	100
19MCAAD02	Internet Programming Frameworks					
**	Elective VI – General	4	4	50	50	100
19MCA404	Lab VII - Mobile Application Development	6	3	50	50	100

19MCA405	Lab VIII- Python Programming	6	3	50	50	100
19MCA406	Skill Based Lab IV - Software Testing Tools	2	1	25	25	50
19MCA407	Soft Skills IV – Technical Aptitude	2	1	25	25	50
19MCA408	Comprehensive Viva – IV	-	1	-	50	50
19MCA409	Live Project	-	6	50	50	100
SEMESTER - V						
19MCA501	Software Project Management	4	4	50	50	100
19MCA502	Machine Learning	4	4	50	50	100
19MCA503	Enterprise Application Development	4	4	50	50	100
19MCA503	Data Analytics Using Pig & Hive					
19MCANW03	High Speed Networks	4	4			
19MCAAD03	Software Development Frameworks			50	50	100
	Elective VIII - General	4	4	50	50	100
19MCA504	Lab IX - Python for Machine Learning	6	3	50	50	100
19MCA505	Lab X - Enterprise Application Development	6	3	50	50	100
19MCA506	Skill Based Lab V –R Programming	2	1	25	25	50
19MCA507	Soft Skills V – Interpersonal Skills for Corporate Readiness	2	1	25	25	50
19MCA508	Comprehensive Viva - V	-	1	-	50	50
19MCA509	Internship	-	6	50	50	100
SEMESTER - VI						
19MCA601	Major Project		12	100	100	200
19MCA602	Internet of Things – Self Learning Course		5	50	50	100

GENERAL ELECTIVES – I MCA

S.NO	COURSE CODE	COURSE TITLE
1.	20MCAGE01	Office Automation Tools
2.	20MCAGE02	Financial Management and Accounting
3.	20MCAGE03	Organizational Behaviour
4.	20MCAGE04	E-Commerce
5.	20MCAGE05	Ethics in Computing
6.	20MCAGE06	Resource Management Techniques
7.	20MCAGE07	Entrepreneurship Development
8.	20MCAGE08	Wireless Sensor Networks
9.	20MCAGE09	Research Methodology
10.	20MCAGE10	Digital Image Processing
11.	20MCAGE11	Cloud Computing
12.	20MCAGE12	Agile Software Engineering

GENERAL ELECTIVES – II & III MCA

S.NO	SUBJECT CODE	SUBJECT TITLE
E-BUSINESS PROCESS		
1	19MCAGE01	Resource Management Techniques
2	19MCAGE02	Financial Management & Accounting
3	19MCAGE03	Management Information Systems
4	19MCAGE04	E-Commerce
5	19MCAGE05	Cyber Forensics
6	19MCAGE06	Ethics in Computing
7	19MCAGE07	Entrepreneurship Development
RESEARCH DOMAIN		
8	19MCAGE21	Research Methodology
9	19MCAGE22	Data Mining & Data warehousing
10	19MCAGE23	Digital Image Processing
11	19MCAGE24	Artificial Intelligence & Expert Systems
12	19MCAGE25	Soft Computing
13	19MCAGE26	Cloud Computing
14	19MCAGE27	Advanced DBMS Techniques

EXTRA CREDITS (FOR ADVANCED LEARNERS)

Sub.Code	Courses	Hrs.	Credits	Semester in which the course is offered	CIA Mks	ESE Mks	Total Marks
19MCAAL0 1	HUMAN COMPUTER INTERACTION	-	4	VI	50	50	100
	MOOC/NPTEL/SWAYAM COURSES	-	Respecti ve Credits allotted by UGC	I - V	-	-	-

I MCA
SEMESTER – I

(For those who join in 2020 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
MCA	20MCA101	MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE	MAJOR CORE	4	4

COURSE DESCRIPTION

This course provides the logical, analytical and mathematical concepts that are fundamental for Computer Science

COURSE OBJECTIVE

- ❖ To impart the basic Foundation of mathematics for Computer Science.
- ❖ To introduce the concept of propositional and predicate logic and their applications.
- ❖ To inculcate logical thinking and promote arithmetic knowledge

UNIT- I MATHEMATICAL LOGIC

(12 Hours)

Introduction – Propositional calculus – Propositional variables and constants – Logical connectives and compound proposition – Basic Logical Operations - Conjunction – Disjunction – Negation – Derived Connectives – Statements generated by a set – Conditional Statements – Converse, Inverse and Contrapositive Statements – Converse Statements – Inverse Statements – Contrapositive Statements - Bi conditional statements - Negation of Bi Conditional Statements

SELF STUDY: Bi conditional statements - Negation of Bi Conditional Statements

UNIT- II **(12 Hours)**
THE SOLUTION OF NUMERICAL ALGEBRAIC AND TRANSCENDENTAL EQUATIONS

Introduction – The Bisection method – Iteration method – The method of False Position (No derivations)

SELF STUDY: The method of False Position

UNIT – III STATISTICS **(12 Hours)**

Measures of Central Tendency – Mean – Median-Mode – Karl Pearson's coefficient – Derivations are taken from assumed mean – Correlation of Bivariate grouped Data – Rank Correlation Coefficient

SELF STUDY: Median-Mode

UNIT – IV SET THEORY **(12 Hours)**

Introduction – Set and its elements – Elements of a set – Standard Sets and Symbols – Set Description – Roaster method – Set Builder method – Cardinal number of a set – Types of Sets - Venn – Euler diagram – Set Operations and Laws of Set Theory – Union of Sets – Intersection of Sets – Disjoint Sets – Difference of Two Sets – Complement of a Set – Distributive Laws

SELF STUDY: Standard Sets and Symbols – Set Description, Types of Sets - Venn – Euler diagram

UNIT – V MATRICES **(12 Hours)**

Introduction – Algebra of Matrices – Types of Matrices- Rank of a Matrix – Inverse of Matrix - Elementary Transformations – Simultaneous Linear Equations – Cayley Hamilton - Eigen Values and Eigen Vectors (Only Problems)

SELF STUDY: Algebra of Matrices – Types of Matrices- Elementary Transformations

REFERENCES:

1. J.K. Sharma, "Discrete Mathematics", MacMillan Publications, 3rd Edition , 2011.
2. Dr.M.K.Venkataraman, "Numerical Methods in Science and Engineering", The National Publishing Company, 5th Edition ,2001
3. Dr.S.P.Gupta&M.P.Gupta, "Business Statistics", Sultan Chand & Sons, 18th edition, 2014
4. Dr.S.Arumugam, A.T.Isaac, "Modern Algebra", SciTech Publications India Pvt. Ltd, 2016
5. Dr.S.P.Gupta&M.P.Gupta, "Business Statistics", Sultan Chand& Sons , 15th Edition, 2008.
6. J.P. Tremblay & R. Manohar, "Discrete Mathematical Structures with applications to Computer Science", Tata McGraw – Hill publishing, New Delhi, Reprint 2015.
7. Dr.S.Arumugam, A.T.Isaac, "Numerical Methods", SciTech Publications India Pvt. Ltd, 2nd Edition, 2015.

WEB REFERENCES:

1. www.britannica.com/science/set-theory
2. <https://www.khanacademy.org/math/precalculus/precalc-matrices>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Perform Logical operations and predicate calculus needed for computing skill.	K2	PSO1 & PSO2
CO 2	Analyze and Compare the various techniques for solving numerical equations	K2, K3, K4	PSO1 & PSO2
CO 3	Apply the techniques of statistics and numerical methods to unravel problems by computers.	K2 & K3	PSO1 & PSO3
CO 4	Explain the set theory logic	K2, K3 & K5	PSO1 & PSO4
CO 5	Utilize the Knowledge of matrices for designing and solving problems	K2,K3 & K5	PSO1 & PSO5

I MCA
SEMESTER – I

(For those who joined in 2020 onwards)

PROGRAM ME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WE EK	CREDIT S
MCA	20MCA102	SOFTWARE ENGINEERING	MAJOR CORE	4	4

COURSE DESCRIPTION

This course provides the fundamental perception of Software Engineering which includes system requirements, finding the effective methods to analyze, design, code, test and implement the full application with appropriate tools

COURSE OBJECTIVES

- ❖ To provide an insight into software life cycle and various software process models.
- ❖ To understand the methodologies for constructing software with high quality and reliability.
- ❖ To be familiar with estimation and scheduling of projects.

UNIT – I PROCESS AND PROCESS MODELS (12 Hours)

Software Engineering a Layered Technology- Process Framework – The Capability Maturity Model Integration (CMMI) - Process Models - Prescriptive Models – The Waterfall Model – Incremental Process Models – Evolutionary Process Models The Unified Process.

SELF STUDY: Specialized Process Models

UNIT – II ESTIMATION AND SCHEDULING OF PROJECTS (12 Hours)

Estimation – Observation – Project Planning Process - Software Scope and Feasibility – Resources – Human – Reusable – Environmental - Decomposition Techniques – sizing – Problem Based – LOC Based – FP Based - Empirical Estimation Models – Structure

SELF STUDY: COCOMO II Model

UNIT - III SOFTWARE ENGINEERING PRACTICE AND ANALYSIS(12 Hours)

Software Engineering Practice – Communication Practices - Planning Practices - Modeling Practices – Construction Practice – Deployment - Building the Analysis Model - Requirement Analysis - Data Modeling Concepts –Scenario Based Modeling – Flow Oriented Modeling – Class-based Modeling – Creating a Behavioral Model.

SELF STUDY: Object Oriented Analysis.

UNIT- IV DESIGN ENGINEERING

(12 Hours)

Design - Process and Quality - Concepts – Design Model – Design Elements – Pattern Based Design – Usage of Patterns – Frameworks - Software Architecture – Data Design – Architectural Level – Component Level - Transform Flow and Mapping – Transaction Flow and Mapping .

SELF STUDY: Refining the Design

UNIT – V

(12 Hours)

MODELING COMPONENTS AND PROJECT MANAGEMENT

Component – Views - Class-Based Components – Principles – Guidelines – Cohesion – Coupling – Project - Management Spectrum – The People – Software Team - The Product – Scope – Decomposition – The Process - Modeling – The Project – Approaches.

SELF STUDY: W5HH Principles.

REFERENCES:

1. Roger S.Pressman, “Software Engineering (A Practitioner's Approach)”, Tata McGraw-Hill Companies, 6th Edition, 2014.
Unit I, II, III, IV and V
2. Jibitesh Mishra, Ashok Mohanty, “Software Engineering”, Pearson Education, 1st Edition, 2011.
3. D. Jeya Mala, S. Geetha, “Object Oriented Analysis and Design Using UML”, Tata McGraw-Hill Publishers, 2013.
4. Muthuramachandran, Zaigham,. Mohammed, “Software Engineering in the Era of Cloud Computing, Springer Publishers, 2019.
5. PankajJalote, “An Integrated approach to Software Engineering”, 3rd Edition, Narosa Publications, 2011.
6. Stephen Schach, “Software Engineering”, McGraw publication, 7th Edition, 2012.
7. Ali Behforroz, Frederick J.Hudson, “Software Engineering Fundamentals”, Oxford Indian Reprint,2012.
8. Sommerville, “Software Engineering”, 10th Edition, Pearson, 2015.

WEB REFERENCES:

1. https://www.tutorialspoint.com/software_engineering/
2. <https://www.geeksforgeeks.org/software-engineering/>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Compare the different domains and process models.	K2	PSO1 & PSO2
CO 2	Generate project schedule for different activities of software development.	K2, K3, K4	PSO1 & PSO2
CO 3	Identify the data, class and flow oriented modelling concepts.	K2 & K3	PSO1 & PSO3
CO 4	Analyse on the design oriented concepts	K2, K3 & K5	PSO1 & PSO4
CO 5	Identify the managerial aspects of Software development.	K2,K3 & K5	PSO1 & PSO5

I MCA
SEMESTER – I

(For those who joined in 2020 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
MCA	20MCA103	OPERATING SYSTEMS	MAJOR CORE	4	4

COURSE DESCRIPTION

This course provides knowledge on the concepts of abstraction, scheduling mechanisms, implementations and manages a computer's resources, especially the allocation of those resources among other programmes.

COURSE OBJECTIVES

- ❖ To be aware of the evolution and fundamental principles of operating system.
- ❖ To understand the various operating system components like process management, memory management, file management.
- ❖ To be familiar with storage management.

UNIT - I INTRODUCTION

(12 Hours)

What is Operating System? – System Organization – System Architecture – System Structure – Protection and Security – Distributed Systems – Special Purpose Systems – Process Overview – Process Scheduling – Process Operations – Inter process Communication.

SELF STUDY: Inter process Communication

UNIT – II PROCESS CO-ORDINATION

(12 Hours)

CPU Basic Concepts – Scheduling Criteria – Scheduling Algorithms – Synchronization - Background – Critical Section Problem – Peterson’s Solution - Synchronization Hardware – Semaphore Problems – Monitors Deadlock – System Model – Deadlock Characterization – Methods for Handling – Prevention – Avoidance – Detection – Recovery from Deadlock.

SELF STUDY: Monitors

UNIT – III MEMORY MANAGEMENT

(12 Hours)

Memory Management - Background – Swapping – Contiguous Memory Allocation – Paging – Structure of Page Table – Segmentation - Virtual Memory - Copy-on-Write - Page Replacement algorithms – Basic – FIFO – Optimal – LRU – LRU Approximation – Counting Based – Page Buffering.

SELF STUDY: Demand Paging.

UNIT - IV FILE SYSTEM MANAGEMENT

(12 Hours)

File Concept – Access Methods – Directory and Disk Structure – File system mounting – File sharing - File System Structure – File System Implementation – Directory Implementation - Allocation Methods – Free Space Management.

SELF STUDY: Free Space Management

UNIT – V STORAGE MANAGEMENT

(12 Hours)

Disk Structure – Disk Attachment - Disk Scheduling – Disk Management – Swap-space Management – RAID Structure – I/O Systems - I/O Hardware – I/O interface – I/O Subsystem - I/O Request to hardware operations.

SELF STUDY: Swap-space Management

REFERENCES:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating System Principles", 7th Edition, Wiley Publication, 2013.
2. William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, Prentice Hall, 2011.
3. Madnick&J.Donovan, "Operating Systems", McGraw, 2nd Edition, Hill Publication, 2013.
4. H.M.Deitel, "Operating systems", 3rd Edition, Addison Wesley Publication, 2013.
5. William Stallings, "Operating Systems ", 7th Edition, Prentice Hall Publication, 2014.

WEB REFERENCES:

1. <http://Williamstallings.com/os/animations>
2. https://www.tutorial.com/operating_system/

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Identify the components and processes.	K2	PSO1 & PSO2
CO 2	Analyse on scheduling algorithms and deadlocks.	K2, K3, K4	PSO1 & PSO2
CO 3	Demonstrate the mapping between the physical memory and virtual memory	K2 & K3	PSO1 & PSO3
CO 4	Identify the secondary memory management techniques	K2, K3 & K5	PSO1 & PSO4
CO 5	Analyse on the I/O systems	K2, K3 & K5	PSO1 & PSO5

I MCA
SEMESTER – I

(For those who join in 2020 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
MCA	20MCA104	PROGRAMMING IN PYTHON	MAJOR CORE	4	4

COURSE DESCRIPTION

This course provides the basics of writing and running Python scripts to more advanced features such as file operations, regular expressions, working with OOPs concept and using the extensive functionality of Python modules. Extra emphasis is placed on features unique to Python, such as tuples, array slices, and output formatting.

COURSE OBJECTIVE

- ❖ To differentiate syntax of Python from other programming languages.
- ❖ To get familiar in writing simple programs using Python language.
- ❖ To understand various data structures provided by Python library including string, List.
- ❖ To build real-world applications using OOPs, Files and Exception handling.

UNIT – I INTRODUCTION

(12 Hours)

Context of Software Development - Learning Programming with Python - Writing a Python Program - Values and Variables – Identifiers - Floating-point types – Control Codes within Strings – User Input – Eval Function – Controlling Print Function - Expressions & Arithmetic – Operator Precedence and Associativity – Comments – Errors - Syntax, Run-time, Logic Errors – Conditional Execution – Boolean Expressions – If Statement – If/Else Statement – Nested Conditionals – Multi-way Decision Statements.

SELF STUDY : Arithmetic Operators

UNIT - II FUNCTIONS

(12 Hours)

Iteration – While – For – Nested loop – Abnormal Loop Termination - Infinite loop Using Functions – Time Functions – Random Numbers – Importing Issues - Writing Functions – Basics – Main Function - Parameter Passing – Function Examples – Custom Functions - More on Functions – Global Variables – Default Parameters – Recursion – Documenting Functions and Modules – Functions as Data.

SELF STUDY : Standard Mathematical Functions

UNIT - III LIST PROCESSING AND EXCEPTION HANDLING

(12 Hours)

List Assignment and Equivalence – List bounds - Slicing – List and Functions- List Processing – Sorting – Flexible Sorting – Searching – Linear Search – Binary Search – List Permutations – Reversing List – Handling Exceptions – Using Exceptions – Custom Exceptions.

SELF STUDY : Exception Handling

UNIT - IV TUPLES AND FILE HANDLING

(12 Hours)

Strings - String Traversal – String slices – Searching – Looping and Counting – IN operator – String Comparison - Tuples - Tuple Assignment – Variable – Length Argument Tuples - Lists and Tuples – Dictionaries and tuples - Comparing Tuples - File Handling – Reading and Writing – Filenames and Paths – Catching Exceptions – Databases – Writing Modules - Debugging.

SELF STUDY : String Methods, Format Operator

UNIT - V OBJECT ORIENTED FEATURES

(12 Hours)

Classes and Objects – User-defined Types – Attributes – Rectangles - Objects are mutable – Copying - Classes and Functions – Time – Modifiers – Prototyping Vs Planning - Classes and Methods – Object-Oriented Features – Printing Objects – Init, str Method, Operator Overloading – Polymorphism -

Inheritance – Class Attributes – Card Objects – Decks – Inheritance - Class Diagrams.

REFERENCES:

1. Richard L. Halterman, “Learning To Program with Python”, 2013.
2. Allen B. Downey, “Python for Software Design”, 2018.
3. ReemaThareja, “Python Programming Using Probblem Solving Approach”, Oxford University Press, 2017
4. Bill Lubanovic, “Introducing Python”, O ‘Reilly Media Publications, 2015

WEB REFERENCES:

- 1.<http://spoken-tutorial.org/tutorial-search/python>
- 2.<https://docs.python.org>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Predict the basics of Python programming.	K2	PSO1
CO 2	Solve problems requiring the writing of well-documented programs in the Python language, including use of the logical constructs of that language.	K2, K3 & K4	PSO1& PSO2
CO 3	Use and manipulate Lists and python exception handling model to develop robust programs.	K2, K4	PSO1&PSO3
CO 4	Formulate solutions for String, tuples and File operations.	K2, K3 & K5	PSO1&PSO4
CO 5	Apply object-oriented programming concepts to develop dynamic interactive Python applications.	K2, K3 & K5	PSO1&PSO5

I MCA
SEMESTER – I

(For those who join in 2020 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
MCA	20MCA105	LAB I – PYTHON PROGRAMMING	MAJOR LAB	4	2

COURSE DESCRIPTION

This course provides the practical knowledge of implementing Python programs with loops, functions and represent compound data using lists, tuples and dictionaries.

COURSE OBJECTIVES

- ❖ To write, test and debug simple Python programs.
- ❖ To use functions for structuring Python programs.
- ❖ To read and write data from/to files in Python.

LAB LIST

1. Running instructions in Interactive interpreter and a Python Script
2. Write a program to purposefully raise Indentation Error and Correct it.
3. Write a program add.py that takes 2 numbers as command line arguments and prints its sum.
4. Write a program using for loop that loops over a sequence.
5. Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
6. Write a program to count the numbers of characters in the string and to use split and join methods in the string.
7. Write a program combine_lists that combines these lists into a dictionary

8. Write a function `nearly_equal` to test whether two strings are nearly equal. Two strings `a` and `b` are nearly equal when `a` can be generated by a single mutation on `b`.
9. Write a function `reverse` to reverse a list. Without using the `reverse` function.
10. Find the most frequent words in a text read from a file.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Implement Math functions, Strings, List and Tuple in Python programs.	K2	PSO1, PSO2 & PSO3
CO 2	Express different Decision Making statements and Functions.	K2, K3, K4	PSO1 & PSO2
CO 3	Interpret Object oriented programming in Python & File handling operations.	K2, K3 & K5	PSO4 & PSO5

I MCA
SEMESTER – I

(For those who join in 2020 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
MCA	20MCA106	LAB II – RDBMS	MAJOR LAB	4	2

COURSE DESCRIPTION

This course provides practical knowledge in PL/SQL programming, utilizing the services provided by Oracle database in a stored procedure perspective. This also includes implementation of Subprograms, Triggers, and Cursors concepts in depth.

COURSE OBJECTIVE

- ❖ To give a good formal foundation on the relational model of data
- ❖ To present the techniques relating to query processing by SQL engines.
- ❖ To develop PL/SQL programs with stored procedures, stored functions, cursors and packages.

LAB LIST

SQL QUERIES

1. SQL queries to implement DDL statements to Create, Alter, Drop, Truncate and rename tables.
2. SQL queries to implement DML statements to perform Select, Insert, Delete, Update on tables.
3. SQL queries to implement DCL statements to access database using Grant and Revoke.
4. SQL queries to implement TCL statements to work on Commit, Rollback and Savepoint.

5. SQL queries to implement Where, Like, Order By, Group By, Having clauses.
6. SQL queries to implement arithmetic, Logical, Concatenation and Quote operators.
7. SQL queries to implement mathematical functions. (count, minimum value, maximum value, sum, average, First and Last)
8. SQL queries to implement scalar functions. (UCASE, LCASE, MID, ROUND)
9. SQL queries to implement Set Operations. (Intersect, Union, Union All, Minus)
10. SQL queries to implement column and table level constraints.(NOT NULL, UNIQUE, PRIMARY KEY, FOREIGN KEY, CHECK and DEFAULT)
11. SQL queries to perform Natural, Inner, Outer, Left, Right and Equi Joins.
12. SQL queries to create sequence using initial, increment and maximum value.
13. SQL queries to implement create, display, update in Views.
14. SQL queries to implement subqueries and nested queries.
15. SQL queries to implement Keywords (AS, Cycle, No Cycle, Force) and DESC Commands.

PL/SQL

1. PL/SQL Program to Find Factorial of a Number
2. PL/SQL Program for Reverse of a Number
3. PL/SQL Program to Check Number is Odd or Even
4. PL/SQL Program to Reverse a String
5. PL/SQL Program for Palindrome Number
6. PL/SQL Program for Armstrong Number
7. PL/SQL Program for Calculation Of Net Salary
8. PL/SQL Program to apply implicit and explicit cursors.
9. PL/SQL Program to handle errors.
10. PL/SQL Program to include sub programs.

11. PL/SQL Program to trigger an action.
12. PL/SQL Program to create sequence.
13. PL/SQL Program to implement cursors and packages.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Enhance Programming skills and techniques.	K2	PSO1, PSO2 & PSO3
CO 2	Formulate complex queries using SQL	K2, K3, K4	PSO1 & PSO2
CO 3	Use the PL/SQL code constructs of IF-THEN-ELSE and LOOP types as well as syntax and command functions.	K2, K3& K5	PSO4 & PSO5

I MCA
SEMESTER –I

(For those who joined in 2020 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
MCA	20MCA107	SKILL BASED-LAB I-LINUX	SKILL BASED	2	1

COURSE DESCRIPTION

This course provides focus on the fundamental tools and concepts of Linux and Unix OS. It gives practical exposure on topics such as LINUX environment, commands, file system, processes and utilities. Specific emphasis is given to the bash shell and user environment with several flavours of UNIX/Linux using a version of Red Hat Linux.

COURSE OBJECTIVES

- ❖ To learn the basic set of commands and utilities in Linux.
- ❖ To develop software for Linux systems.

LAB LIST

Shell programming

1. Using Basic Commands.
2. Arithmetic Operations Using Case Statement.
3. Sum of the Digits Calculation.
4. Check for file Existence.
5. Check for String Palindrome.
6. Prime Number Generation.
7. Factorial Calculation.
8. Pattern checking Using grep command.
9. Open a file using System Call.

C programming

1. Open a file using System Call.
2. Emulate scanf and printf Function.
3. Copying Files.
4. Changing File Permissions.
5. File Copy using fgetc.
6. Print the directory Content.
7. Memory Allocation.
8. File Manipulations.
9. Simple C Programs.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Use Linux utilities and develop shell scripts to perform tasks.	K2	PSO1 & PSO2
CO 2	Effectively use Linux environment to accomplish software development tasks	K2, K3, K4	PSO1 & PSO2
CO 3	Monitor system performance and network activities	K2 & K3	PSO1 & PSO3

**I MCA
SEMESTER – I**

(For those who join in 2020 onwards)

PROGRAMM E CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
MCA	20MCA108	SOFT SKILLS I – PROFESSIONAL COMMUNICATION	SOFTSKILLS	2	1

COURSE DESCRIPTION

This course provides skills of oral and written communication to work in different environments, develop emotional sensitivity and an awareness of how to work and negotiate with people.

COURSE OBJECTIVE:

- ❖ To communicate ethically and efficiently.

TOPICS

1. Elements of Communication
 - a. The importance of communication through English
 - b. Factors that influence communication
 - c. Verbal and Non Verbal Communication
 - d. Business Communication
2. Review of English Grammar.
3. Pronunciation Practice.
4. The Sounds of English.
5. Reading and Writing Skills.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Display competence in oral and written communication.	K2	PSO1& PSO2
CO 2	Use current technology related to the communication.	K2, K3	PSO3

I MCA
SEMESTER – II

(For those who join in 2020 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
MCA	20MCA201	DATA STRUCTURES AND ALGORITHMS	MAJOR CORE	4	4

COURSE DESCRIPTION

This course provides knowledge on several fundamental algorithms and data structures and to implement them in C++ to be an effective designer, developer, or customer for new applications.

COURSE OBJECTIVE

- ❖ To understand the concept of data structures through ADT including List, Stack and Queues.
- ❖ To design, develop and implement various data structure algorithms.
- ❖ To compute the complexity of various algorithms.

UNIT – I LISTS, STACKS AND QUEUES

(12 Hours)

Abstract Data Types - The List ADT – Array Implementation of List - Single Linked Lists – Doubly Linked Lists – Circular Linked Lists - The Stack ADT - Stack Model – Implementation Of Stacks - The Queue ADT -Queue Model – Implementation Of Queues.

SELF STUDY : Applications of Stack and queue

UNIT - II TREES

(12 Hours)

Preliminaries - Implementation Of Trees – Tree Traversals With An Application – Binary Trees – Implementation – The Search Tree ADT – Binary Search Trees – Make Empty – Find – Min and Max – Insert – Delete.

SELF STUDY : Expression Trees

UNIT - III ADVANCED SEARCH TREES AND HASHING (12 Hours)

AVL Trees – Splay Trees – Tree Traversals - B-Trees – Hashing - General Idea – Hash Function – Open Addressing – Linear Probing – Quadratic Probing – Double Hashing – Rehashing – Extendible Hashing.

SELF STUDY : Separate Chaining

UNIT - IV PRIORITY QUEUE AND SORTING (12 Hours)

Priority Queue (Heaps) - Model – Implementation - Binary Heap- Structure Property-Heap Order Property - Basic Heap Operations – Selection Problem - Sorting - Insertion Sort – Heap Sort – Merge Sort – Quick Sort - Bucket Sorting– External Sorting.

SELF STUDY : Application of Priority Queues

UNIT - V GRAPHS (12 Hours)

Graph Algorithm - Definitions – Representation of Graphs – Shortest-Path Algorithms. Dijkstra’s Algorithm – Minimum Spanning Tree – Prim’s Algorithm – Kruskal’s Algorithm - Greedy Algorithms – Huffman Codes - Divide And Conquer – Running Time Of Divide And Conquer Algorithms-Closest Point Problem.

SELF STUDY : A Simple Scheduling Problem

REFERENCES :

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C“,2nd Edition, Pearson Education Asia, 2016.
2. Seymour Lipschutz, “Data structures with C”, Tata Mc Graw Hill, 2011.

3. Debasis Samanta, "Classic Data Structures", 2nd Edition, PHI, 2012.
4. Ashok N. Kamthane , "Programming and Data structure", Dorling Kindersley,2012.
5. E.Balagursamy," Data Structures using C", Tata McGraw Hill, 2015 Reprint.

WEB REFERENCES:

1. <https://www.w3schools.in/data-structures-tutorial/intro>
2. <https://www.tutorialride.com/data-structures/data-structures-tutorial.htm>
3. <https://www.geeksforgeeks.org/fundamentals-of-algorithms/>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Select appropriate data structures as applied to specified problem definition.	K2 & K4	PSO1
CO 2	Implement operations like searching, insertion, deletion and traversing in trees.	K2, K3	PSO2
CO 3	Compare the data structures of advanced search trees.	K2 & K4	PSO3
CO 4	Implement appropriate heap operations, sorting, searching techniques for a given problem.	K2, K3 & K5	PSO2 & PSO4
CO 5	Determine and analyze the complexity of graph Algorithms.	K2,K3 & K5	PSO5

I MCA
SEMESTER – II

(For those who join in 2020 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
MCA	20MCA202	WEB TECHNOLOGIES	MAJOR CORE	4	4

COURSE DESCRIPTION

This course provides the student with foundational programming knowledge and skills for application development on the Internet.

COURSE OBJECTIVES

- ❖ To make the students familiar with client server architecture and able to develop web applications using PHP.
- ❖ To plan, design, construct, and integrate basic server-side components of modern web applications including databases and scripts.
- ❖ To impart the skills and project-based experience needed for entry into web application and development careers.

UNIT – I HTML5 & CSS 3

(12Hours)

The Basics of HTML5 – Document structure – Basic elements – Marking text – Working with characters – Making a list – Table

The Basics of CSS3 – Understanding styles – Styling text – Box model – Styling tables- Positioning elements

HTML 5 Forms - Using input fields – Adding a Text area – Using Drop-Down Lists – Data Validation

Advance CSS3 – Rounding corners – Colors - Creating fonts – Handling media queries

HTML5 and Multimedia – Working with images – Playing Audio – Watching videos

SELF-STUDY: Positioning elements

UNIT- II JAVASCRIPT & JQUERY

(12Hours)

Introducing JavaScript – The basics of JavaScript – Controlling program flow – Working with functions

Advanced JavaScript Coding – Document Object Model – Finding your Elements - Document Object Model form data

Using jQuery – Loading the jQuery library –Functions –Finding elements – Replacing data – Changing styles – Changing the Document Object Model

Reacting to events with JavaScript and jQuery – Understanding events – Focusing on JavaScript and events - Looking jQuery and events

SELF STUDY: Understanding events

UNIT – III INTRODUCING PHP

(12Hours)

Understanding PHP Basics – Benefits – Variable – Operators - Including files

PHP Flow Control – Looping - Building own functions – event driven PHP

PHP Libraries – Text Functions – Math Functions – Date and time functions

Sessions and carts – Storing Persistent Data – PHP and cookies – PHP and Sessions

SELF STUDY: Math Functions.

UNIT – IV INTRODUCING MYSQL

(12Hours)

Introducing MYSQL – Designing and building a database – Managing data – Creating databases – Building tables

Using the database – Working with data – Searching for data

Communicating with the database from PHP Scripts – Database support in PHP – Using mysqli library

SELF STUDY: Searching for data.

UNIT - V AJAX & PHP FRAMEWORK

(12 Hours)

Using Ajax – Communicating using JavaScript – Using the jQuery library – Transferring data in AJAX

Getting Acquainted with MVC – Comparing MVC to other web models – Implementing MVC

Selecting a Framework – PHP Frameworks – Popular PHP Frameworks – Looking at Micro Frameworks.

SELF STUDY: Transferring data in AJAX

REFERENCES:

1. Richard Blum, “PHP, MySQL & JavaScript All-in-One For Dummies”, John Wiley & Sons, Inc, 2018
2. Robin Nixon, “PHP, MYSQL, JavaScript & CSS”, 2nd Edition, O’Reilly, 2012.
3. Chris Minnick, Ed Tittel, “Beginning HTML5 and CSS3 For Dummies”, 1st edition, 2013
4. Chris Minnick, Eva Holland, “Coding with JavaScript For Dummies”, Wiley, 2015

WEB REFERENCES:

1. https://www.w3schools.com/html/html5_intro.asp
2. css3generator.com
3. <https://www.w3schools.com/php/default.asp>
4. https://en.wikiversity.org/wiki/Computer_architecture_and_organization

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Use knowledge of HTML and CSS to create personal and/or business websites	K2	PSO1 & PSO2
CO 2	Create effective scripts using JavaScript and jQuery to enhance the end user experience.	K2, K3, K4	PSO1 & PSO2
CO 3	Write PHP scripts to handle HTML forms.	K2 & K3	PSO1 & PSO3
CO 4	Test, debug, and deploy web pages containing PHP and MySQL.	K2, K3 & K5	PSO1 & PSO4
CO 5	Implement SQL language, JavaScript, Ajax, JQuery, PHP and CSS in the project.	K2,K3 & K5	PSO1 & PSO5

I MCA
SEMESTER – II

(For those who join in 2020 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
MCA	20MCA203	PROGRAMMING IN JAVA	MAJOR CORE	4	4

COURSE DESCRIPTION

This course provides an exhaustive coverage of Core Java programming language features like OOPS and GUI programming.

COURSE OBJECTIVE

- ❖ To understand the basic Java programming constructs
- ❖ To develop program by using OOPS concept.
- ❖ To handle Packages, Exception , Basics of AWT and Applets
- ❖ To create and manipulate databases in Java using JDBC and show how to create client-server programs using RMI.

UNIT – I INTRODUCTION

(12 Hours)

An overview of Java – Object Oriented Programming – Lexical issues - Data types – Literals – Type conversion and casting - Variables - Arrays – Arithmetic – Bitwise - Relational – Assignment – Ternary Operator – Operator precedence – Selection statements – Iteration statements – Jump Statements.

SELF STUDY : Operators, Control statements

UNIT - II CLASSES AND METHODS

(12 Hours)

Introduction to classes – Declaring Objects – Introducing Methods – this Keyword – Garbage Collection – finalize () method – Stack class – Method

Overloading – Method Overriding – Constructor Overloading - - Inheritance – Multilevel Hierarchy – Abstract class – Final with Inheritance .

SELF STUDY : Constructors

UNIT - III PACKAGES AND THREADS (12 Hours)

Defining Package Access protection – Importing Packages – Defining Interfaces – Implementing Interfaces – Nested Interface - Exception Types – Using try and catch – Multiple catch – Nested try statements – Built-in Exceptions - Multithreaded Programming – Java Thread Model – Main Thread – Implementing Runnable – Extending Thread – Thread Priorities – Synchronization – Inter-thread communication.

SELF STUDY : Exception Handling

UNIT - IV AWT CLASSES AND CONTROLS (12 Hours)

The Applet class –Architecture – Skeleton – Applet display methods – HTML Applet tag - AWT classes – Window fundamentals – Frame windows – Color – Fonts – Using Font Metrics – Control fundamentals - Labels – Buttons – Checkbox – Choice control – Lists – Scroll Bars – Layout Managers and Menus – Dialog box – AWT Components.

SELF STUDY : Working with graphics

UNIT - V DATABASE AND RMI (12 Hours)

Introduction to JDBC – Installing JDBC – Basic JDBC Programming Concepts - Java RMI - RMI Concepts - Remote Interface - RMI process - Server side - Client side.

SELF STUDY : Passing Objects in RMI

REFERENCES:

1. Herbert Schildt, "JAVA the Complete Reference", 9th Edition, Tata McGraw Hill, 2016
2. Jim Keogh, "The Complete Reference J2EE", 3rd Edition, Tata McGraw Hill, Reprint 2010.
3. Ken Arnold, David Holmes, James Gosling, "The JAVA Programming Language", 3rd Edition, PrakashGoteti.

WEB REFERENCES:

1. <https://www.cs.cmu.edu/afs/cs.cmu.edu/user/gchen/www/download/java/LearnJava.pdf>
2. <https://lecturenotes.in/subject/73/java-programming-java>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Apply the basic Java constructs to develop solutions to real time problems.	K2	PSO1
CO 2	Analyze the hierarchy of java classes to develop object oriented programs.	K2, K3, K4	PSO1& PSO2
CO 3	Design software in Java using Packages and Threads.	K2 & K3	PSO1&PSO3
CO 4	Implement Concepts of AWT for Creating GUI.	K2, K3 & K5	PSO1&PSO4
CO 5	Design a Software using JDBC and to explain the role of RMI interfaces.	K2,K3 & K5	PSO1&PSO5

I MCA

SEMESTER – II

(For those who joined in 2020 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
MCA	20MCA204	Lab III – WEB TECHNOLOGIES	MAJOR LAB	4	2

COURSE DESCRIPTION

This course provides information about two powerful technologies. Together, these two technologies provide a powerful platform for building database-driven Web applications.

COURSE OBJECTIVE

- ❖ To understand how client side and server-side programming works on the web.
- ❖ To Test, debug and deploy web pages containing PHP and MySQL.
- ❖ To create, read and process data in a MySQL database.

LAB LIST

1. Basic programs in HTML5, CSS3, JavaScript and jquery
2. Program for implementing mathematical functions.
3. Program for implementing string functions.
4. Program for Validating Registration Form.
5. Program to create Login form using PHP and MYSQL.
6. Program for online quiz using PHP and MYSQL.
7. Programs for manipulating MYSQL database
8. Program for uploading an image using PHP and MYSQL.
9. Program for Pagination using PHP and MYSQL.
10. Program for Cookie manipulation using PHP.
11. Program for Session manipulation using PHP.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Design WebPages using server side scripting.	K1	PSO1& PSO2
CO 2	Use PHP built-in functions and custom functions for processing.	K1, K2,	PSO3
CO 3	Create various interactive and dynamic websites	K1 & K3	PSO5

I MCA
SEMESTER - II

(For those who join in 2020 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
MCA	20MCA205	LAB IV – JAVA PROGRAMMING	MAJOR LAB	4	2

COURSE DESCRIPTION

This course provides experiential learning in the implementation of Core Java Programming.

COURSE OBJECTIVE

- ❖ To understand the basic Java programming constructs
- ❖ To develop program by using OOPS concept.
- ❖ To handle Packages, Exception , Basics of AWT and Applets.
- ❖ To create and manipulate databases in Java using JDBC.

LAB LIST

1. Programs using Basic Programming Constructs
2. Programs implementing Classes.
3. Programs for implementing Inheritance
4. Programs for implementing Abstract Classes
5. Programs for implementing a Stack Class
6. Programs for implementing Constructor Overloading
7. Programs for implementing Method Overloading
8. Programs for implementing Method Overriding
9. Programs for Handling Errors using Exception Handling
10. Programs using Interfaces.
11. Programs on Packages.
12. Programs on Multithreading

13. Programs in Applets.

14. Programs for Designing Graphical User Interface using AWT

15. Programs for Data Base Management Systems using JDBC

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Understand Java programming development environment, Compiling, Debugging, Linking and Executing the programs.	K2	PSO1& PSO3
CO 2	Analyze the complexity of problems, modularized the problems into small modules and then convert them in to programs.	K2, K3	PSO2 & PSO3
CO 3	Understand and apply the in built functions and customized functions for solving the problems.	K3 & K4	PSO3 & PSO5

I MCA
SEMESTER - II

(For those who join in 2020 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
MCA	20MCA206	SKILL BASED LAB II - R PROGRAMMING	SKILL BASED LAB	2	1

COURSE DESCRIPTION

This course provides an in-depth knowledge on the basic constructs and statistical analysis in R.

COURSE OBJECTIVE

- ❖ Understand the basic constructs of R Programming.
- ❖ Analyze the statistical operations using R.

LAB LIST

1. Exercises to understand the R basics.
2. Exercises to understand the programming constructs of R
3. Exercises to draw a scatter diagram and charts.
4. Exercises to implement statistical operations in R
5. Exercises to implement concepts of probability and distributions in R

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Demonstrate the practical application of R programming tool.	K1	PSO1& PSO2
CO 2	Emphasize the implementation of statistical operations in R	K1, K2,	PSO3

I MCA
SEMESTER - II

(For those who join in 2020 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
MCA	20MCA207	SOFT SKILL II – APTITUDE TRAINING	SOFT SKILL	2	1

COURSE DESCRIPTION

This course provides gamut of skills which facilitate the students to enhance their employability quotient and to establish a stronger connect with the technical environment in which they operate. It makes them think critically and apply basic mathematics skills to interpret data, draw conclusions and solve problems.

COURSE OBJECTIVE

- ❖ To improve aptitude, problem solving skills and reasoning ability.
- ❖ To comprehend the basic concepts of various domains of computer science.

SECTION 1 – ARITHMETIC ABILITY

1. Problems on Numbers
2. Problems on Ages
3. Time and Work
4. Time and Distance
5. Simple Interest
6. Permutation and Combination
7. Odd Man Out & Series

SECTION 2- REASONING

1. Logical Sequence of words

2. Blood Relations Test
3. Series Completion
4. Mirror Images.

SECTION 3 – APTITUDE QUESTIONS

1. Computer Networks
2. RDBMS
3. Operating Systems
4. C/ C++
5. Java
6. Oracle

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Apply quantitative techniques to solve variety of problems.	K1	PSO1& PSO2
CO 2	Enhance the technical skills for employability.	K1, K2,	PSO3

I MCA

SEMESTER – II

(For those who join in 2020 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	20MCADA01	DATA MINING TECHNIQUES	SPECIALIZATION ELECTIVE – DATA ANALYTICS	4	4

COURSE DESCRIPTION

This course provides the basic concepts, principles, methods, implementation techniques and applications of data mining.

COURSE OBJECTIVE

- ❖ To know then scope and necessity of Data mining for the Society.
- ❖ To understand & analyze the various algorithms for Knowledge Extraction.
- ❖ To acquire the basic knowledge of various data mining techniques through Weak tool.

UNIT I

(12 Hours)

INTRODUCTION:

What is Data Mining? , Data Mining: Definitions, KDD vs Data Mining, Stages of KDD, DBMS vs DM, Other Related Areas, DM Techniques, Other Mining Problems, Issues and Challenges in DM.

SELF STUDY: Issues and Challenges in DM

UNIT II

(12 Hours)

ASSOCIATION RULES:

What is an Association Rule?, Methods to discover Association Rules, Apriori Algorithm, Partition Algorithm, Pincer Search Algorithm, FP-tree Growth Algorithm, Discussion on different algorithms, Generalized Association Rule.

SELF STUDY: Discussion on different algorithms

UNIT III

(12 Hours)

CLUSTERING TECHNIQUES:

Clustering paradigms, Partitioning Algorithms, k-Medoid Algorithms, CLARA, CLARANS, Hierarchical Clustering, DBSCAN.

SELF STUDY: Hierarchical Clustering

UNIT IV

(12 Hours)

WEB MINING:

Web Mining, Web Content Mining, Web Structure Mining, Web Usage Mining, Text Mining.

TEMPORAL AND SPATIAL DATA MINING:

What is Temporal Data Mining? , Temporal Association Rules, Sequence Mining, The GSP Algorithm, SPIRIT, Spatial Mining, Spatial Mining Tasks, Spatial Clustering, Spatial Trends.

SELF STUDY: SPIRIT

UNIT V WEAK TOOL

(12 Hours)

Introduction, Launching Weka Explorer, Preprocessing Data, File conversion, Opening file from a local file system, Opening file from a web site, Reading data from a database, Preprocessing window, Building Classifiers, Clustering data, Finding associations, Attribute selection, Data visualization.

SELF STUDY : Preprocessing window

REFERENCES :

1. Arun K Pujari , “Data mining Techniques”, Universities Press (India) Private Limited, 2008
2. Jiawei Han, Micheline Kamber, Jian Pei, “Data mining Concepts and Techniques”, Third Edition, Morgan Kaufman Publishers, 2012.
3. Bharat Bhushan Agarwal, Sumit Prakash Tayal, “Data Mining and Data Warehousing”, Laxmi Publications Ltd., 2009
4. Margaret H ,”Data Mining: Introductory And Advanced Topics”, Dunham Pearson Education India, 2006.
5. Usama M.Farrad, Geogory Piatetsky – Shapiro, Padhrai Smyth and Ramasamy Uthurusamy, “ Advances in Knowledge Discovery and Data Mining”, The M.I.T. Press 1996.

WEB REFERENCES:

1. https://www.tutorialspoint.com/data_mining
2. <http://people.sabanciuniv.edu/berrin/cs512/lectures>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Identify the functionalities of Data Mining and various techniques to extract knowledge.	K2	PSO1 & PSO2
CO 2	Analyze the methods to discover Association Rules	K2, K3, K4	PSO1 & PSO2
CO 3	Design & deploy the appropriate Clustering techniques.	K2 & K3	PSO1 & PSO3
CO 4	Outline web mining, temporal and spatial data mining	K2, K3 & K5	PSO1 & PSO4
CO 5	Examine and Explore weka techniques	K2,K3 & K5	PSO1 & PSO5

II MCA
SEMESTER – II

(For those who join in 2020 onwards)

PROGRAMM E CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	20MCADA02	DATA ANALYTICS AND VISUALIZATION USING SPREADSHEETS	SPECIALIZATION ELECTIVE – DATA ANALYTICS	4	4

COURSE DESCRIPTION

This course provides knowledge to perform data analysis using Excel's most popular features.

COURSE OBJECTIVE

- ❖ Learn about the pivot tables in Spreadsheet
- ❖ Provide knowledge on Data Checking and Evaluation.
- ❖ Perform Data Analysis and Evaluation

UNIT I

Introducing Spreadsheet

Building Tables - Analyzing Table Information

Grabbing Data from External Sources

Getting Data the Export - Import Way - Querying External Databases and Web Page Tables

UNIT II

Cleaning Data

Editing Your Imported Workbook - Cleaning Data with Text Functions

Working with PivotTables

Looking at Data from Many Angles - Running the PivotTable Wizard-
Customizing How Pivot Tables Work and Look

UNIT III

Building PivotTable Formulas

Adding Another Standard Calculation - Creating Custom Calculations - Using
Calculated Fields and Items - Retrieving Data from a Pivot Table

Working with PivotCharts

Running the PivotTable Wizard - Fooling Around with Your Pivot Chart.

Customizing PivotCharts

Selecting a Chart Type - Working with Chart Styles - Changing Chart Layout -
Changing a Chart's Location - Formatting the Plot Area - Formatting the
Chart Area

UNIT IV

Using the Database Functions

Using the DAVERAGE Function -Using the DCOUNT and DCOUNTA
Functions- Using the DGET Function - Using the DMAX and DMAX Functions
- Using the DPRODUCT Function - Using the DSTDEV and DSTDEVP
Functions - Using the DSUM Function - Using the DVAR and DVARP
Functions

Using the Statistics Functions

Counting Items in a Data Set - Means, Modes, and Medians - Finding Values,
Ranks, and Percentiles - Standard Deviations and Variances - Regression
Analysis - Correlation

UNIT V

Descriptive Statistics

Using the Descriptive Statistics Tool - Creating a Histogram - Ranking by Percentile - Calculating Moving Averages Exponential Smoothing - Generating Random Numbers - Sampling Data

Inferential Statistics

Using the t-test Data Analysis Tool - Performing z-test Calculations - Creating a Scatter Plot - Using the Regression Data Analysis Tool - Using the Correlation Analysis Tool - Using the Covariance Analysis Tool - Using the ANOVA Data Analysis Tools - Creating an f-test Analysis - Using Fourier Analysis

REFERENCES:

1. Stephen L. Nelson, and E. C. Nelson, “Excel Data Analysis For Dummies” , Second edition, John Wiley & Sons, Inc., 2014
2. Walkenbach, John, “Excel 2016 Bible”, John Wiley & Sons, Inc., 2015
3. Jelen, Bill, “Excel 2016 Pivot Table Data Crunching”, Pearson Education, Inc, 2016

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1. owardsdatascience.com/data-analysis-using-excel-885f337c85c
2. <https://people.umass.edu/evagold/excel.html>
3. <https://www.analyticsvidhya.com/blog/2020/04/excel-tips-tricks-data-analysis/>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Ability to analyze data is a powerful skill that helps you make better decisions	K2	PSO1 & PSO2
CO 2	Identify the basic principles of a Pivot Table	K2, K3, K4	PSO1 & PSO2
CO 3	Recognize how to use Pivot Table and Pivot chart	K2 & K3	PSO1 & PSO3
CO 4	Use Excel's powerful functions to efficiently transform mountains of raw data into clear insights	K2, K3 & K5	PSO1 & PSO4
CO 5	Use your new-found Excel skills like Descriptive Statistics and Inferential Statistics to analyze what makes a successful project.	K2,K3 & K5	PSO1 & PSO5

I MCA
SEMESTER – II

(For those who join in 2020 onwards)

PROGRAM ME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	20MCADS01	DATA COMMUNICATION & NETWORKING	SPECIALIZ ATION ELECTIVE – DISTRIBUT ED SYSTEM SECURITY	4	4

COURSE DESCRIPTION

This course provides the basic concepts, design principles and underlying technologies of networking.

COURSE OBJECTIVE

- ❖ To familiarize with the basic taxonomy & terminology of data communication.
- ❖ To analyze the function & design strategies of Physical, Datalink, Network and Transport layer.
- ❖ To acquire the basic knowledge of various Application protocols.

UNIT – I OVERVIEW

(12 Hours)

Introduction: Data Communications – Networks -Network Models: Layered tasks- OSI Model- Layers in the OSI model- TCP/ IP protocols suite- Addressing.

SELF STUDY: OSI Model

UNIT – II PHYSICAL LAYER & MEDIA, DATA LINK LAYER (12 Hours)

Digital Transmission: Transmission Modes - Transmission Media- Guided Media- Unguided Media.

Switching – Circuit switched Network- Datagram Network- Virtual Circuit Network -Error detection and Correction- Introduction- Block Coding - Data link Control: Framing- Flow and Error control- Protocols- Noiseless Channels- Noisy Channels.

UNIT - III NETWORK LAYER & TRANSPORT LAYER (12 Hours)

Network Layer: Internet Protocol - Internetworking- IPV4- IPV4- Transition from IPV4 to IPV4 - Routing: Unicast Routing Protocols

Transport Layer: Process-to-Process delivery- UDP – TCP – SCTP.

SELF STUDY:Transition from IPV4 to IPV4

UNIT –IV APPLICATION LAYER (12 Hours)

Domain Name System :Name Space - Domain Name Space- Distribution of Name Space- DNS in the Internet – DNS Messages- Resolution - Remote Login – DNS Messages – Types of records.

Remote Logging, Electronic Mail and File Transfer: Remote Logging - Email- FTP.

SELF STUDY: Name Space – Domain name space – DNS Messages – Resolution- Remote Login – Email.

UNIT –V NETWORK SIMULATOR (NS2) (12 Hours)

Introduction – Features of NS2 – Basic architecture – TCL & C++ - Installation of NS2 – Example on NS2 – Advantages and Dis advantages of NS2

NS Components – Basic Tcl – Simple two node wired network – Adding traffic to the Link – Simulate a topology – UDP Traffic – TCP Traffic

SELF STUDY: Advantages and Dis advantages of NS2

REFERENCES:

1. BEHROUZ A FOROUZAN, “Data Communication and Networking”, 4th Edition, Tata McGraw Hill.
2. Andrew. S. Tanenbaum, “Data Communication and Networking”, 4th Edition, Pearson Education.
3. Teerawat Issariyakul, Ekram Hossain, “Introduction to Network Simulator NS2”, Springer, 2nd Edition

WEB REFERENCES:

1. <http://www.omniseku.com/basic-networking/>
2. <https://www.tutorialweb.com/ns2/NS2-1.htm>
3. <https://www.isi.edu/nsnam/ns/>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Identify the functionalities of Networking layers of both OSI and TCP/IP reference models.	K2	PSO1 & PSO2
CO 2	Analyze the design issues of Datalink layer and techniques to resolve it.	K2, K3, K4	PSO1 & PSO2
CO 3	Compare the principles of Internet protocols and Routing algorithm. Predict the TCP and UDP related procedures	K2 & K3	PSO1 & PSO3
CO 4	Outline the Application layer protocols.	K2, K3 & K4	PSO1 & PSO4
CO 4	Examine and Explore Network Simulation techniques	K2, K3 & K4	PSO1 & PSO4

I MCA
SEMESTER – II

(For those who join in 2020 onwards)

PROGRAM ME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	20MCADS02	WIRELESS COMMUNICATI ON & SECURITY	SPECIALIZATION ELECTIVE – DISTRIBUTED SYSTEM SECURITY	4	4

COURSE DESCRIPTION

This course provides knowledge on key mobile system and wireless communication. It also aims at developing applications using Android

COURSE OBJECTIVE

- ❖ To learn the basic concepts of MAC, SDMA, TDMA, FDMA, CDMA.
- ❖ To have an exposure about GSM and Satellites.
- ❖ To be familiar with wireless protocols, WLAN, Bluetooth.
- ❖ To be acquainted with the Mobile Internet Protocol.
- ❖ To understand the basic concepts of SIP.

UNIT – I INTRODUCTION

(12 Hours)

Applications - History of wireless communication - Simplified reference model- Medium Access Control - Motivation for a specified MAC- SDMA- FDMA- TDMA- CDMA – Comparison of SDMA, TDMA, FDMA, CDMA.

SELF STUDY: History of wireless communication

UNIT – II Mobile Networks**(12 Hours)**

GSM - Mobile services- System Architecture- Protocols- Handover – Security - New data services – DECT – TETRA – Satellite systems – Introduction – Applications - Basics- Routing- Localization- Handover.

SELF STUDY: Satellite systems Basics**UNIT – III Wireless Systems****(12 Hours)**

Infra Red Vs Radio transmission- Infrastructure and Adhoc Networks- IEEE 802.11 System Architecture - Protocol Architecture – Newer developments - Bluetooth- Architecture- Link manager Protocol – Security – SDP – IEEE 802.15.

SELF STUDY: Bluetooth**UNIT – IV Mobile IP****(12 Hours)**

Basics – IP Packet delivery – Tunneling and encapsulation – IP micro mobility support – Dynamic host configuration protocol – Mobile ad-hoc networks – Overview ad-hoc routing protocols.

UNIT – SIP**(12 Hours)**

Introduction - VoIP Technology – SIP Overview – Network Elements – SIP System Architecture – SIP Basic call flow - SIP trapezoid – SIP Messaging – SIP Response Codes – SIP Headers.

SELF STUDY: SIP Headers

REFERENCES:

- 1 Jochen Schiller, "Mobile communication", Second Edition, Pearson Education, 12th Impression, 2013.
2. Wei- Manglee, "Beginning Android 4 Application Development", Wiley India pvt ltd, Reprint 2013
3. Reto Meier, "Professional Android4 Application Development", Wiley India Edition.
4. Wallace B. Maclure, Nathan Blevins, John J Croft IV, Jonathan Dick, Chris Hardly, "Professional Android Programming", Wiley India Edition

WEB REFERENCES:

1. https://www.tutorialspoint.com/session_initiation_protocol/session_initiation_protocol_introduction.htm
2. <https://nsrc.org/wrc/data/2004/629197984427ef56fc2cd1/sanog4-aarati-voiptut.pdf>
<http://www.cse.psu.edu/~pdm12/cse545-s11/slides/cse545-voip.pdf>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Identify, Predict and Evaluate MAC, SDMA, TDMA, FDMA, CDMA	K2	PSO1 & PSO2
CO 2	Demonstrate the architectures, challenges and solutions of Wireless communication	K2, K3, K4	PSO1 & PSO2
CO 3	Assess the role of Wireless Networks in shaping the future internet.	K2 & K3	PSO1 & PSO3
CO 4	Design Mobile IP to support seamless and continuous Internet connectivity	K2, K3 & K5	PSO1 & PSO4
CO 5	Design SIP to create, modify, and terminate a multimedia session over the Internet Protocol.	K2,K3 & K5	PSO1 & PSO5

I MCA
SEMESTER - II

(For those who join in 2020 onwards)

PROGRAM ME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCA	20MCAAM01	ARTIFICIAL INTELLIGENC E & EXPERT SYSTEMS	SPECIALIZ ATION ELECTIVE - AI & MACHINE LEARNING	4	4

COURSE DESCRIPTION

This course provides the basic principles of artificial intelligence. It will cover problem solving paradigms, constraint propagation and search strategies in the areas of applications including knowledge representation, natural language processing, expert systems, vision and robotics.

COURSE OBJECTIVE

- ❖ To learn the methods of solving problems using Artificial Intelligence.
- ❖ To have an understanding of the basic issues of knowledge representation, blind and heuristic search.
- ❖ To have a basic proficiency in a traditional AI language and ability to write simple to intermediate programs in expert systems through scikit learn tools.

UNIT – I AI Problems and Problem Characteristics (12 Hours)

The AI Problems – The underlying assumption - AI techniques – The level of the model – Criteria for success - Problems , Problem space and search – Defining the problem as a state space search – Production Systems – Problem characteristics – Production system characteristics – Issues in the design of search programs- Additional problems.

Self Study : Problem characteristics

UNIT II Search Techniques

(12 Hours)

Heuristic search techniques – Generate and test – Hill climbing – Best first search – Problem reduction – Constraint satisfaction – Means ends analysis. Knowledge Representation Issues- Representations and Mappings- Approaches to Knowledge Representation – Issues in Knowledge Representation – The Frame Problem.

Self Study : Constraint satisfaction

UNIT III Using predicate logic

(12 Hours)

Using predicate logic – Representing simple facts in logic – Representing instance and ISA relationship – Computable functions and predicates – Resolution – Natural deduction - Representing knowledge – Using rules – Procedural versus declarative knowledge – Logic programming – forward versus backward reasoning – Matching – Control knowledge.

Self Study : Natural deduction

UNIT IV Filler Structure and Game playing

(12 Hours)

Weak Slot and Filler Structure: Semantic Nets- Frames. Strong Slot and Filler Structure: Conceptual Dependency- Scripts-CYC. Game playing- The minimax search procedure- Adding alpha beta cutoffs- additional refinements- Iterative Deepening.

Self Study : Scripts

UNIT V AI Learning, Expert systems and Scikit-Learn

(12 Hours)

What is Learning – ROTE Learning - Learning by Taking Advice – Learning in Problem solving –Explanation-based Learning - Discovery – Analogy – Formal Learning Theory. Expert Systems – Representing and using domain knowledge – Expert System Shells – Explanation- Scikit-Learn – Introduction - Modelling process - Data Representation - Estimator API – Conventions - Linear Modelling

- Support Vector Machine - Classification with Naïve Bayes - Decision Trees - Clustering Methods.

Self Study : Knowledge Acquisition

REFERENCE BOOKS

1. Elaine Rich, Kevin Knight, “Artificial Intelligence”, III Edition McGraw Hill Education Pvt Ltd.
2. Mishra Ravi Bhushan, “Artificial Intelligence”, PHI learning Pvt. Ltd,2011
3. Kaushik saroj, “Artificial Intelligence” ,Cengage learning India Pvt. Ltd,2011.

WEB RESOURCES

4. http://en.wikipedia.org/wiki/Artificial_intelligence
5. http://www.cee.hw.ac.uk/~alison/ai3notes/subsection2_6_2_3.html
6. <http://starbase.trincoll.edu/~ram/cpsc352/notes/heuristics.html>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Identify problems that are amenable to solution by AI methods.	K1	PSO1& PSO2
CO 2	Formulate search problems and implement search algorithms using admissible heuristics.	K1, K2,	PSO3
CO 3	Design and carry out an empirical evaluation of different algorithms on a predicate logic and state the conclusions that the evaluation supports.	K1 & K3	PSO5
CO 4	Analyze games playing as adversarial search problems and implement optimal and efficient solutions.	K1, K2, K3 &	
CO 5	Apply the concepts of Expert Systems in machine learning, Examine and Explore scikit learn techniques	K2 & K4	

I MCA
SEMESTER - II

(For those who join in 2020 onwards)

PROGRAM ME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCA	20MCAAM02	SOFT COMPUTING	SPECIALIZ ATION ELECTIVE - AI & MACHINE LEARNING	4	4

COURSE DESCRIPTION

This course provides the principal constituents of soft computing that is fuzzy logic, neural network theory and probabilistic reasoning. The course explores the features that are employed in various associated techniques.

COURSE OBJECTIVE

- ❖ To master the various fundamental models of artificial neural networks.
- ❖ To cater the knowledge of Neural Networks and use these for controlling real time systems.
- ❖ To use the fuzzy logic and neural network for application related to design and manufacture.

UNIT – I FUNDAMENTALS OF NEURAL NETWORKS

(12 Hours)

Basic Concepts of Neural Networks – Human Brain - Model of An Artificial Neuron – Neural Network Architectures –Single Layer Feedforward Network – Multilayer Feedforward Network – Recurrent Networks - Learning Methods – Taxonomy of Neural Network Architectures –History of Neural Networks Research-Early Neural Networks Architectures – Rosenblatt’s Perception – ADALINE Network – MADELINE Networks.

SELF STUDY : Single Layer Feedforward Network

UNIT II BACK PROPAGATION NETWORKS

(12 Hours)

Architecture of back propagation network – The Perceptron Model – The Solution – Single Layer Artificial Neural Network – Model for Multilayer Perceptron - Back Propagation Learning – Input Layer Computation – Hidden Layer Computation – Output Layer Computation – Calculation of Error – Training of Neural Network – Method of Steepest Descent – Effect of Learning Rate – Adding a Momentum Term – Backpropagation Algorithm - Applications – Design of Journal Bearing – Classification of Soil – Hot Extrusion of Steel - Selection Of Various Parameters in BPN – Number of Hidden Nodes – Momentum Coefficient – Sigmoidal Gain – Local Minima – Learning Coefficient.

SELF STUDY : Single Layer Artificial Neural Network

UNIT III ADAPTIVE REASONANCE THEORY

(12 Hours)

Introduction –Cluster Structure – Vector Quantization – Classical ART Networks – Simplified SRT Architecture - ART 1 – Architecture of ART1 – Special Features of ART1 Models – ART1 Algorithm - ART2 – Architecture – ART2 Algorithm - Applications –Character Recognition Using ART1 – Classification of Soil – Prediction of Load from Yield Line Patterns of Elastic Plastic Clamped Square Plate - Sensitivities of ordering of data.

SELF STUDY : Vector Quantization

UNIT IV

(12 Hours)

FUZZY LOGIC PRINCIPLES, CLASSICAL SETS AND FUZZY SETS

The Case for Imprecision - A Historical Perspective - The Utility of Fuzzy Systems - Limitations of Fuzzy Systems - The Illusion: Ignoring Uncertainty and Accuracy - Uncertainty and Information - The Unknown - Fuzzy Sets and Membership - Chance Versus Fuzziness - Sets as Points in Hypercubes - Classical Sets - Operations on Classical Sets - Properties of Classical (Crisp)

Sets - Mapping of Classical Sets to Functions - Fuzzy Sets - Fuzzy Set Operations - Properties of Fuzzy Sets - Alternative Fuzzy Set Operations.

SELF STUDY : Limitations of Fuzzy Systems

UNIT V

(12 Hours)

CLASSICAL RELATIONS AND FUZZY RELATIONS, PROPERTIES OF MEMBERSHIP FUNCTIONS, FUZZIFICATION, AND DEFUZZIFICATION

Cartesian Product - Crisp Relations - Cardinality of Crisp Relations - Operations on Crisp Relations - Properties of Crisp Relations - Composition - Fuzzy Relations - Cardinality of Fuzzy Relations - Operations on Fuzzy Relations - Properties of Fuzzy Relations - Fuzzy Cartesian Product and Composition - Tolerance and Equivalence Relations - Crisp Equivalence Relation - Crisp Tolerance Relation .

Features of the Membership Function - Various Forms - Fuzzification - Defuzzification to Crisp Sets - λ -Cuts for Fuzzy Relations - Defuzzification to Scalars.

SELF STUDY : Cartesian Product.

REFERENCES :

1. Rajasekaran. S.. Vijayalakshmi Pai. G.A. “Neural Networks, Fuzzy Logic and Genetic Algorithms”, Prentice Hall of India Private Limited, 2011
2. Timothy J.Ross, “Fuzzy logic with Engineering Applications”, McGraw Hill, 2011
3. S.Rajasekaran, G. A. Vijayalakshmi Pai “Neural Networks, Fuzzy Systems and Evolutionary Algorithms Synthesis and Applications” 2nd Edition, PHI 2017.
4. Laurance Fausett, “Fundamentals of Neural Networks”, Prentice hall, 2006.

WEB REFERENCES:

1. http://en.wikipedia.org/wiki/Neural_network
2. http://en.wikipedia.org/wiki/Fuzzy_logic
3. <https://books.google.co.in/books?isbn=8120321863>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Explore the functional components of artificial neural networks.	K2	PSO1 & PSO2
CO 2	Examine the principles of back propagation networks.	K2, K3, K4	PSO1 & PSO2
CO 3	Expose the students to the concepts of predicting the functionalities of ART.	K2 & K3	PSO1 & PSO3
CO 4	Analyze the logic principle of classical sets and fuzzy set operations in fuzzy set theory.	K2, K3 & K5	PSO1 & PSO4
CO 5	Identify the concept of fuzzification and defuzzification involved in various systems.	K2, K3 & K5	PSO1 & PSO5

GENERAL ELECTIVE - MCA

(For those who join in 2020 onwards)

PROGRAM ME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	20MCAGE01	OFFICE AUTOMATION TOOLS	GENERAL ELECTIVE	4	4

COURSE DESCRIPTION

This course enable the students in crafting professional word documents, excel spread sheets, power point presentations using the Microsoft suite of office tools and also preparation of documents and presentations with office automation tools.

COURSE OBJECTIVE

- ❖ Learn the various types of documentation using Word Processing S/w.
- ❖ Understand the design and create excellent programming types of process using function and having huge statistical report with charts and other process.
- ❖ Develop presentational Skills by Power Point and it's process to perform documentation

UNIT – I WORKING WITH DOCUMENTS

(12 Hours)

Introduction: Opening & Saving files, Editing text documents, Inserting, Deleting, Cut, Copy, Paste, Undo, Redo, Find, Search, Replace, Formatting page & setting Margins, Converting files to different formats, Importing & Exporting documents, Sending files to others, Using Tool bars, Ruler, Using Icons, using help.

Formatting Documents: Setting Font styles, Font selection- style, size, colour etc,

Type face: Bold, Italic, Underline, Case settings, Highlighting, Special symbols, Setting Paragraph style, Alignments, Indents, Line Space, Margins, Bullets & Numbering.

Setting Page style: Formatting Page, Page tab, Margins, Layout settings, Paper tray, Border & Shading, Columns, Header & footer, Setting Footnotes & end notes, Shortcut Keys, Inserting manual page break, Column break and line break, Creating sections & frames, Anchoring & Wrapping, Setting Document styles, Table of Contents, Index, Page Numbering, date & Time, Author etc., Creating Master Documents, Web page.

Creating Tables: Table settings, Borders, Alignments, Insertion, deletion, Merging, Splitting, Sorting, and Formula,

Drawing: Inserting ClipArts, Pictures/Files etc.,

Tools: Word Completion, Spell Checks, Mail merge, Templates, Creating contents for books, Creating Letter/Faxes, Creating Web pages, Using Wizards, Tracking Changes, Security, Digital Signature, Printing Documents, Shortcut keys.

UNIT – II SPREADSHEET

(12 Hours)

Introduction: Spread Sheet & its Applications, Opening Spreadsheet

Menus: main menu, Formula Editing, Formatting, Toolbars, Using Icons, Using help, Shortcuts, Spreadsheet types.

Working with Spreadsheets: opening, Saving files, setting Margins, Converting files to different formats, importing, exporting, sending files to others.

Spread sheet addressing: Rows, Columns & Cells, Referring Cells & Selecting Cells – Shortcut Keys.

Entering & Deleting Data: Entering data, Cut, Copy, Paste, Undo, Redo, Filling Continuous rows, columns, Highlighting values, Find, Search & replace, Inserting Data, Insert Cells, Column, rows & sheets, Symbols, Data from external files, Frames, Clipart, Pictures, Files etc, Inserting Functions, Manual breaks.

UNIT – III Advanced SPREADSHEET

(12 Hours)

Setting Formula: finding total in a column or row, Mathematical operations, Using other Formulae.

Formatting Spreadsheets: Labelling columns & rows, Formatting- Cell, row, column & Sheet

Category – Alignment: Font, Border & Shading, Hiding/ Locking Cells, Anchoring objects, Formatting layout for Graphics, Clipart etc., Worksheet Row & Column Headers, Sheet Name, Row height & Column width,

Visibility: Row, Column, Sheet, Security, Sheet Formatting & style, Sheet background, Colour etc, Borders & Shading – Shortcut keys.

Calculations: Sorting, Filtering, Validation, Consolidation, and Subtotal, Creating Charts - Drawing. Printing, Error checking, Spell Checks, Formula Auditing, Creating & Using Templates, Pivot Tables, Tracking Changes, Security, Customization.

UNIT – IV DATABASE AND REPORTS

(12 Hours)

Introduction: Planning a Database, Starting Access, Access Screen

Database: Creating a New Database, Creating Tables, Working with Forms, Creating queries, Finding Information in Databases

Reports: Creating Reports, Types of Reports, Printing & Print Preview, Importing data from other databases.

UNIT – V PRESENTATION

(12 Hours)

Introduction: Opening new presentation, Different presentation templates, Setting backgrounds, Selecting presentation layouts, Creating a presentation, Setting Presentation style, Adding text to the Presentation.

Formatting a Presentation: Adding style, Colour, gradient fills, Arranging objects, Adding Header & Footer, Slide Background, Slide layout.

Adding Graphics: Inserting pictures, movies, tables etc into presentation, Drawing Pictures using Draw.

Adding Effects: Setting Animation & transition effects, Printing Handouts, Generating Standalone Presentation viewer.

REFERENCES:

1. Vikas Gupta, “Comdex Information Technology course tool kit”, WILEY Dreamtech, 2008
2. Schmidt Cheryl A, “The Complete Computer upgrade and repair book”,3rd edition, WILEY Dreamtech
3. Archana Kumar, “Computer Basics with Office Automation”, I.K. International Publishing House Pvt. Limited, 2010.
4. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.

WEB REFERENCES:

1. <https://khpditweebly.weebly.com/office-automation>
2. <https://books.google.co.in/books?id=iLRHDwAAQBAJ&printsec=frontcover&dq=Introduction+to+Information+Technology>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Identify current and emerging word processing technologies to produce organizational documents	K2	PSO1 & PSO2
CO 2	Develop, open and explore the Microsoft Office Excel environment	K2, K3, K4	PSO1 & PSO2
CO 3	Design and edit charts and graphs with the use of functions and formulas.	K2 & K3	PSO1 & PSO3
CO 4	Implement and query a database using different methods	K2, K3 & K5	PSO1 & PSO4
CO 5	Generate slide presentations that include text, graphics, animation, and transitions.	K2, K3 & K5	PSO1 & PSO5

GENERAL ELECTIVE - MCA

(For those who join in 2020 onwards)

PROGRAM ME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	20MCAGE02	FINANCIAL MANAGEMENT AND ACCOUNTING	GENERAL ELECTIVE	4	4

COURSE DESCRIPTION

This course provides an overview of financial concepts, process and operations from a managerial perspective.

COURSE OBJECTIVE

- ❖ To define the set of accounting method and disclosure practices from which firms select when providing information to external parties.
- ❖ The primary emphasis is to assist in developing the skills required to interpret, analyze and evaluate information contained in published financial statements.

UNIT I ACCOUNTING

(12 Hours)

Principles, Basic accounting concepts and conventions, journal, ledger – final accounts.

SELF STUDY: Ledger

UNIT II COSTING

(12 Hours)

Introduction to costing - cost elements - Classification of costing- Materials - Stock levels – FIFO, LIFO, Simple Average Method, Weighted Average Method (simple problem only)

SELF STUDY: Classification of costing

UNIT III FUND FLOW AND CASH FLOW STATEMENT (12 Hours)

Meaning –objective- preparation of fund flow statement and cash flow statements.

SELF STUDY: Objective

UNIT IV (12 Hours)

BUDGET AND BUDGETARY CONTROL:

Nature and scope, Importance.

MARGINAL COSTING:

Nature, scope and importance, Break-even analysis, Uses and limitations.

SELF STUDY: Uses and limitations

UNIT V TALLY (12 Hours)

Introduction to tally – Accounting Information – Vouchers – Inventory – Purchase/Sales Orders – Invoices – Reports – Important Features of Tally.

SELF STUDY: Invoices

REFERENCES :

1. T.S.Reddy & A.Murthy, “Advanced Accountancy”, Margham Publications , 2nd Revised Edition, 2014.
2. T.S.Reddy & Y.Hari Prasad Reddy, ”Cost Accounting” ,Margham Publications, Fourth Revised Edition, 2015.
3. T.S Reddy & Y.Hari Prasad Reddy, “Management Accounting”, Margham Publications Third Revised Edition- 2014.
4. S. Palanivel,“Tally 9: Accounting Software”, Margham Publications, 2015.
5. A.K.Nadani, “Simple Tally 9” BPB Publications, 2010.
6. R.L.Gupta & M.Radhaswamy, “Advanced accountancy”, Sultan chand & co, 2014.

7. S.N.Maheswari “Principles of Management accounting”, Sultan Chand & co, 2014.
8. R.S.N.Pillai & B.Bagavathi, “Cost accounting”, Sultan Chand & co, 2014.

WEB REFERENCES:

1. [https:// en.wikipedia.org/wiki/Financial_management](https://en.wikipedia.org/wiki/Financial_management)
2. <https://www.managementstudyguide.com/financial-management.htm>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Preparation and analysis of balance sheet.	K2	PSO1 & PSO2
CO 2	Predict the Classification of Costing.	K2, K3, K4	PSO1 & PSO2
CO 3	Decide the budget preparation and control of a company.	K2 & K3	PSO1 & PSO3
CO 4	Analyze the flow of funds.	K2, K3 & K5	PSO1 & PSO4
CO 5	Use Tally to implement the needs of financial accounting.	K2,K3 & K5	PSO1 & PSO5

GENERAL ELECTIVE - MCA

(For those who join in 2020 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	20MCAGE03	ORGANIZATIONAL BEHAVIOUR	GENERAL ELECTIVE	4	4

COURSE DESCRIPTION

This course provides solution to learn challenges and opportunities in organizations from a behavioural perspective.

COURSE OBJECTIVE

- ❖ To develop an Organisational Behaviour model for any type of Organization.
- ❖ To develop and improve the quality of Leadership.
- ❖ To evaluate the Common biases and eradication in Decision Making Process.
- ❖ To understand how to manage the Stress during a job.

UNIT I INTRODUCTION

(12 Hours)

Introduction to Organizational Behaviour(OB), Contributing disciplines to OB Field, challenges and opportunities for OB, Developing an OB Model, Foundation of Individual Behaviour, Ability - Learning. Values, Attitudes and Types of Attitudes. Job satisfaction- Measuring Job satisfaction, Effect of Job satisfaction on employee performance.

SELF STUDY: Values, Attitudes

UNIT II PERSONALITY AND VALUES

(12 Hours)

Personality determinants, Achieving personality fit, Factors Influencing perception, Attribution Theory, Perception / Individual Decision Making: Ethics

in Decision Making. Motivation, Management by Objectives, Employee Recognition programs, Employee Involvement programs, Variable Pay Programs.

SELF STUDY: Ethics in Decision Making

UNIT III UNDERSTANDING WORK TEAMS

(12 Hours)

Teams Vs Groups – Types of Teams, Creating Effective Teams – Turning Individuals into Team Players. **Communication:** Functions of Communication, Communication Process – Direction of communication, Interpersonal and Organizational communication, Barriers of effective communication, Current issues in Communication.

SELF STUDY: Communication Process

UNIT IV LEADERSHIP & ORGANIZATIONAL STRUCTURE

(12 Hours)

Leadership – Meaning, Trait Theories – Behavioural Theories, Contingency Theories, Contemporary issues in Leadership, The foundation of leadership. Inspirational approach – Emotional intelligence. Foundations of Organization structure, Meaning of Organizational structure – Common organizational Designs, New Design Options – Organizational Designs and Employee Behaviour

SELF STUDY: Contemporary issues in Leadership

UNIT V ORGANIZATIONAL CULTURE, CHANGE & STRESS MANAGEMENT

(12 Hours)

Organizational culture: Meaning – Creating and sustaining culture, How employees learn culture, creating an ethical organizational culture, creating a customer responsive culture, spirituality and organizational culture. Organizational change and Stress Management: Approaches to Managing

organizational change, Creating a Culture, Change in Business, Work stress and its Management.

SELF STUDY: Work stress

REFERENCES :

1. Stephen P. Robbins, "Organisational Behaviour", 11th Edition, Pearson Education, 2009.
2. Uma Sekaran," Organisational Behaviour", 2nd Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2010.
3. 2. Sharma, R.A," Organisational Theory and Behaviour", 2nd Edition, Tata McGraw-Hill Ltd.,New Delhi, 2007.

WEB REFERENCES:

1. https://www.tutorialspoint.com/organizational_behavior/index.htm
2. <https://www.geektonight.com/organizational-behavior-tutorial/>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Develop an Organisational Behaviour model for any type of Organization	K2	PSO1 & PSO2
CO 2	Understand the Ethics in Decision Making	K2, K3, K4	PSO1 & PSO2
CO 3	Develop and improve the quality of Leadership	K2 & K3	PSO1 & PSO3
CO 4	Evaluate the Common biases and eradication in Decision Making Process	K2, K3 & K5	PSO1 & PSO4
CO 5	Understand how to manage the Stress during a job	K2,K3 & K5	PSO1 & PSO5

GENERAL ELECTIVE - MCA

(For those who join in 2020 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCA	20MCAGE04	E-COMMERCE	GENERAL ELECTIVE	4	4

COURSE DESCRIPTION

This course provides information on the combination of Internet with E-Commerce, options available for doing business on the Internet, features that helps to build E-Commerce web sites, marketing issues, payment options, security issues and customer service.

COURSE OBJECTIVE

- ❖ To illustrate the management's role and identify strategies involved in an e-commerce model.
- ❖ To provide a fundamental understanding of the different types and key components on business models.
- ❖ To become familiar with state of the art Electronic Model, Payment and Supply Chain Mechanisms..

UNIT – I INTRODUCTION TO ELECTRONIC COMMERCE (12 Hours)

Introduction to electronic commerce - What is electronic commerce?, Benefits of electronic commerce, Impact of electronic commerce, Classification of electronic commerce, Application of electronic commerce technologies.

SELF STUDY : Benefits of Electronic Commerce

UNIT II ELECTRONIC COMMERCE: BUSINESS MODELS (12 Hours)

What is business models?, Native content based models -Information content model, Information exchange model, Transplanted content model - Subscription model, Advertising model, Affiliate model, Native transaction

models - Digital products merchant model, Web hosting and internet services, Metamediary , Transplanted transaction models - Electronic store model, Brokerage model.

SELF STUDY : Electronic store model

UNIT III

(12 Hours)

ELECTRONIC COMMERCE: NETWORK INFRASTRUCTURE

Local area network, Topologies, Transmission media, Wireless transmission, Wide area network, Internet, TCP/IP reference model.

SELF STUDY : Local area network

UNIT IV ELECTRONIC PAYMENT SYSTEMS

(12 Hours)

Online payment systems, Pre-paid electronic payment systems - Ecash, Mondex, Milicent, Netbill, Post-paid electronic systems - Ikp, Cybercash, SET, Netcheque, First Virtual.

SELF STUDY : Milicent

UNIT V SECURING NETWORK TRANSACTION

(12 Hours)

Transaction security, security services, Cryptology - Introduction to cryptography, Cryptanalysis, Conventional Encryption Model, Public key Cryptosystems, Comparison of conventional and public key encryption systems, Digital signatures, Electronic mail security.

SELF STUDY : Electronic mail security

REFERENCES :

1. Bharat Bhaskar, “Electronic Commerce – Framework Technologies and Applications”, Tata McGraw Hill 4thEdition ,2013.
2. P.T. Joseph, “Ecommerce An Indian Perspective”, 6th Edition, PHI Learning Pvt. Ltd, 2019.
3. Saimunur Rahman , Introduction to E-Commerce Technology in Business, GRIN Publishing 2014.
4. Amir Manzoor, Ecommerce An Introduction, Lambert Academic Publishing, 2010.

WEB REFERENCES:

1. <https://en.wikipedia.org/wiki/E-commerce>
2. <https://www.shopify.com/encyclopedia/what-is-ecommerce>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Gain a comprehensive understanding of the E-Commerce landscape, current and emerging technology and infrastructure underpinnings of the business.	K2	PSO1 & PSO2
CO 2	Analyze the impact of E-commerce on business models and strategy.	K2, K3, K4	PSO1 & PSO2
CO 3	Develop an understanding on how internet can help business grow/ Describe the infrastructure for E-commerce	K2 & K3	PSO1 & PSO3
CO 4	Assess electronic payment systems	K2, K3 & K5	PSO1 & PSO4
CO 5	Gain an understanding on the importance of security, privacy, and ethical issues as they relate to E-Commerce.	K2,K3 & K5	PSO1 & PSO5

GENERAL ELECTIVE - MCA

(For those who join in 2020 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCA	20MCAGE05	ETHICS IN COMPUTING	GENERAL ELECTIVE	4	4

COURSE DESCRIPTION

This course provides the basis for ethical decision-making and the methodology for reaching ethical decisions concerning computing matters.

COURSE OBJECTIVE

- ❖ To construct defensible arguments from an ethical point of view concerning the issue of computer hacking.
- ❖ To have an overview knowledge of protective measures against computer crime.
- ❖ To comprehend relevant legislation and international initiatives for equal rights.
- ❖ To compare knowledge of different existing ethics frameworks and professional ethics standards for computer professionals.

UNIT – I INTRODUCTION

(12 Hours)

Computer Ethics- an overview- Identifying an ethical issue – Ethics and the law – Ethical theories – Professional Codes of conduct – An ethical dilemma – Framework for ethical decision making - Computer Hacking – Introduction – Definitions – Destructive Programs – Hacker Ethics – Legal constraints – Professional Constraints – Ethical positions on hacking – Ethical Dilemma.

SELF STUDY : Activities: Ethics and the law - Arguments against hacking

UNIT II INTERNET CRIME AND IPR

(12 Hours)

Aspects of Internet Crime - Introduction – What is Computer Crime – computer Security Measures – The Computer misuse Act – Professional duties and obligations - Intellectual property rights - Introduction - The nature of intellectual property - Intellectual property legislation - The extent and nature of software piracy - Ethical and professional issues - Free software and open source code - An ethical dilemma.

SELF STUDY : Researching a computer crime case

UNIT III INTERNET TECHNOLOGIES AND PRIVACY

(12 Hours)

Regulating Internet content - Introduction - In defence of freedom of expression - Censorship - Laws upholding free speech - Free speech and the Internet - Ethical and professional issues - An ethical dilemma - Personal privacy and computer technologies Introduction - Valuing privacy – Internet technologies and privacy - Privacy legislation - The Data Protection Act, 1998 -Professional and ethical issues - An ethical dilemma

SELF STUDY : Internet Technologies and free expression

UNIT IV EMPOWERING COMPUTERS IN THE WORKPLACE

(12 Hours)

Computer technologies: accessibility issues - Introduction - Principle of equal access -Obstacles to access for individuals - Legislation - Enabling the disabled – Professional responsibility - An ethical dilemma - Empowering computers in the workplace - Introduction - Computers and employment - Computers and the quality of work - Computerised monitoring in the workplace – Telecommuting.

SELF STUDY : Obstacles to equal access – Monitoring illegal activities

UNIT V TOWARDS THE FUTURE

(12 Hours)

The failure of IT projects - Introduction - The problems of producing successful IT projects - How the profession is addressing the problem of IT failure - The relationship between professional codes of conduct and IT projects - An overview of national legislation - Towards the future: some ethical and social questions - Introduction - The database society - Restricting choice: digital rights management - Review of the ethical dilemmas - The pace of change.

SELF STUDY : Inferring personal information.

REFERENCES

1. Penny Duquenoy, Simon Jones, Barry G Blundell , “Ethical, Legal and Professional Issues in Computing”, Middlesex University Press, 2008
2. George Reynolds, “Ethics in Information Technology”, 2nd Edition, Thomson CourseTechnology.
3. Charles P .Pfleeger, Shari Lawrence Pfleeger, “Security in Computing”, 4th Edition,Pearson Prentice Hall.

WEB REFERENCES:

1. http://www.infosectoday.com/Articles/Intro_Computer_Ethics.htm
2. http://www.tutorialspoint.com/professional_ethics/

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Predict the relationship between the law, ethics and computer technology	K2	PSO1
CO 2	Outline the philosophical and ethical debates with the ideas and the nature of intellectual creativity.	K2, K3, K4	PSO2 & PSO4
CO 3	Design the impact of computer technology on free speech.	K2 & K3	PSO3
CO 4	Formulate the ethical and legal issues of the impact that computing technologies had on workplace.	K2, K3 & K5	PSO2 & PSO4
CO 5	Develop a personal standpoint in relation to DataBase society and the usage of biometric data	K2,K3 & K5	PSO2 & PSO5

GENERAL ELECTIVE - MCA

(For those who join in 2020 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	20MCAGE06	RESOURCE MANAGEMENT TECHNIQUES	GENERAL ELECTIVE	4	4

COURSE DESCRIPTION

This course provides solution to problems in different environment that needs decision making using optimization techniques

COURSE OBJECTIVE

- ❖ To provide the concept and an understanding of basic concepts in Operations Research Techniques for Analysis and Modeling in Computer Applications.
- ❖ To understand, develop and solve mathematical model of linear programming problems.
- ❖ To understand, develop and solve mathematical model of Transport and assignment problems.
- ❖ To understand network modeling for planning and scheduling the project activities

UNIT I INTRODUCTION

(12 Hours)

Operations Research – An Introduction- Features- Definition- Scientific Method- Models- Methods for solving OR Models- Methodology of OR- Advantages- Applications and Scope- LPP Model formulation – LPP Graphical Solution.

SELF STUDY: Advantages- Applications and Scope

UNIT II LINEAR PROGRAMMING PROBLEM

(12 Hours)

LPP - Standard form – Definition- Reduction of Feasible solution to a basic feasible solution- Simplex algorithm (Maximization Case) - Simplex algorithm (Minimization Case).

SELF STUDY: Reduction of Feasible solution to a basic feasible solution

UNIT III TRANSPORTATION & ASSIGNMENT PROBLEM

(12 Hours)

Transportation Problem – Initial Basic Feasible solution – North West Corner Method- Least Cost method- Vogel's Approximation Method- MODI Method- Unbalanced Transportation Problem. Assignment Problem – Hungarian Assignment Method

SELF STUDY: Unbalanced Transportation Problem

UNIT IV GAME THEORY

(12 Hours)

Game Theory- Two persons zero sum game- Games with saddle point- Games without saddle point- Graphical Method- LP Method- The rule of dominance

SELF STUDY: LP Method

UNIT V PERT & CPM

(12 Hours)

Project Management: PERT and CPM – Difference between PERT and CPM- Critical Path analysis- Problems in PERT analysis- Project , Time, Cost Trade off- Resource allocation.

SELF STUDY: Difference between PERT and CPM

REFERENCES :

1. J.K. Sharma , “Operations Research- Problems and Solutions”,Macmillan Publishers India Ltd,3 rd Edition, 2009.
2. KantiSwarup ,P.K.Gupta, Manmohan , “Operations Research”, 13 th Edition, 2008.
3. S. Kalavathy , “Operations Research”,Vikas publishing house private Ltd, 4th Edition,2013.
4. R. Paneerselvam, “Operations Research”, PHI learning Pvt Ltd, 2nd Edition, 2012.

WEB REFERENCES:

1. <https://lecturenotes.in/subject/573/operations-research-or>
2. <http://www.cs.toronto.edu/~stacho/public/IEOR4004-notes1.pdf>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Identify the applications of Operations Research and methods to solve business problems	K2	PSO1 & PSO2
CO 2	Apply linear programming to solve operational problem with constraints	K2, K3, K4	PSO1 & PSO2
CO 3	Apply transportation and assignment models to find optimal solution in warehousing and Travelling,	K2 & K3	PSO1 & PSO3
CO 4	Prepare project scheduling using PERT and CPM	K2, K3 & K5	PSO1 & PSO4
CO 5	Use optimization concepts in real world problems	K2,K3 & K5	PSO1 & PSO5

GENERAL ELECTIVE - MCA

(For those who join in 2020 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	20MCAGE07	ENTREPRENEURSHIP DEVELOPMENT	GENERAL ELECTIVE	4	4

COURSE DESCRIPTION

This course provides the skills necessary to succeed as an entrepreneur. It includes the fundamentals of starting and operating a business, developing a business plan, obtaining financing, marketing a product or service and developing an effective accounting system

COURSE OBJECTIVE

- ❖ Understand the need of entrepreneurial discipline.
- ❖ To let the entrepreneur set or reset the objectives of his business and work individually and along with his group.
- ❖ Analyze the environment set up relating to small industry and business.

UNIT – I ENTREPRENEUR

(12 Hours)

Introduction – Evolution of the Concept of Entrepreneur – Characteristics of Successful Entrepreneurs – The Charms of Becoming an Entrepreneur – The Entrepreneurial Decision Process – Functions of Entrepreneur – Need for an Entrepreneur- Types of Entrepreneurs- Distinction between an Entrepreneur and a manager –Entrepreneur – Social Entrepreneur.

SELF STUDY : Social Entrepreneur

UNIT II ENTREPRENEURIAL COMPETENCIES

(12 Hours)

Meaning of Entrepreneurial Competency – Major Entrepreneurial Competencies – Developing Entrepreneurial Competencies – Factors Affecting Entrepreneurship Growth: Factors Affecting Entrepreneurship- Economic Factors – Non- economic Factors – Government Actions.

SELF STUDY :Government Actions.

UNIT III WOMEN ENTREPRENEURSHIP

(12 Hours)

Concept of Women Entrepreneur – Functions of Women Entrepreneurs – Growth of Women Entrepreneurship in India – Problems of Women Entrepreneurs – Developing Women Entrepreneurship.

SELF STUDY : Problems of Women Entrepreneurs

UNIT IV EDPS, INSTITUTIONAL FINANCE TO ENTREPRENEURS(12 Hours)

Meaning of EDP – Need for EDPs – Objectives of EDPs – Entrepreneurship Development Programmes (EDPs) in India: A Historical Perspective – Course Contents and Curriculum of EDPs – Phases of EDP- Evaluation of EDPs – Problems of EDPs - Need for Institutional Finance – Institutional Finance- Commercial Banks – Other Financial Institutions.

SELF STUDY : Other Financial Institutions

UNIT V

(12 Hours)

PROJECT APPRAISAL , FORMULATION OF BUSINESS PLANS

Concept of Project Appraisal – Methods of Project Appraisal – Economic Analysis – Financial Analysis – Market Analysis – Technical Feasibility – Managerial Competence – Environmental Clearance for SMEs – Environmental Restrictions for SSI Sector – The Environmental clearance Process - Meaning of Business Plan- Contents of Business Plan – Significance of Business Plan – Formulation of Business Plan – Planning Commission’s Guidelines for Formulating Project Report – Network Analysis – Business Plan Formulation.

SELF STUDY : The Environmental clearance Process

REFERENCES:

1. S S Khanka , “Entrepreneurial Development”, S. Chand Publishing Revised edition ,2020
2. S Anil Kumar, “Entrepreneurship Development” new age international publishers edition, 2003
3. Janakiram B, “Entrepreneurship Development: Text and Cases” Excel Books India, 2011

WEB REFERENCES:

1. https://www.tutorialspoint.com/entrepreneurship_development/entrepreneurship_development_tutorial.pdf
2. https://www.macmillanihe.com/resources/sample-chapters/9781137430359_sample.pdf

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Highlight the salient characteristics of successful entrepreneur	K2	PSO1 & PSO2
CO 2	Enumerate the competencies relevant for Entrepreneurial development.	K2, K3, K4	PSO1 & PSO2
CO 3	Delineate the growth of women Entrepreneurship in India.	K2 & K3	PSO1 & PSO3
CO 4	Identify the major problems faced in conducting EDPs.	K2, K3 & K5	PSO1 & PSO4
CO 5	Discuss the methods of project appraisal used for small scale enterprises.	K2,K3 & K5	PSO1 & PSO5

GENERAL ELECTIVE - MCA

(For those who join in 2020 onwards)

PROGRAM ME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	20MCAGE08	WIRELESS SENSOR NETWORKS	GENERAL ELECTIVE	4	4

COURSE DESCRIPTION

This course provides knowledge on the architectures, functions and performances of wireless sensor systems and platforms. It also describes and analyze the specific requirements for applications in wireless sensor networks regarding energy supply, memory, processing and transmission capacity.

COURSE OBJECTIVE

- ❖ To understand the fundamental architecture of wireless and sensor networks
- ❖ To analyse the role of physical and data link layer and its protocol.
- ❖ To understand the impact of time synchronization, localization and positioning in WSN.
- ❖ To learn the rules of routing protocols in WSN.

UNIT I

(12 Hours)

INTRODUCTION - Challenges for Wireless Sensor Networks – Mobile ad hoc networks and wireless Sensor Networks – field buses and Wireless Sensor Networks – enabling Technologies for wireless sensor networks.

ARCHITECTURES – Single Node Architecture - Hardware Components – Energy Consumption of sensor nodes – Operating systems and execution environments - Examples of sensor nodes

NETWORK ARCHITECTURE – Sensor network scenarios – Optimization Goals and figures of merit – Design principles of WSN

SELF STUDY: Enabling Technologies for wireless sensor networks, Examples of sensor nodes

UNIT II **(12 Hours)**

MAC PROTOCOLS – fundamentals of MAC protocols - Low duty cycle protocols and wakeup concepts- contention based protocols – schedule based protocols – the IEEE 802.15.4 MAC protocol

LINK LAYER PROTOCOLS – Fundamentals - Error control - Framing – Link management

SELF STUDY: Link management

UNIT III **(12 Hours)**

TIME SYNCHRONIZATION - Introduction – Protocols

LOCALIZATION AND POSITIONING – Properties of localization and positioning procedures – Mathematical basics for the lateration problem – single hop localization – Positioning in multi hop environment – Impact of anchor placement.

TOPOLOGY CONTROL – Motivation and basic ideas – Controlling topology in flat networks – power control – Hierarchical networks by dominating sets – hierarchical networks by clustering

SELF STUDY: Properties of localization and positioning procedures

UNIT IV **(12 Hours)**

ROUTING PROTOCOLS – Gossiping and agent based uni cast forwarding – energy efficient unicast – broadcast and multicast – Geographic routing –

Mobile nodes - Data centric and content based networking – Introduction – Data centric routing – data aggregation – data centric storage

SELF STUDY: Geographic routing – Mobile nodes

UNIT V

(12 Hours)

TRANSPORT LAYER AND QUALITY OF SERVICE - Transport layer and QoS in wireless sensor networks – Congestion control and rate control

ADVANCED APPLICATION SUPPORT – advanced network processing – Security – Application specific support

SELF STUDY: Congestion control and rate control

REFERENCES :

1. Holger Karl & Andreas Willig, “Protocols and Architectures for Wireless Sensor Networks” , John Wiley, 2006
2. Carlos De MoraesCordeiro, Dharma Prakash Agrawal, “Ad Hoc and Sensor Networks: Theory and Applications”,2nd Edition, World Scientific Publishing, 2011.
3. WaltenegeDargie, Christian Poellabauer,“Fundamentals of Wireless Sensor Networks Theory and Practice”,John Wiley and Sons, 2010.
4. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach”, Elsevier, 2007.

WEB REFERENCES:

1. <https://www.elprocus.com/architecture-of-wireless-sensor-network-and-applications/>
2. https://en.wikipedia.org/wiki/wireless_sensor_network

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Explore the impact of WSN and its hardware components.	K2	PSO1 & PSO2
CO 2	Analyze the different protocols in MAC and Link layer	K2, K3, K4	PSO1 & PSO2
CO 3	Apply the concepts of localization, time synchronization and positioning in WSN	K2 & K3	PSO1 & PSO3
CO 4	Perform data routing and data aggregation	K2, K3 & K5	PSO1 & PSO4
CO 5	Design simple applications using sensor nodes incorporating security features.	K2,K3 & K5	PSO1 & PSO5

GENERAL ELECTIVE - MCA

(For those who join in 2020 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCA	20MCAGE09	RESEARCH METHODOLOGY	GENERAL ELECTIVE	4	4

COURSE DESCRIPTION

This course provides an overview of various methods employed in quantitative and qualitative research.

COURSE OBJECTIVE

- ❖ Understand the basic concepts of research and its methodologies.
- ❖ Identify a research problem stated in a study.
- ❖ Prepare a conventional research report / thesis.

UNIT I INTRODUCTION

(12 Hours)

An Introduction: – Meaning of research – Objective of research – Motivation in research – Types of research – Research approaches – Significance of research – Research methods versus Methodology – Research and scientific method – Importance of knowing how research is done – Research process – Criteria of good research – Problems encountered by researchers in India

SELF STUDY: Types of research

UNIT II DEFINING THE RESEARCH PROBLEM

(12 Hours)

Defining the research problem: What is research problem? – Selecting the problem – Necessity of defining the problem - Research Design: Meaning of research design – Need for research design –Features of a good design – Important concepts relating to research design – Different research designs – Basic principles of experimental designs.

SELF STUDY: Research problem

UNIT III MEASUREMENT AND SCALING TECHNIQUES (12 Hours)

Measurement and scaling techniques: Measurement in research – Measurement scales – Sources of error in measurement – Tests of sound measurement – Technique of developing measurement tools – scaling – Meaning of scaling – Scale classification bases- Important scaling techniques – Scale construction techniques - Methods of Data Collection: Collection of primary data – Observation method – Interview method – Collection of data through schedules – Difference between Questionnaires and schedules – Some other methods of data collection – Collection of secondary data – Selection of appropriate method for data collection – Case study method

SELF STUDY: Case study method

UNIT IV PROCESSING AND ANALYSIS OF DATA (12 Hours)

Processing and Analysis of Data: Processing operations – Some problems in processing – Elements/Types of Analysis- Statistics in research – Measures of central tendency – Measures of dispersion – Measures of Asymmetry – Measures of relationship – Simple regression analysis – Multiple correlation and regression – Partial correlation – Association in case of attributes

UNIT V TESTING OF HYPOTHESES (12 Hours)

What is a Hypothesis? – Basic concepts concerning testing of Hypotheses - Procedure for Hypothesis testing – Measuring the power of a Hypothesis testing – Tests of Hypotheses- Important parametric tests – Hypothesis testing of means – Hypothesis testing for differences between means - Interpretation and report writing: Meaning of interpretation – Why interpretation? – Technique of interpretation – Precaution in interpretation – Significance of report writing – Different steps in writing report – Layout of the research report – Types of reports – Oral Presentation – Mechanics of writing a research report – Precautions for writing research reports

SELF STUDY: Types of reports

REFERENCES :

1. Kothari, C.R (2013), “Research Methodology – Methods and Techniques”, 2ND Edition. Wiley Eastern Limited
2. R. Panneerselvam, “Research Methodology”, 4th Edition. Prentice Hall India Learning Private Limited, 2014
3. Ranjit Kumar, “Research Methodology – A step- by-step guide for beginners”, 3rd Edition. Pearson Education, 2011
4. Deepak Chawla and NeenaSondh , “Research Methodology, Concepts and Cases”, VikasPublishingHousePvt. Ltd., 2011

WEB REFERENCES:

1. https://edutechwiki.unige.ch/en/Research_methodology_resources
2. <https://csus.libguides.com/>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Predict the different stages of research process.	K2	PSO1 & PSO2
CO 2	Apply methods to collect best data.	K2, K3, K4	PSO1 & PSO2
CO 3	Assess the suitable research design & work.	K2 & K3	PSO1 & PSO3
CO 4	Compare categorical and continuous measures.	K2, K3 & K5	PSO1 & PSO4
CO 5	Analyze the process of various reports writing.	K2, K3 & K5	PSO1 & PSO5

GENERAL ELECTIVE - MCA

(For those who joined in 2020 onwards)

PROGRAM ME CODE	COURSE CODE	COURSE TITLE	CATEGOR Y	HRS/WEE K	CREDIT S
PSCA	20MCAGE10	DIGITAL IMAGE PROCESSING	GENERAL ELECTIVE	4	4

COURSE DESCRIPTION

This course provides an introduction to the basic concepts, methodologies and algorithms of digital image processing focusing image enhancement, image analysis and object recognition.

COURSE OBJECTIVES

- ❖ To study the image fundamental principles and mathematical transforms necessary for image processing.
- ❖ To learn the image enhancement, restoration techniques used in digital image processing.
- ❖ To understand about color images and compression techniques

UNIT I

(12 Hours)

INTRODUCTION AND DIP FUNDAMENTALS

DIP Definition - Origin of DIP- Fundamental steps in DIP - Elements of Visual Perception- Image sampling and Quantization

SELF STUDY: Some basic Relationships between pixels

UNIT II

(12 Hours)

INTENSITY TRANSFORMATION AND SPATIAL FILTERING

Background- Smoothing spatial filters- Sharpening spatial filters.

SELF STUDY: basic intensity transformation

UNIT III

(12 Hours)

IMAGE RESTORATION AND RECONSTRUCTION

Model - Restoration in the process of noise only Spatial filtering - mean filters- Order statistic filters- Adaptive filters – Periodic noise reduction by Frequency domain filtering- Band Reject filters - Band pass filter - Notch Filter- Optimum Notch Filtering.

SELF STUDY :Noise Models

UNIT IV

(12 Hours)

COLOR IMAGE PROCESSING

Color Fundamentals - Color Models – Pseudo color image processing- Basis of full color image processing- Color Transformations - Smoothing and Sharpening Image segmentation based on Color - Noise in color images - Color image compression.

SELF STUDY:Color components

UNIT V

(12 Hours)

IMAGE COMPRESSION

Huffmann Coding- LZW coding- Run Length coding- Digital Image Watermarking.

SELF STUDY:Arithmetic Coding.

REFERENCES

1. Rafael C. Gonzalez, Richard E.,“Digital Image Processing”, 3rd Edition- Woods Pearson India Education Pvt. Ltd.- 2016
2. Scott Umbaugh, “Computer Vision and Image Processing- a practical approach using CVIP tools”
3. Anil K.Jain, “Fundamentals of Digital Image Processing”, Person Education, 2003.

WEB REFERENCES

1. <https://imagej.net/Welcome>
2. <https://imagej.nih.gov/ij/docs/examples/index.html>

3. COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	To review the fundamental concepts of a digital image processing system.	K2	PSO1 & PSO2
CO 2	To examine various types of images, their intensity transformations and spatial filtering.	K2, K3, K4	PSO1 & PSO2
CO 3	To analyze the different types of noises and the filters used to restore and reconstruct the images.	K2 & K3	PSO1 & PSO3
CO 4	To create color images and pseudo images with smoothing and sharpening techniques.	K2, K3 & K5	PSO1 & PSO4
CO 5	To compare the various lossy and lossless compression mechanisms.	K2, K3 & K5	PSO1 & PSO5

GENERAL ELECTIVE - MCA

For those who joined in 2020 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCA	20MCAGE11	CLOUD COMPUTING	GENERAL ELECTIVE	4	4

COURSE DESCRIPTION

This course provides a comprehensive study of cloud concepts and capabilities across the various Cloud service models including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), and Identity as a Service (IDaaS).

COURSE OBJECTIVES

- ❖ To introduce the broad perspective of cloud architecture and model
- ❖ To Gain knowledge on the concept of Virtualization and design of cloud Services
- ❖ To understand the issues on cloud storage & security.

UNIT -I

(12 HRS.)

BASICS OF CLOUD COMPUTING AND CLOUD ARCHITECTURE

Defining Cloud Computing - Cloud Types - The NIST model - The Cloud Cube Model Deployment models Service models -Examining the Characteristics of Cloud Computing - Paradigm shift Benefits of cloud computing Disadvantages of cloud computing - Assessing the Role of Open Standards

Understanding Cloud Architecture - Exploring the Cloud Computing Stack - Infrastructure - Platforms - Virtual Appliances - Communication Protocols – Applications

SELF STUDY :Connecting to Cloud - The Jolicloud Netbook OS - Chromium OS

UNIT –II CLOUD SERVICES AND APPLICATIONS

(12 HRS.)

Understanding Services and Applications by Type - Defining Infrastructure as a Service (IaaS) - IaaS workloads - Pods, aggregation, and silos - Defining Platform as a Service (PaaS) - Defining Software as a Service (SaaS) - SaaS characteristics - Open SaaS and SOA - Salesforce.com and CRM SaaS

SELF STUDY : Defining Identity as a Service (IDaaS) - IDaaS interoperability - User authentication and Authorization

UNIT –III ABSTRACTION VS. VIRTUALIZATION

(12 HRS.)

Understanding Abstraction and Virtualization - Using Virtualization Technologies -Load Balancing and Virtualization - Advanced load balancing - The Google cloud - Understanding Hypervisors -Virtual machine types - VMware vSphere - Understanding Machine Imaging - Porting Applications - The Simple Cloud API - AppZero Virtual Application Appliance

Using PaaS Application Frameworks – Drupal - Using SaaS Application Frameworks - Google App Engine – Using IaaS Application Frameworks - Amazon Elastic Compute Cloud (EC2) - Windows Azure.

SELF STUDY : Virtualization Practicum

UNIT –IV CLOUD MANAGEMENT AND CLOUD SECURITY

(12 HRS.)

Managing the Cloud - Administrating the Clouds - Management responsibilities - Lifecycle management - Cloud Management Product - Emerging Cloud Management Standards - Cloud Security - Securing the Cloud - The security boundary - Security service boundary - Security mapping - Securing Data - Brokered cloud storage access - Storage location and tenancy - Encryption - Auditing and compliance

SELF STUDY : DMTF cloud management standards - Cloud Commons and SMI

UNIT –V

(12 HRS.)

CLOUD BASED STORAGE AND COMMUNICATING WITH CLOUD

Working with Cloud-Based Storage -- Cloud storage in the Digital Universe - Cloud storage definition - Provisioning Cloud Storage - Unmanaged cloud storage - Managed cloud storage - Creating cloud storage systems - Virtual storage containers -Exploring Cloud Backup Solutions - Backup types -Cloud backup features - Cloud attached backup - Cloud Storage Interoperability - Cloud Data Management Interface (CDMI) -Open Cloud Computing Interface (OCCI) - Communicating with the Cloud - Exploring Instant Messaging - Instant messaging clients - Instant messaging interoperability - Micro-blogs or Short Message Services - Exploring Collaboration Technologies

SELF STUDY : Using Social Networks - Features - List of social networking sites - Privacy and security - Interaction and interoperability

REFERENCES:

1. Barrie Sosinsky, “Cloud Computing Bible”, Wiley India Pvt. Ltd, 2013.
2. John W.RittingHouse, James F.Ransome, ”Cloud Computing Implementation, Management and Security”, CRC Press, 2013.
3. Kris Jamsa, Jones & Bartlett , “Cloud Computing” , Learning Publishers 2014.
4. Anthony T. Velte, Toby J. Velte, RoberElsenpeter, “Cloud Computing – A Practical Approach” , Mc Graw Hill publications, 2013.
5. Rajkumarbuyya, James Broberg, Andrzej Goscinski, “ Computing Principles & Paradigms”, Wiley India Pvt. Ltd., 2013.

WEB REFERENCES :

1. <https://lecturenotes.in/subject/366/cloud-computing-cc>
2. <https://www.guru99.com/cloud-computing-for-beginners.html>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Examine the characteristics of Cloud Computing and the architecture	K1	PSO1
CO 2	Define Infrastructure and Identify service models.	K1, K2	PSO2, PSO3
CO 3	Relate abstraction and virtualization and cloud computing frameworks.	K1 & K3	PSO3
CO 4	Manage and administrate cloud.	K1, K2, K3	PSO4, PSO5
CO 5	Explore cloud based storage and collaboration technologies.	K2 & K4	PSO3, PSO4

GENERAL ELECTIVE - MCA

(For those who join in 2020 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	20MCAGE12	AGILE SOFTWARE ENGINEERING	GENERAL ELECTIVE	4	4

COURSE DESCRIPTION

This course provides an immersive experience in the technical, cultural and social aspects of Agile and DevOps.

COURSE OBJECTIVE

- ❖ To learn the software development process using agile.
- ❖ To comprehend the quality and risk management in software development.
- ❖ To understand the integration between development and operations in software project development.

UNIT I

(12 Hours)

MODERNIZING PROJECT MANAGEMENT

Project management needed a makeover – Introducing Agile Project Management.

APPLYING AGILE MANIFESTOS & PRINCIPLES

Understanding the Agile Manifesto - Outlining the four values of Agile manifesto- Defining the 12 Agile principles - Agile Benefits.

AGILE APPROACHES:

Overview of lean- Overview of scrum - Overview of Extreme programming.

SELF STUDY :Agile Benefits

UNIT II

(12 Hours)

AGILE PLANNING AND EXECUTION:

Agile planning – Defining the product vision – Creating a product road map – completing the product backlog.

PLANNING RELEASES AND SPRINTS:

Refining requirements and estimates – Release planning – Sprint planning.

SHOWCASING WORK, INSPECTING AND ADAPTING:

The Sprint review – The sprint retrospective – Preparing for release.

SELF STUDY:Sprint planning

UNIT III

(12 Hours)

MANAGING SCOPE AND PROCUREMENT

Managing Agile scope - Managing Agile procurement

MANAGING TIME AND COST

Managing Agile schedule – Managing Agile budgets

MANAGING AGILE TEAM DYNAMICS& COMMUNICATION

Managing Agile Team Dynamics - Managing Agile communication – Managing Agile quality – Managing Agile risk.

SELF STUDY: Managing Agile communication

UNIT IV FUNDAMENTALS OF DEVOPS

(12 Hours)

The Definition of DevOps – What DevOps is not - Introduction – Traditional Project Setting – Agile Project Setting – Blame Game: Dev vs. Ops – Operations as Bottleneck - DevOps to Rescue – The Essence of DevOps **SELF STUDY:** Quality and testing

UNIT V

(12 Hours)

BUILDING BLOCKS OF DEVOPS

Measurement and Metrics – Improving flow of features – Improve And Accelerate Delivery

QUALITY AND TESTING

What is Quality – Pattern for Improving Quality.

SELF STUDY: Specification by example

REFERENCES :

1. Mark C.Layton , Steven J.Ostermiller , “Agile Project Management”, Wiley Publication II edition ,2018
2. MachaelHuttermann, “DevOps for developers”, Apress publication, 2012
3. Joseph joyner, “DevOps for Beginners” Speedy publishing LLC 2015
4. Robert Martin, “Agile software development, Principles patterns and practices” person new international edition, 2013
5. Greene Jennifer, “Learning Agile” Orielly series I edition 2014

WEB REFERENCES:

1. <https://martinfowler.com/agile.html>
2. <https://refactoring.com/>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Explain the fundamental principles and practices of the agile development methods.	K1	PSO1& PSO2
CO 2	Analyze the planning and execution of the agile manifesto	K1, K2,	PSO3
CO 3	Monitor the management to achieve complete product development.	K1 & K3	PSO5
CO 4	Practice the integration of development and operations in software projects.	K1, K2, K3 &	
CO 5	Present the software project by following the principles that best fit the technical and market demands.	K2 & K4	

ADVANCED LEARNERS - MCA

(For those who joined in 2020 onwards)

PROGRAMM E CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	20MCAAL01	INTERNET OF THINGS	ADVANCED LEARNERS	-	2

COURSE DESCRIPTION

This course provides the knowledge required to design an IOT system to connect embedded sensors.

COURSE OBJECTIVE

- ❖ Learn the fundamentals of IoT
- ❖ Understand the design methodology of IoT applications
- ❖ Design IoT applications using Raspberry Pi

UNIT - I FUNDAMENTALS OF IOT

(12 Hours)

Introduction-Characteristics-Physical design – Things in IoT - Protocols – Logical design of IoT – Functional blocks – communication models – communication API s – IoT Enabling technologies – IoT Levels and deployment templates.

SELF STUDY: Characteristics

UNIT – II DOMAIN SPECIFIC IOT

(12 Hours)

Domain Specific IoTs – Introduction – Home Automation – Cities – Environment – Energy – Retail – Logistics – Agriculture – Industry – Health and Life style
IoT and M2M – Introduction – M2M – Difference between IoT and M2M - SDN and NFV for IoT.

SELF STUDY: Home Automation

UNIT – III IOT PLATFORMS DESIGN METHODOLOGY (12 Hours)

Introduction – IoT Design Methodology-IOT physical devices and Endpoints – IoT Device – Raspberry Pi – Linux on Raspberry Pi - Raspberry Pi interfaces – Programming Raspberry Pi with Python.

SELF STUDY: IoT Device

UNIT – IV IOT PHYSICAL SERVERS AND CLOUD OFFERINGS (12 Hours)

Introduction to cloud storage models and communication API s – Python web application framework –Django – Designing a RESTful web API – Amazon web services for IoT

SELF STUDY: Introduction to cloud storage

UNIT – V CASE STUDIES ILLUSTRATING IOT DESIGN (12 Hours)

Introduction – Home automation – Cities – Environment – Agriculture – Productivity Applications.

SELF STUDY: Agriculture

REFERENCES:

1. ArshdeepBahga, Vijay Madiseti,“Internet of Things – A hands-on approach”, Hyderabad Universities Press, 2015.
2. Honbo Zhou,“The Internet of Things in the Cloud : A Middleware Perspective”, Newyork : CRC Press , 2012.
3. D. Jeya Mala, “Integrating the Internet of Things into Software Engineering best practices”, IGI Global Publishers, UK, 2019.
4. Dieter Uckelmann; Mark Harrison; Florian Michahelles (Eds.) “Architecting the Internet of Things”, Germany: Springer,2011.
5. David Easley and Jon Kleinberg, “ Networks, Crowds, and Markets: Reasoning About a Highly Connected World” United Kingdom: Cambridge University Press, 2010.

6. Olivier Hersent, Omar Elloumi and David Boswarthick, "The Internet of Things: Applications to the Smart Grid and Building Automation", United States : Wiley Publishing Inc, 2012.

WEB REFERENCES:

1. <https://lecturenotes.in/subject/370/internet-of-things-iot>
2. <http://www.cs.ust.hk/~qianzh/FYTGS5100/spr2013/notes/Chapter1-IoT.pdf>

COURSE OUTCOMES

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

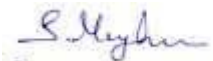
NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Identify the Fundamentals of Internet of Things.	K2	PSO1 & PSO2
CO 2	Design a portable IoT using relevant protocols.	K2, K3, K4	PSO1 & PSO2
CO 3	Analyze applications of IoT in real time scenario.	K2 & K3	PSO1 & PSO3
CO 4	Develop web services to access/control IoT devices.	K2, K3 & K5	PSO1 & PSO4
CO 5	Deploy an IoT application and connect to the cloud.	K2,K3 & K5	PSO1 & PSO5

COURSE DESIGNER:

Staff Name – B. USHA

Forwarded By

HOD'S Signature & Name


(S. MARY HELAN FELISTA)

II MCA

SEMESTER – III

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCA	19MCA301	GRAPH THEORY	MAJOR CORE	4	4

COURSE DESCRIPTION

This course provides a basic knowlwdge of the structure of graphs and the techniques used to analyze problems in graph theory.

COURSE OBJECTIVE

- ❖ To understand the fundamental concepts in Graph theory.
- ❖ To define how graphs serve as models for many standard problems.
- ❖ To equip the student with algorithmic techniques that may be used to solve a host of very practical real world problems.
- ❖ To understand the ubiquitous usage of Graph theory in different domains.

UNIT – I INTRODUCTION:

(12 Hours)

What is a Graph?- Application of Graphs - Finite and Infinite Graphs - Incidence and Degree - Isolated Vertex, Pendant Vertex, and Null Graph.

PATHS AND CIRCUITS:

Isomorphism - Subgraphs - Walks, Paths, and Circuits, Connected Graphs, Disconnected Graphs, and Components - Euler Graphs - Hamiltonian Paths and Circuits.

SELF STUDY :Sub graphs

UNIT – II TREES AND FUNDAMENTAL CIRCUITS (12 Hours)

Trees - Some Properties of Trees-Pendant Vertices in a Tree - Distance and Centers in a Tree - Rooted and Binary Tree - On Counting Trees - Spanning Trees - Definition of Fundamental Circuits & Spanning tree - Prim's &Kruskal's algorithm for finding the Shortest Spanning tree.

CUT-SETS AND CUT-VERTICES:

Cut-Sets - Some Properties of a Cut-Set - Fundamental Circuits and Cut-Sets - Connectivity and Separability.

SELF STUDY :Fundamental Circuits - Connectivity and Separability.

UNIT – III PLANAR AND DUAL GRAPHS: (12 Hours)

Combinatorial Vs. Geometric Graphs - Planar Graphs - Kuratowski's Two Graphs - Different Representations of a Planar Graph - Detection of Planarity - Geometric Dual - Thickness and Crossings.

MATRIX REPRESENTATION OF GRAPHS(ONLY DEFINITIONS):

Incidence Matrix - Circuit Matrix - Cut-Set Matrix - Path Matrix - Adjacency Matrix

SELF STUDY :Matrix Representation Of Graphs

UNIT – IV COLORING, COVERING, AND PARTITIONING: (12 Hours)

Chromatic Number - Chromatic Partitioning - Chromatic Polynomial - The Four Color Problem

DIRECTED GRAPHS:

What is a Directed Graph? - Some Types of Diagraphs - Digraphs and Binary Relations - Directed Paths and Connectedness - Euler Digraphs - Trees with Directed Edges - Fundamental Circuits in Digraphs - Paired Comparisons and tournaments.

UNIT – V ENUMERATION OF GRAPHS: (12 Hours)

A type of Enumeration - Counting Labeled Trees - Polya's Counting Theorem.

GRAPH THEORETIC ALGORITHMS AND COMPUTER PROGRAMS:

Algorithms Input: Computer Representation of a Graph - The Output -
Some Basic Algorithms - Connectedness – Spanning tree - Shortest - Path
Algorithms .

SELF STUDY: Spanning tree

REFERENCES:

1. NarsinghDeo,“Graph Theory With Applications to Engineering and Computer Science”,Prentice Hall of India., 2013
2. Prof.S. Kumaravelu& Prof. SusheelaKumaravelu,“Graph Theory”
3. S.A. Choudum,“A First Course In Graph Theory”,Macmillan.

WEB REFERENCES:

1. <https://www.britannica.com/topic/graph-theory>
2. <https://scanfree.com/Graph-Theory>.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Write precise & accurate mathematical definitions of graph theory	K2	PSO1 & PSO2
CO 2	Apply the principles and concepts of graph theory in practical situations	K2, K3, K4	PSO1 & PSO2
CO 3	Solve the problems using the concepts of Graphs and trees.	K2 & K3	PSO1 & PSO3
CO 4	Validate and critically assess a mathematical proof.	K2, K3 & K5	PSO1 & PSO4
CO 5	Explore the modern applications of graph theory.	K2, K3 & K5	PSO1 & PSO5

COURSE DESIGNER:

Staff Name – B. CHANDIRIKA

Forwarded By

HOD'S Signature & Name

B. Chandirika
(B.CHANDIRIKA)

II MCA
SEMESTER – III

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	19MCA302	DATA COMMUNICATION AND NETWORKING	MAJOR CORE	4	4

COURSE DESCRIPTION

This course provides the basic concepts, design principles and underlying technologies of networking.

COURSE OBJECTIVE

- ❖ To familiarize with the basic taxonomy & terminology of data communication.
- ❖ To analyze the function & design strategies of Physical, Datalink, Network and Transport layer.
- ❖ To acquire the basic knowledge of various Application protocols.

UNIT – I OVERVIEW

(12 Hours)

Introduction:Data Communications – Networks -Network Models: Layered tasks- OSI Model- Layers in the OSI model- TCP/ IP protocols suite- Addressing.

SELF STUDY: OSI Model

UNIT – II PHYSICAL LAYER & MEDIA, DATA LINK LAYER

(12 Hours)

Digital Transmission: Transmission Modes - Transmission Media- Guided Media- Unguided Media.

Switching – Circuit switched Network- Datagram Network- Virtual Circuit Network -Error detection and Correction- Introduction- Block Coding - Data

link Control: Framing- Flow and Error control- Protocols- Noiseless Channels- Noisy Channels.

UNIT - III NETWORK LAYER

(12 Hours)

Internet Protocol - Internetworking- IPV4- IPV6- Transition from IPV4 to IPV6 - Delivery, Forwarding & Routing: Delivery- Forwarding - Unicast Routing Protocols - Multicast Routing Protocols.

UNIT – IV TRANSPORT LAYER

(12 Hours)

Process-to-Process delivery: UDP – TCP – SCTP.

Congestion Control and Quality of Service: Data traffic – Congestion - Congestion Control - QOS

SELF STUDY: Congestion – Congestion control

UNIT – V APPLICATION LAYER

(12 Hours)

Domain Name System :Name Space - Domain Name Space- Distribution of Name Space- DNS in the Internet – DNS Messages- Resolution - Remote Login – DNS Messages – Types of records.

Remote Logging, Electronic Mail and File Transfer: Remote Logging - Email- FTP.

SELF STUDY: Name Space – Domain name space – DNS Messages – Resolution- Remote Login – Email.

REFERENCES:

1. Behrouz A Forouzan,“Data Communication and Networking”, 4th Edition, Tata McGraw Hill.
2. Andrew. S. Tanenbaum, “Data Communication and Networking”, 4th Edition, Pearson Education.
3. MassoudMoussavi, “Data Communication and Networking”, 2011

WEB REFERENCES:

1. <http://www.omniseu.com/basic-networking/>
2. <https://www.ece.uvic.ca/~itraore/elec567-13/notes/dist-03-4.pdf>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Identify the functionalities of Networking layers of both OSI and TCP/IP reference models.	K2	PSO1 & PSO2
CO 2	Analyze the design issues of Data link layer and techniques to resolve it.	K2, K3, K4	PSO1 & PSO2
CO 3	Compare the principles of Switching and Routing algorithm.	K2 & K3	PSO1 & PSO3
CO 4	Predict the TCP and UDP related procedures.	K2, K3 & K5	PSO1 & PSO4
CO 5	Outline the Application layer protocols.	K2, K3 & K5	PSO1 & PSO5

II MCA
SEMESTER – III

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCA	19MCA303	PROGRAMMING IN JAVA	MAJOR CORE	4	4

COURSE DESCRIPTION

This course provides an exhaustive coverage of Core Java programming language features like OOPS and GUI programming.

COURSE OBJECTIVE

- ❖ To understand the basic Java programming constructs
- ❖ To develop program by using OOPS concept.
- ❖ To handle Packages, Exception , Basics of AWT and Applets
- ❖ To create and manipulate databases in Java using JDBC and show how to create client-server programs using RMI.

UNIT – I INTRODUCTION

(12 Hours)

An overview of Java – Object Oriented Programming – Lexical issues - Data types – Literals – Type conversion and casting - Variables - Arrays – Arithmetic – Bitwise - Relational – Assignment – Ternary Operator – Operator precedence – Selection statements – Iteration statements – Jump Statements.

SELF STUDY: Operators, Control statements

UNIT - II CLASSES AND METHODS

(12 Hours)

Introduction to classes – Declaring Objects – Introducing Methods – this Keyword – Garbage Collection – finalize () method – Stack class – Method Overloading – Method Overriding – Constructor Overloading - - Inheritance – Multilevel Hierarchy – Abstract class – Final with Inheritance .

SELF STUDY:Constructors

UNIT - III PACKAGES AND THREADS

(12 Hours)

Defining Package Access protection – Importing Packages – Defining Interfaces – Implementing Interfaces – Nested Interface - Exception Types – Using try and catch – Multiple catch – Nested try statements – Built-in Exceptions - Multithreaded Programming – Java Thread Model – Main Thread – Implementing Runnable – Extending Thread – Thread Priorities – Synchronization – Inter-thread communication.

SELF STUDY:Exception Handling

UNIT - IV AWT CLASSES AND CONTROLS

(12 Hours)

The Applet class –Architecture – Skeleton – Applet display methods – HTML Applet tag - AWT classes – Window fundamentals – Frame windows – Color – Fonts – Using Font Metrics – Control fundamentals - Labels – Buttons – Checkbox – Choice control – Lists – Scroll Bars – Layout Managers and Menus – Dialog box – AWT Components.

SELF STUDY:Working with graphics

UNIT -V DATABASE AND RMI

(12 Hours)

Introduction to JDBC – Installing JDBC – Basic JDBC Programming Concepts - Java RMI - RMI Concepts - Remote Interface - RMI process - Server side - Client side.

SELF STUDY:Passing Objects in RMI

REFERENCES:

1. Herbert Schildt, "JAVA the Complete Reference",9th Edition, Tata McGraw Hill,2016
2. Jim Keogh, "The Complete Reference J2EE", 3rd Edition, Tata McGraw Hill, Reprint 2010.
3. Ken Arnold, David Holmes, James Gosling,"The JAVA Programming Language", 3rd Edition, Prakash Goteti.

WEB REFERENCES:

1. <https://www.cs.cmu.edu/afs/cs.cmu.edu/user/gchen/www/download/java/LearnJava.pdf>
2. <https://lecturenotes.in/subject/73/java-programming-java>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Apply the basic Java constructs to develop solutions to real time problems.	K2	PSO1
CO 2	Analyze the hierarchy of java classes to develop object oriented programs.	K2, K3, K4	PSO1& PSO2
CO 3	Design software in Java using Packages and Threads.	K2 & K3	PSO1&PSO3
CO 4	Implement Concepts of AWT for CreatingGUI.	K2, K3 & K5	PSO1&PSO4
CO 5	Design a Software using JDBC and to explain the role of RMI interfaces.	K2,K3 & K5	PSO1&PSO5

II MCA

SEMESTER – III

(For those who joined in 2019 onwards)

PROGRAM ME CODE	COURSE CODE	COURSE TITLE	CATEGO RY	HRS/WEE K	CREDI TS
PSCA	19MCA3 04	LAB V – PHP & MYSQL	MAJOR LAB	6	3

COURSE DESCRIPTION

This course provides information about two powerful technologies. Together, these two technologies provide a powerful platform for building database-driven Web applications.

COURSE OBJECTIVE

- ❖ To understand how server-side programming works on the web.
- ❖ To Test, debug and deploy web pages containing PHP and MySQL.
- ❖ To create, read and process data in a MySQL database.

LAB LIST

10. Program for implementing mathematical functions.
11. Program for implementing string functions.
12. Program for Validating Registration Form.
13. Program to create Login form using PHP and MYSQL.
14. Program for online quiz using PHP and MYSQL.
15. Programs for manipulating MYSQL database
16. Program for uploading an image using PHP and MYSQL.
17. Program for Pagination using PHP and MYSQL.
18. Program for Cookie manipulation using PHP.
10. Program for Session manipulation using PHP.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Design WebPages using server side scripting.	K1	PSO1& PSO2
CO 2	Use PHP built-in functions and custom functions for processing.	K1, K2,	PSO3
CO 3	Create various interactive and dynamic websites	K1 & K3	PSO5

II MCA
SEMESTER - III

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WE EK	CREDITS
PSCA	19MCA305	LAB VI – JAVA PROGRAMMING	MAJOR LAB	6	3

COURSE DESCRIPTION

This course provides experiential learning in the implementation of Core Java Programming.

COURSE OBJECTIVE

- ❖ To understand the basic Java programming constructs
- ❖ To develop program by using OOPS concept.
- ❖ To handle Packages, Exception , Basics of AWT and Applets.
- ❖ To create and manipulate databases in Java using JDBC.

LAB LIST

1. Programs using Basic Programming Constructs
2. Programs implementing Classes.
3. Programs for implementing Inheritance
4. Programs for implementing Abstract Classes
5. Programs for implementing a Stack Class
6. Programs for implementing Constructor Overloading
7. Programs for implementing Method Overloading
8. Programs for implementing Method Overriding
9. Programs for Handling Errors using Exception Handling
10. Programs using Interfaces.
11. Programs on Packages.
12. Programs on Multithreading
13. Programs in Applets.
14. Programs for Designing Graphical User Interface using AWT

15. Programs for Data Base Management Systems using JDBC

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Design WebPages using server side scripting.	K1	PSO1& PSO2
CO 2	Use PHP built-in functions and custom functions for processing.	K1, K2,	PSO3
CO 3	Create various interactive and dynamic websites	K1 & K3	PSO5

II MCA
SEMESTER – III

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	19MCA307	SOFT SKILLS III - QUANTITATIVE APTITUDE	SOFT SKILLS	2	1

COURSE DESCRIPTION

This course provides gamut of skills which facilitate the students to enhance their employability quotient and do well in the professional space. It makes them think critically and apply basic mathematics skills to interpret data, draw conclusions and solve problems.

COURSE OBJECTIVE

- ❖ To improve aptitude, problem solving skills and reasoning ability.

SECTION 1 – ARITHMETIC ABILITY

1. Problems on Numbers
2. Problems on Ages
3. Time and Work
4. Time and Distance
5. Simple Interest
6. Permutation and Combination
7. Odd Man Out & Series

SECTION 2- REASONING

1. Logical Sequence of words
2. Blood Relations Test
3. Series Completion
4. Mirror Images.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Apply quantitative techniques to solve variety of problems.	K1	PSO1& PSO2
CO 2	Perform statistical analysis to interpret information.	K1, K2,	PSO3

II MCA
SEMESTER –IV

(For those who joined in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	19MCA401	COMPILER DESIGN	MAJOR CORE	4	4

COURSE DESCRIPTION

The course provides knowledge on the theory and tools that can be employed in order to perform syntax-directed translation of a high-level programming language into an executable code along with data flows. The concepts covered are Parsing, Scanning, Semantic Analysis, and Code Generation combined with the theory of computation conversions.

COURSE OBJECTIVES

- ❖ To learn and understand the design principles of a Compiler.
- ❖ To enrich the knowledge in various phases of compiler and uses
- ❖ To appreciate practical programming skills necessary to construct a compiler.

UNIT - I INTRODUCTION (12 Hours)

Introduction to Compilers – Compilers – Translators – Need of translators – Structure of compiler – Lexical Analysis – Syntax Analysis – Intermediate Code Generation – Optimization – Code Generation – Bookkeeping – Programming Languages – Lexical and Syntactic Structure of a language – Data Elements – Data Structures– Assignment – Statements – Program Units.

SELF-STUDY: Operators- – Error Handling

UNIT - II**PARSING TECHNIQUES****(12 Hours)**

Basic Parsing Techniques – Top Down Parsing – Bottom Up Parsing – LR Parsers –Using Ambiguous Grammars – Parser Generators – Automatic Generation – Shift Reduce Parsing – Operator Precedence Parsing – Predictive Parsers. Error Detection and Recovery – Errors – Lexical Phase Errors – Syntactic Phase Errors –Semantic Errors – Introduction to Code Optimization – Principal Sources – Loop Optimization – DAG Representation.

SELF STUDY:Postfix notations - Grammars

UNIT - III**(12 Hours)****THREE BASIC CONCEPTS: GRAMMAR, LANGUAGES, AUTOMATA & FINITE AUTOMATA**

Strings and Languages – Terminologies – Properties – Operations – Grammars – Chomsky Hierarchy of Grammars – Automata – Finite Automata – DFA and Transition Graph – Languages and DFA – Languages and NFA – Conversion from NFA to DFA – NFA with λ -Transitions – Mealy Machine – Moore Machine – Transformation from Mealy to Moore Machine – Reduction of States in Finite Automation

SELF-STUDY: Languages – DFA and NDFA – PDA

UNIT - IV**(12 Hours)****REGULAR LANGUAGES AND REGULAR GRAMMARS**

Regular Expressions – Formal Definitions– Regular Languages – Regular Sets – Equivalence of Two Regular Expressions – Connection between REs and RLs – Finite Automata and Regular Expression – Regular Grammars – Right Linear and Left Linear Grammar – Equivalence between RLs and RGs – Properties of RLs – Closure – Identifying Non-RLs — Pumping Lemma

SELF-STUDY:Pigeonhole Principle

UNIT - V

(12 Hours)

CONTEXT FREE LANGUAGES AND PUSHDOWN AUTOMATA

Context Free Grammars – Left Most Derivation– Right Most Derivation – Derivation Tree – Sentential Form – Parsing and Ambiguity – CFG and PL – CFG Simplification – Substitution Rule – Useless Production Removal – λ Production Removal – Unit Production Removal – Normal Forms – Chomsky Normal Form (CNF) – Greibach Normal Form (GNF) – NDPA – Configuration– NDPA and CFL – CFG and PA – Deterministic PA – Deterministic CFL – Grammars for DCFL

REFERENCES:

1. Alfred V. Aho, Jeffrey D.Ullman,“Principles of Compiler Design”, Narosa PublishingHouse, 2014
2. Debidas Ghosh,“Formal Languages and Computation”, First Edition. PHI Learning Private Ltd, 2013.
3. Alfred V.Aho, Monica S. Lam, Ravi Sethi , Jeffrey D.Ullman, “Compilers: Principles,Techniques and tools”, Second Edition, 2011
4. John E. Hopcroft , R. Rajeev Motwani, Jeffery D. Ullman, Introduction to Automata Theory, Languages and Computation, Third Edition. Pearson Education, 2009.
5. Bernard M. Moret, The Theory of Computation, Pearson Education, 2011.

WEB REFERENCES:

1. <https://online.visual-paradigm.com/features/uml-tool/>
2. <https://html-online.com/editor/>
3. <https://www.geeksforgeeks.org/toc-introduction-theory-computation/>
4. https://en.wikipedia.org/wiki/Theory_of_computation

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	To analyse the basic concepts and applications of Compiler Design	K2	PSO1 & PSO2
CO 2	To compare various lexical analyzers and grammars	K2, K3, K4	PSO1 & PSO2
CO 3	To formulate the conversion process between finite automata, regular grammars with the transition and transformation methods	K2 & K3	PSO1 & PSO3
CO 4	To demonstrate the knowledge of formal connection and relationship to expressions and languages	K2, K3 & K5	PSO1 & PSO4
CO 5	To identify if a language is regular, context-free, unambiguous after reducing it to normal forms	K2, K3 & K5	PSO1 & PSO5

II MCA
SEMESTER – IV

(For those who join in 2019 onwards)

PROGRAM ME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	19MCA402	MOBILE COMMUNICATION & APPLICATION DEVELOPMENT	MAJOR CORE	4	4

COURSE DESCRIPTION

This course provides knowledge on key mobile system and wireless communication. It also aims at developing applications using Android

COURSE OBJECTIVE

- ❖ To learn the basic concepts of GSM, SMS and GPRS Architecture.
- ❖ To have an exposure about wireless protocols, WLAN, Bluetooth, WAP
- ❖ To be familiar with the Network and Transport Functionalities of Mobile communication.
- ❖ To be acquainted with the Mobile Application Development Platform.
- ❖ To become skilled on the components needed for Mobile App development.

UNIT – I INTRODUCTION

(12 Hours)

Applications - History of wireless communication - Simplified reference model-
MAC- Motivation for a specified MAC- SDMA- FDMA- TDMA- CDMA.

SELF STUDY: History of wireless communication

UNIT – IIGSM

(12 Hours)

Mobile services- System Architecture- Protocols- Handover- Security- GPRS-
Satellite systems- Basics- Routing- Localization- Handover.

MOBILE IP:

Entities & Terminology- IP Packet delivery- Agent discovery- Registration.

SELF STUDY: Satellite systems Basics, Agent discovery in Mobile IP

UNIT –III WIRELESS LAN**(12 Hours)**

IR Vs Radio transmission- Infrastructure and Adhoc Networks- IEEE 802.11

System Architecture - Protocol Architecture- Bluetooth- Architecture- Protocol Stack.

WAP ARCHITECTURE:

WDP - WTLS - Wireless session protocol- Wireless transaction protocol- WSP/B over WTP - Wireless Application environment.

SELF STUDY: IR Vs Radio transmission, Wireless Application environment

UNIT – IV**(12 Hours)****GETTING STARTED WITH ANDROID PROGRAMMING**

Understanding Activities- Linking activities using intents - Calling Built-in Applications using intents - Getting to know the Android interface.

SELF STUDY: Calling Built-in Applications using intents

UNIT – V USING BASIC VIEWS**(12 Hours)**

Using Basic Views -Picker views- List views- Displaying pictures and menus with views- Messaging- Location based services.

SELF STUDY: List views

REFERENCES:

1. Jochen Schiller, "Mobile communication", Second Edition, Pearson Education, 12th Impression, 2013.
2. Wei- Manglee, "Beginning Android 4 Application Development", Wiley India pvt ltd, Reprint 2013
3. Reto Meier, "Professional Android4 Application Development", Wiley India Edition.
4. Wallace B. Maclure, Nathan Blevins, John J Croft IV, Jonathan Dick, Chris Hardly, "Professional Android Programming", Wiley India Edition

WEB REFERENCES:

1. www.radio-electronics.com
2. www.developer.android.com

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Identify, Predict and Evaluate Wireless Communication Protocols	K2	PSO1 & PSO2
CO 2	Compare and analyze various multiplexing techniques in mobile environment	K2, K3, K4	PSO1 & PSO2
CO 3	Demonstrate the architectures, challenges and solutions of Wireless communication	K2 & K3	PSO1 & PSO3
CO 4	Assess the role of Wireless Networks in shaping the future internet.	K2, K3 & K5	PSO1 & PSO4
CO 5	Design and develop apps for mobiles using Android	K2,K3 & K5	PSO1 & PSO5

II MCA
SEMESTER – IV

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCA	19MCA403	PROGRAMMING IN PYTHON	MAJOR CORE	4	4

COURSE DESCRIPTION

This course provides the basics of writing and running Python scripts to more advanced features such as file operations, regular expressions, working with OOPs concept and using the extensive functionality of Python modules. Extra emphasis is placed on features unique to Python, such as tuples, array slices, and output formatting.

COURSE OBJECTIVE

- ❖ To differentiate syntax of Python from other programming languages.
- ❖ To get familiar in writing simple programs using Python language.
- ❖ To understand various data structures provided by Python library including string, List.
- ❖ To build real-world applications using OOPs, Files and Exception handling.

UNIT – I INTRODUCTION

(12 Hours)

Context of Software Development - Learning Programming with Python - Writing a Python Program - Values and Variables – Identifiers - Floating-point types – Control Codes within Strings – User Input – Eval Function – Controlling Print Function - Expressions & Arithmetic – Operator Precedence and Associativity – Comments – Errors - Syntax, Run-time, Logic Errors – Conditional Execution – Boolean Expressions – If Statement – If/Else Statement – Nested Conditionals – Multi-way Decision Statements.

SELF STUDY:Arithmetic Operators

UNIT - II FUNCTIONS

(12 Hours)

Iteration – While – For – Nested loop – Abnormal Loop Termination - Infinite loop Using Functions – Time Functions – Random Numbers – Importing Issues - Writing Functions – Basics – Main Function - Parameter Passing – Function Examples – Custom Functions - More on Functions – Global Variables – Default Parameters – Recursion – Documenting Functions and Modules – Functions as Data.

SELF STUDY:Standard Mathematical Functions

UNIT - III LIST PROCESSING AND EXCEPTION HANDLING

(12 Hours)

List Assignment and Equivalence – List bounds - Slicing – List and Functions- List Processing – Sorting – Flexible Sorting – Searching – Linear Search – Binary Search – List Permutations – Reversing List – Handling Exceptions – Using Exceptions – Custom Exceptions.

SELF STUDY :Exception Handling

UNIT - IV TUPLES AND FILE HANDLING

(12

Hours)Strings - String Traversal – String slices – Searching – Looping and Counting –IN operator – String Comparison - Tuples - Tuple Assignment – Variable –Length Argument Tuples - Lists and Tuples – Dictionaries and tuples - Comparing Tuples - File Handling – Reading and Writing – Filenames and Paths – Catching Exceptions – Databases – Writing Modules - Debugging.

SELF STUDY :String Methods, Format Operator

UNIT -V OBJECT ORIENTED FEATURES

(12 Hours)

Classes and Objects – User-defined Types – Attributes – Rectangles - Objects are mutable – Copying - Classes and Functions – Time – Modifiers – Prototyping Vs Planning - Classes and Methods – Object-Oriented Features – Printing Objects – Init, str Method, Operator Overloading – Polymorphism -

Inheritance – Class Attributes – Card Objects – Decks – Inheritance - Class Diagrams.

REFERENCES:

1. Richard L. Halterman, “Learning To Program with Python”, 2013.
2. Allen B. Downey, “Python for Software Design”, 2018.
3. ReemaThareja, “Python Programming Using Probblem Solving Approach”, Oxford University Press, 2017
4. Bill Lubanovic, “Introducing Python”, O ‘Reilly Media Publications, 2015

WEB REFERENCES:

- 1.<http://spoken-tutorial.org/tutorial-search/python>
- 2.<https://docs.python.org>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Predict the basics of Python programming.	K2	PSO1
CO 2	Solve problems requiring the writing of well-documented programs in the Python language, including use of the logical constructs of that language.	K2, K3 & K4	PSO1& PSO2
CO 3	Use and manipulate Lists and python exception handling model to develop robust programs.	K2, K4	PSO1&PSO3
CO 4	Formulate solutions for String, tuples and File operations.	K2, K3 & K5	PSO1&PSO4
CO 5	Apply object-oriented programming concepts to develop dynamic interactive Python applications.	K2, K3 & K5	PSO1&PSO5

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SEMESTER – IV

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	19MCA404	LAB VII - MOBILE APPLICATION DEVELOPMENT	MAJOR LAB	6	3

COURSE DESCRIPTION

This course provides knowledge of developing applications for mobiles using native and hybrid frameworks.

COURSE OBJECTIVE

- ❖ Know the components and structure of mobile application development frameworks
- ❖ Learn the basic and important design concepts and issues of development of mobile applications.
- ❖ Write applications for the platforms used, simulate them, and test them on the mobile hardware where possible

LAB LIST FOR CREATING NATIVE & HYBRID APPLICATIONS USING ANDROID & REACT

1. Create Applications using Layouts.
2. Create Event Driven Applications.
3. Create Applications using Date and Time.
4. Create Applications to include Menus
5. Create an application for sending and receiving SMS
6. Creating Android Audio Video Application
7. Create an Application with One-Time, Repeating Alarms
8. Create an Application which uses Multiple Activities
9. Create an Application To Call Built In Applications.
10. Create an Application for Simple Mobile Game.

11. Create an Application that implements database connectivity

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Install and configure Android application development tools.	K2	PSO1
CO 2	Design and develop user Interfaces for the Android platform.	K2, K3 & K4	PSO1& PSO2
CO 3	Apply Java programming concepts to Android application development.	K2, K4	PSO1&PSO3
CO 4	Familiar with technology and business trends impacting mobile applications.	K2, K3 & K5	PSO1&PSO4
CO 5	Include database and maps in apps to facilitate societal centric applications	K2, K3 & K5	PSO1&PSO5

II MCA
SEMESTER – IV

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	19MCA405	LAB VIII – PYTHON PROGRAMMING	MAJOR LAB	6	3

COURSE DESCRIPTION

This course provides the practical knowledge of implementing Python programs with loops, functions and represent compound data using lists, tuples and dictionaries.

COURSE OBJECTIVES

- ❖ To write, test and debug simple Python programs.
- ❖ To use functions for structuring Python programs.
- ❖ To read and write data from/to files in Python.

LAB LIST

1. Running instructions in Interactive interpreter and a Python Script
2. Write a program to purposefully raise Indentation Error and Correct it.
3. Write a program add.py that takes 2 numbers as command line arguments and prints its sum.
4. Write a program using for loop that loops over a sequence.
5. Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
6. Write a program to count the numbers of characters in the string and to use split and join methods in the string.

7. Write a program `combine_lists` that combines these lists into a dictionary
8. Write a function `nearly_equal` to test whether two strings are nearly equal. Two strings `a` and `b` are nearly equal when `a` can be generated by a single mutation on `b`.
9. Write a function `reverse` to reverse a list. Without using the `reverse` function.
10. Find the most frequent words in a text read from a file.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Implement Math functions, Strings, List and Tuple in Python programs.	K2	PSO1, PSO2 & PSO3
CO 2	Express different Decision Making statements and Functions.	K2, K3, K4	PSO1 & PSO2
CO 3	Interpret Object oriented programming in Python & File handling operations.	K2, K3 & K5	PSO4 & PSO5

II MCA
SEMESTER – IV

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDIT S
PSCA	19MCA406	SKILL BASED LAB IV - SOFTWARE TESTING TOOLS	SKILL BASED LAB	2	1

COURSE DESCRIPTION

This course provides focus on the needs of automated testing tools. The testing tactics of a project are done by understanding the customer's requirements, test planning, test design scenarios, test cases, test execution, result analysis, defect tracking and reporting .

COURSE OBJECTIVES

- ❖ To generate and write manual test cases
- ❖ To impart knowledge on automated testing tools
- ❖ To automate tests against applications and execute them in multiple browsers

LAB LIST

1. Manual Testing Strategies
2. Write manual Test Cases for a website
3. Generation of Manual Test Cases and Scenarios for an Application
4. Create Test Plan Document for any kind of Application
5. Field Validation Checking
6. Page Validation Checking
7. Navigation Link Error Checking

8. Modules Error Checking
9. Working on Web Testing Automation Tool
10. Working on Open – Source Testing Tool

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Finding defects in the programs while developing the software.	K1	PSO1& PSO2
CO 2	Able to write test cases and test scenarios.	K1, K2,	PSO3
CO 3	Develop the scripts for finding the defects and preventing them.	K1 & K3	PSO5
CO 4	Understand the automated testing tools available	K1, K2, K3 &	PSO4

II MCA
SEMESTER – IV

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	19MCA407	SOFT SKILLS IV - TECHNICAL APTITUDE	SOFT SKILLS	2	1

COURSE DESCRIPTION

This course provides skills that are imperative for students to establish a stronger connect with the technical environment in which they operate. An understanding of these skills will enable students to manage the placement challenges more effectively.

COURSE OBJECTIVE

- ❖ To comprehend the basic concepts of various domains of computer science.

I Aptitude Questions

7. Computer Networks
8. RDBMS
9. Operating Systems
10. C/ C++
11. Java
12. Oracle

II Frequently Asked Questions

1. Aptitude tests from software industries
2. NET / SET

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Enhance the technical skills for employability.	K1	PSO1& PSO2
CO 2	Improve the proficiency of participation in competitive examinations.	K1, K2,	PSO3

III MCA
SEMESTER – V

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	19MCA501	SOFTWARE PROJECT MANAGEMENT	MAJOR CORE	4	4

COURSE DESCRIPTION

This course provides knowledge in applying different techniques to monitor & control project and people.

COURSE OBJECTIVE

- ❖ To understand the fundamental principles of Software Project management.
- ❖ To have a good knowledge of the responsibilities of project manager and how to handle them.
- ❖ To be familiar with the different methods and techniques used for project management.
- ❖ To know the issues and challenges faced while developing software.
- ❖ To be able to do the Project Scheduling, tracking, Risk analysis, Quality management and Project Cost estimation using different techniques.

UNIT-I

(12 Hours)

INTRODUCTION TO SOFTWARE PROJECTMANAGEMENT

Introduction - Definition of Project – Comparison of projects – Activities – Plans, Methods and Methodologies – Categorization – Stakeholders - Setting Objectives - The business case - What is Management –Management control – Traditional versus Modern Project management Practices.

PROJECT EVALUATION & PROGRAMME MANAGEMENT

Introduction – Project Portfolio Management – Evaluation of individual project – Cost-benefit Evaluation techniques – Risk evaluation – Programme management - Allocation of resources – Strategic Program management – Creating a Programme – Aids to management – Benefits management

SELF STUDY: Risk evaluation

UNIT - II

(12 Hours)

OVERVIEW OF PROJECT PLANNING SELECTION OF AN APPROPRIATE PROJECT APPROACH

Introduction – build or buy – Choosing Methodologies and technologies – Software Process and Process Models – Choice of process models – Structure versus speed of delivery

ACTIVITY PLANNING

Objectives – When to plan – Project Schedules – Projects & activities – Sequencing & scheduling – Network Planning Models - Formulating a Network model - Adding Time dimensions – Forward & Backward pass – Identifying Critical path – Activity float

UNIT - III RISK MANAGEMENT

(12 Hours)

Risk – Categories of risk – Framework for Risk – Risk Identification – Assessment, planning, Management – Evaluating risks to the schedule – Applying the PERT technique – Monte Carlo Simulation – Critical chain concepts

RESOURCE ALLOCATION

Nature of Resources – Identifying resource requirements – Scheduling Resources – Creating Critical paths – Counting the cost – Being Specific – Publishing the resource schedule - Cost schedule – The scheduling sequence.

SELF STUDY: cost schedule

UNIT - IV MONITORING AND CONTROL

(12 Hours)

Creating Framework - Collecting the data- Review – Project Termination Review
- Visualizing the progress – Cost monitoring – Earned Value Analysis –
Prioritizing Monitoring – Change Control

MANAGING PEOPLE IN SOFTWARE ENVIRONMENTS

Introduction – Understanding behaviour – Organizational behaviour – Selection
of people – Instruction in the best methods –Motivation – Job Characteristics
model – Stress – Health and safety.

SELF STUDY: Cost monitoring

UNIT – WORKING IN TEAMS

(12 Hours)

Becoming a team – Decision making – Organizational structures – Coordination
dependencies – Dispersed & Virtual teams – Communication plans –
Leadership

SOFTWARE QUALITY

The place of software quality in project planning - Definition of Software
Quality – Importance – ISO 9126 – Product and Process Metrics - Product
versus Process Quality Management – Quality management systems – Process
capability models - Techniques to enhance quality – Testing – Software
reliability - Quality plans.

SELF STUDY: Organizational structures

REFERENCES:

1. Bob Hughes and Mike Cotterell, “Software Project Management”, Fifth
Edition, Tata McGraw-Hill Edition 2015.
2. Pankaj Jalote, “Software Project Management in Practice”, Pearson
Education Edition, 2008.
3. Joel Henry, “Software Project Management”, Pearson Education.
4. Walker Royce, “Software Project Management”, Pearson Education, 2005.

WEB REFERENCES:

- 1.https://www.tutorialspoint.com/software_engineering/software_project_management.htm
- 2.<https://www.studocu.com/en/book/software-project-management/bob-hughes-mike-cotterell>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Deliver successful software projects that support organization's strategic goals	K1	PSO1& PSO2
CO 2	Match organizational needs to the most effective software development model	K1, K2,	PSO3
CO 3	Plan and manage projects at each stage of the software development life cycle	K1 & K3	PSO5
CO 4	Create project plans that address real-world management challenges	K1, K2, K3 &	PSO1 & PSO4
CO 5	Develop the skills for tracking and controlling software deliverables	K2 & K4	PSO1 & PSO5

III MCA
SEMESTER – V
(For those who join in 2019 onwards)

PROGRAM ME CODE	COURSE CODE	COURSE TITLE	CATEGO RY	HRS/WEEK	CREDIT S
PSCA	19MCA502	MACHINE LEARNING	MAJOR CORE	4	4

COURSE DESCRIPTION

This course provides an introduction to learn Machine Intelligence and Machine Learning Applications algorithms to solve real world problems.

COURSE OBJECTIVE

- ❖ To introduce the fundamentals of Machine Learning and algorithms.
- ❖ To define the classifiers and its associated algorithms
- ❖ To impart the knowledge on supervised and unsupervised learning algorithms used for classification, prediction and clustering.

UNIT - I INTRODUCTION

(12 Hours)

Introduction to machine learning -Learning Problems – Learning System – Issues in machine learning - Concept Learning - Learning Task – General-to-specific Ordering – Specific Hypothesis – Candidate Elimination – Inductive Bias.

SELF STUDY:Choosing the Target Function

UNIT – II DECISION TREE & BAYESIAN LEARNING

(12 Hours)

Decision Tree Learning -Decision tree representation – Issues in decision tree learning- Bayesian Learning - Bayes Theorem – Bayes Theorem and Concept Learning – Naive Bayes classifier - Bayesian Networks -EM Algorithm

SELF STUDY:Avoiding Overfitting the Data

UNIT - III GENETIC ALGORITHMS (12 Hours)

Introduction to Instance Based Learning – K-Nearest Neighbor Learning - Radial Basis Function, Case based reasoning - Genetic Algorithms - Hypotheses – Genetic Operators – Hypothesis Space Search – Genetic Programming – Models of Evolution and Learning.

SELF STUDY:Parallelizing Genetic Algorithms

UNIT - IV LEARNING SETS OF RULES (12 Hours)

Introduction to Learning Sets of Rules -Sequential Covering Algorithms – Learning First order Rules – FOIL – Inverting Resolution - Analytical Learning - PROLOG EBG – Explanation Based learning – Features.

SELF STUDY:Deductive Learning

UNIT - V ANALYTICAL& REINFORCEMENT LEARNING (12 Hours)

Combining Inductive and Analytical Learning - Approaches – KBANN Algorithm – TANGENTPROP – EBNN – FOCL - Reinforcement Learning - Learning Task – Q Learning – Non deterministic Actions – Temporal Difference Learning – Relationship to Dynamic Programming.

SELF STUDY:Experimentation Strategies

REFERENCES :

1. Tom M. Mitchell , “Machine Learning”, Tata McGraw-Hill, New Delhi
2. Hastie.T, Tibshirani.R, and Friedman.J, “The Elements of Statistical Learning: Data Mining Inference and Prediction”, Second edition, Springer, 2009
3. Christopher M. Bishop , ”Pattern Recognition and Machine Learning – Information Scienceand Statistics”, Springer, 2007

WEB REFERENCES :

1. <https://machinelearningmastery.com/machine-learning-with-python/>
2. http://ibpsa.fr/jdownloads/Simurex/2015/Presentations/30_03_atelier_datamining.pdf

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Identify the concepts of machine learning	K2	PSO1
CO 2	Demonstrate Decision Tree learning and Bayesian Learning for classification.	K2, K3, K4	PSO2
CO 3	Analyze the logic behind Genetic Algorithms.	K2 & K3	PSO3
CO 4	Compare various set of rules available for Learning.	K2, K3 & K5	PSO2 & PSO4
CO 5	Propose solution for real world problems based on Inductive and Analytical Learning.	K2,K3 & K5	PSO2 & PSO5

II MCA
SEMESTER – V

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCA	19MCA503	ENTERPRISE APPLICATION DEVELOPMENT	MAJOR CORE	4	4

COURSE DESCRIPTION

This course provides exposure to different frameworks namely, Struts, Hibernate, Spring and Django. This collective information supports the learner for developing advanced enterprise applications.

COURSE OBJECTIVES

- ❖ To know the architectures of Distributed systems, to understand and compare the technologies associated with J2EE and DOTNET.
- ❖ To build lightweight enterprise-ready applications
- ❖ To acquire capability in Python programming and grow true web applications utilizing Django.

UNIT – I CLIENT SERVER ARCHITECTURE

(12 Hours)

2-tier model - 3-tier model - n-tier model -J2EE architecture - DOTNET architecture - MVC architecture.

MVC Architecture - How to start an ASP.NET MVC application - The folders and files for a new MVC application

SELF STUDY :Working with Views - Working with controls

UNIT – II SPRING**(12 Hours)**

Web services – Consuming a restful web service – Java desktop application / JSP, building REST service with spring – Spring security architecture – accessing relational data using JDBC with spring – Handling form submission – Creation of batch service – Securing web applications –Accessing data with mongo DB – Creating asynchronous method -Using web socket to build an interactive web application.

SELF STUDY :Uploading files – Validating form input

UNIT –III STRUTS**(12 Hours)**

Struts – Introduction – MVC framework – STRUTS architecture – Business service – Parameter passing – Action class and configuration files – struts.xml tags –Namespace and wild cards – Validation – Interceptors – In built interceptors – Custom interceptors

SELF STUDY :Model driven action – Value stack and OGNL

UNIT – IV HIBERNATE**(12 Hours)**

HIBERNATE ORM – Persistence – Relational Database – The object relational impedance mismatch – Using native Hibernated APTs and hbm.xml – Using the java persistence API's – Hibernate Validator – HIBERNATE OGM – Configuration of tools – HIBERNATE SEARCH – Enabling full text search capabilities in entities – Introduction to Full Text Search.

SELF STUDY :Indexing – Searching

UNIT – V DJANGO**(12 Hours)**

Introduction - Django model layer – View layer - Template layer – Forms – Automated admin interface – Django security – Django web application tools – Core functionalities – Geographic Framework.

SELF STUDY :Internationalization and localization

REFERENCES:

1. Justin Couch, Daniel H.Steinberg, “J2EE Bible”, Wiley India(P) Ltd, NewDelhi , 2002
2. William S. Vincent, “Django for Beginners: Build websites with Python and Django”, 2018
3. Christian Bauer, Gavin King, and Gary Gregory, “Java Persistence with Hibernate”, Second Edition, Manning Publications Co, 2019
4. Craig Walls, “Spring in Action”, Fifth Edition, Manning Publications,2018
5. Sharanam Shah, Vaishali Shah, “Struts 2 for Beginners Struts 2 for Beginners”, 3rd Edition, Arizona Business Alliance,2014

WEB REFERENCES:

1. <https://www.javatpoint.com/spring-tutorial>
2. https://www.tutorialspoint.com/asp.net_mvc/index.htm
3. <https://www.journaldev.com/2134/struts-tutorial-for-beginners#struts-tutorial-8211-result-pages>
4. <https://howtodoinjava.com/hibernate-tutorials/>
5. <https://www.guru99.com/django-tutorial.html>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Develop dynamic web applications using MVC	K2	PSO1
CO 2	Use dependency injection & inversion of control in developing Spring project	K2, K3, K4	PSO2
CO 3	Create the Struts classes and use MVC design pattern for creating large web applications	K2 & K3	PSO3
CO 4	Map Java classes and object associations to relational database tables with Hibernate mapping files	K2, K3 & K5	PSO2 & PSO4
CO 5	Use Django for rapid development, pragmatic, maintainable, clean design, and secures websites.	K2, K3 & K5	PSO2 & PSO5

III MCA

SEMESTER – V

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCA	19MCA504	LAB IX- MACHINE LEARNING WITH PYTHON	MAJOR LAB	6	3

COURSE DESCRIPTION

This course provides experiential learning and implementation of machine learning concepts using python

COURSE OBJECTIVE

- ❖ To Acquire knowledge and Skills for creation of Web applications.
- ❖ To implement Regression and Classification using Python

LAB LIST

1. Exercise to develop simple web applications in Python
2. Exercise to manipulate data using different queries
3. Exercises to handle Exceptions, Multithreading
4. Exercise to extract features from datasets
5. Exercise to implement Regression
6. Exercise to implement Classification
7. Exercise to implement Clustering
8. Exercises for Model selection and evaluation
9. Exercises to Build a data pipeline.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Demonstrate the concept of classification & clustering in Python	K2	PSO1, PSO2 & PSO3
CO 2	Analyse and Evaluate the models built.	K2, K3, K4	PSO1 & PSO2
CO 3	Create classification and clustering models	K2, K3& K5	PSO4 & PSO5

III MCA
SEMESTER – V

For those who joined in 2019 onwards

PROGRAMM E CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	19MCA505	LAB X – ENTERPRISE APPLICATION DEVELOPME NT	MAJOR LAB	6	3

COURSE DESCRIPTION

This lab course provides the experience in creating, debugging, testing & deploying dynamic web applications. It also gives thorough coverage of the use of MVC for creating web applications.

COURSE OBJECTIVE

- ❖ To design applications using J2EE, Struts and Hibernate.
- ❖ To develop a web application with n-tier architecture.
- ❖ To develop a simple application using Spring MVC.

LAB LIST

1. Create a program to connect with database and manipulate the records in the database using ADO.NET
2. Develop a car showroom inventory web application with 2-tier architecture
3. Develop a real estate web application with n-tier architecture
4. Develop a simple Spring MVC application that take user input and checks the input using standard validation annotations

5. Design a student identity management web application using struts framework. The application should be able to provide an identity such as student id, access to department assets with department id, access to lab assets with lab id.
6. Create a simple online bookstore using Django as a back end.
7. Creating a Java Application using Hibernate technology.
8. Example for Basic Hibernate CRUD operations.
9. Example for Spring Dependency Injection and Types
10. Example for Simple spring JDBC program

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Perform Database operations for web applications using MVC	K2	PSO1
CO 2	Develop database application using Spring JDBC/Struts with CURD functionality.	K2, K3, K4	PSO2
CO 3	Enable multilingual websites by using its built-in internationalization system	K2 & K3	PSO3

II MCA
SEMESTER – IV

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	19MCA506	SKILL BASED LAB V - R PROGRAMMING	SKILL BASED LAB	2	1

COURSE DESCRIPTION

This course provides an in-depth knowledge on the basic constructs and statistical analysis in R.

COURSE OBJECTIVE

- ❖ Understand the basic constructs of R Programming.
- ❖ Analyze the statistical operations using R.

LAB LIST

1. Exercises to understand the R basics.
2. Exercises to understand the programming constructs of R
3. Exercises to draw a scatter diagram and charts.
4. Exercises to implement statistical operations in R
5. Exercises to implement concepts of probability and distributions in R

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Demonstrate the practical application of R programming tool.	K1	PSO1& PSO2
CO 2	Emphasize the implementation of statistical operations in R	K1, K2,	PSO3

III MCA
SEMESTER –V

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	19MCA507	SOFT SKILLS V - INTERPERSONAL SKILLS FOR CORPORATE READINESS	SOFT SKILLS	2	1

COURSE DESCRIPTION

This course provides the skills needed to find a job and also the skills needed to excel at the time of entering a career.

COURSE OBJECTIVES

- ❖ To impart the importance of Interpersonal skills in the working environment

UNIT- I Simulating an Interview

Telephone Interviews

- a. How to dress
- b. Body language
- c. Case Interview

UNIT - II Team Skills Development

- a. Quick plan exercise
- b. Group connections activity
- c. Coded team communication activity
- d. Personality tree exercise
- e. Management and leadership training

UNIT – III Time Management Skills

- a. Individual Target achievement activity
- b. Group Target activity

COURSE OUTCOMES

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Develop skills for producing high quality etiquettes at the time of interviews	K2	PSO1, PSO2 & PSO3
CO 2	Exhibit competencies expected by employers	K2, K3, K4	PSO1 & PSO2
CO 3	Demonstrate emotional intelligence and inter cultural competencies and to be ready to work in teams	K2, K3 & K5	PSO4 & PSO5

III MCA
SEMESTER – VI

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	19MCA602	INTERNET OF THINGS	MAJOR CORE	-	4

COURSE DESCRIPTION

This course provides the knowledge required to design an IOT system to connect embedded sensors.

COURSE OBJECTIVE

- ❖ Learn the fundamentals of IoT
- ❖ Understand the design methodology of IoT applications
- ❖ Design IoT applications using Raspberry Pi

UNIT – I FUNDAMENTALS OF IOT

(12 Hours)

Introduction-Characteristics-Physical design – Things in IoT - Protocols – Logical design of IoT – Functional blocks – communication models – communication API s – IoT Enabling technologies – IoT Levels and deployment templates.

SELF STUDY: Characteristics

UNIT - II DOMAIN SPECIFIC IOTs

(12 Hours)

Domain Specific IoTs – Introduction – Home Automation – Cities – Environment – Energy – Retail – Logistics – Agriculture – Industry – Health and Life style
IoTand M2M – Introduction – M2M – Difference between IoT and M2M - SDN and NFV for IoT.

SELF STUDY: Home Automation

UNIT – III IOT PLATFORMS DESIGN METHODOLOGY (12 Hours)

Introduction – IoT Design Methodology-IOT physical devices and Endpoints – IoT Device – Raspberry Pi – Linux on Raspberry Pi - Raspberry Pi interfaces – Programming Raspberry Pi with Python.

SELF STUDY: IoT Device

UNIT – IV IOT PHYSICAL SERVERS AND CLOUD OFFERINGS (12 Hours)

Introduction to cloud storage models and communication API s – Python web application framework –Django – Designing a RESTful web API – Amazon web services for IoT

SELF STUDY: Introduction to cloud storage

UNIT – V CASE STUDIES ILLUSTRATING IOT DESIGN (12 Hours)

Introduction – Home automation – Cities – Environment – Agriculture – Productivity Applications.

SELF STUDY: Agriculture

REFERENCES:

1. ArshdeepBahga, Vijay Madiseti,“Internet of Things – A hands-on approach”, Hyderabad Universities Press, 2015
2. Honbo Zhou,“The Internet of Things in the Cloud : A Middleware Perspective”, Newyork : CRC Press , 2012
3. Dieter Uckelmann; Mark Harrison; Florian Michahelles (Eds.) “Architecting the Internet of Things”, Germany: Springer,2011.
4. David Easley and Jon Kleinberg, “ Networks, Crowds, and Markets: Reasoning About a Highly Connected World” United Kingdom: Cambridge University Press, 2010

- Olivier Hersent, Omar Elloumi and David Boswarthick, “The Internet of Things: Applications to the Smart Grid and Building Automation”, United States : Wiley Publishing Inc, 2012

WEB REFERENCES:

- <https://lecturenotes.in/subject/370/internet-of-things-iot>
- <http://www.cs.ust.hk/~qianzh/FYTGS5100/spr2013/notes/Chapter1-IoT.pdf>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Identify the Fundamentals of Internet of Things.	K2	PSO1 & PSO2
CO 2	Design a portable IoT using relevant protocols.	K2, K3, K4	PSO1 & PSO2
CO 3	Analyze applications of IoT in real time scenario.	K2 & K3	PSO1 & PSO3
CO 4	Develop web services to access/control IoT devices.	K2, K3 & K5	PSO1 & PSO4
CO 5	Deploy an IoT application and connect to the cloud.	K2,K3 & K5	PSO1 & PSO5

II MCA
SEMESTER – III

(For those who join in 2019 onwards)

PROGRAMM E CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	19MCADS01	BIG DATA ANALYTICS	SPECIALIZATION ELECTIVE- DATA SCIENCE	4	4

COURSE DESCRIPTION

This course provides familiarization to the important information technologies used in manipulating, storing and analyzing big data.

COURSE OBJECTIVE

- ❖ To explore the fundamental concepts of Big Data analytics
- ❖ To understand the various technology foundations for Big Data
- ❖ To learn the Hadoop and Map Reduce Concepts

UNIT – I

(12 Hours)

GRASPING THE FUNDAMENTALS OF BIG DATA

Evolution of Data Management –Understanding the waves of managing data –
Defining Big Data – Building a Successful Big Data management architecture

EXAMINING BIG DATA TYPES

Defining Structured data- Defining Unstructured data- Real time and non- real
– time requirements – Managing Different data types – Integrating Data types

SELF STUDY: Managing Different data types

UNIT- II

(12 Hours)

BIG DATA TECHNOLOGY COMPONENTS

Exploring the Big Data stacks – Redundant physical Infrastructure – Security Infrastructure –Operational Databases – Organizing data services and tools – Analytical data warehouses –Big data analytics- Big data applications

DEFINING BIG DATA ANALYTICS

Using Big Data to Get Results – Modifying Business intelligence Products to Handle Big Data – Studying Big Data Analytics Examples – Big data Analytics Solutions

SELF STUDY: Organizing data services and tools

UNIT- III

(12 Hours)

GETTING STARTED WITH HADOOP

Introduction - Need for Hadoop – Origin and Design of Hadoop – Examining the various offerings of Hadoop

USE CASES FOR BIG DATA IN HADOOP

Adopting Hadoop – Log Data Analysis – Data Warehouse Modernization – Fraud Detection – Risk Modeling – Social Sentiment Analysis – Image Classification

SETTING UP THE HADOOP ENVIRONMENT– Choosing a Hadoop Distribution – Hadoop cluster architecture

SELF STUDY: Fraud Detection

UNIT - IV

(12 Hours)

STORING DATA IN HADOOP : THE HDFS

Storing data in Hadoop - Data Storage in HDFS – HDFS federation – HDFS High Availability

READING AND WRITING DATA

Compressing Data – Managing files – Ingesting Log Data

MAPREDUCE PROGRAMMING

Importance – Doing things in parallel – Writing Map Reduce Applications

SELF STUDY: Compressing Data

UNIT - V**(12 Hours)****HADOOP AND DATA WAREHOUSE**

Compare & Contrast Hadoop with Relational Databases - Modernizing the warehouse with Hadoop

STORING DATA IN HBASE

HBase – Understanding HBase Data model – Understanding the HBase architecture – Test run – HBase and RDBMS –Deploying HBase

REFERENCES:

1. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, “ Big Data”, Wiley India Pvt ltd, 2015
2. Dirk deRoos , “Hadoop for Dummies”, John Wiley and sons , 2014
3. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”, Wiley, 2015.
4. Chris Eaton, Dirk deroos et al., “Understanding Big data”, McGraw Hill, 2012.
5. Tom White, “HADOOP: The definitive Guide”, O Reilly 2012.

WEB REFERENCES:

1. http://www.planetdata.eu/sites/default/files/presentations/Big_Data_Tutorial_part4.pdf
2. <https://www.guru99.com/introduction-to-mapreduce.html>
3. <https://www.dezyre.com/hadoop-tutorial/hadoop-mapreduce-tutorial>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Understand the fundamentals of various big data analysis techniques	K2	PSO1 & PSO2
CO 2	Analyze the big data analytic techniques for useful business applications.	K2, K3, K4	PSO1 & PSO2
CO 3	Design efficient algorithms for mining the data from large volumes.	K2 & K3	PSO1 & PSO3
CO 4	Examine the HADOOP and Map Reduce technologies associated with big data analytics	K2, K3 & K5	PSO1 & PSO4
CO 5	Explore the applications of Big Data	K2, K3 & K5	PSO1 & PSO5

II MCA
SEMESTER – IV

(For those who join in 2019 onwards)

PROGRAMM E CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	19MCADS02	BIG DATA SECURITY	SPECIALIZATION ELECTIVE- DATA SCIENCE	4	4

COURSE DESCRIPTION

This course provides an overview of the cutting edge and new technologies in the area of big data security.

COURSE OBJECTIVE

- ❖ Understand the significance of privacy and ethics in big data environment
- ❖ Learn about the security issues in Hadoop environment
- ❖ To become familiar with various algorithms for implementing security

UNIT- I

(12 Hours)

SECURITY AND GOVERNANCE FOR BIG DATA ENVIRONMENTS

Security in context with Big data – Understanding data protection options – Data governance challenge – Putting the right organizational structure in place – Developing a well governed and secured big data environment Big data best practices – Big data do’s and don’ts

SELF STUDY: Big data do’s and don’ts

UNIT - II

(12 Hours)

HADOOP SECURITY OVERVIEW

Challenges for securing the hadoop eco system – key security considerations

Hadoop security design : Kerberos – terminologies – advantages – Hadoop security model without Kerberos – Hadoop Kerberos security implementation.

SELF STUDY:key security considerations

UNIT - III

(12 Hours)

SETTING UP A SECURED HADOOP CLUSTER

Setting up Kerberos – configuring hadoop with Kerberos authentication

SECURING THE HADOOP ECO SYSTEM

Configuring kerberos for Hadoop eco system components – securing Hive, Oozie, flume, Hbase, Scoop, Pig

UNIT - IV

(12 Hours)

SECURING SENSITIVE DATA IN HADOOP

Securing insights in Hadoop – Securing data in Motion – Security data in Rest – Implementing data encryption in Hadoop.

SELF STUDY: Security data in Rest

UNIT - V

(12 Hours)

SECURITY EVENT AND AUDIT LOGGING IN HADOOP

Security incident and event monitoring in Hadoop Cluster – Audit logging in a secured Hadoop cluster.

SELF STUDY: Audit Logging

REFERENCES:

1. Judith Hurwitz, Alan Nugent, Dr. Fern Halper and Marcia Kaufman, “Big Data”, Wiley Publications, 2014.
2. Sudeesh Narayanan, “Securing Hadoop”, Packt Publishing, 2013.
3. Tom White, “Hadoop: The Definitive Guide”, Third Edition, O’reilly Media, 2012
4. Mark Van Rijmenam, “Think Bigger: Developing a Successful Big Data Strategy for Your Business “, Amazon, First edition, 2014.
5. Frank Ohlhorst, “Big Data Analytics: Turning Big Data into Big Money”, John Wiley & Sons, John Wiley & Sons, 2013.

WEB REFERENCES:

1. <https://www.sisense.com/glossary/big-data-security/>
2. <https://www.datamation.com/big-data/big-data-security.html>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Identify the need for security and best practices in a big data environment	K2	PSO1 & PSO2
CO 2	Analyze the steps to secure big data	K2, K3, K4	PSO1 & PSO2
CO 3	Build security in hadoop eco system	K2 & K3	PSO1 & PSO3
CO 4	Assess the sensitivity of data in Hadoop	K2, K3 & K5	PSO1 & PSO4
CO 5	Outline data security and event logging	K2, K3 & K5	PSO1 & PSO5

III MCA
SEMESTER – V

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	19MCADS03	DATA ANALYTICS USING PIG AND HIVE	SPECIALIZATION ELECTIVE- DATA SCIENCE	4	4

COURSE DESCRIPTION

This course provides knowledge on creating applications to analyze big data.

COURSE OBJECTIVE

- ❖ Learn about the fundamental concepts of Pig and Hive.
- ❖ Provide knowledge on writing scripts through Pig Latin and understanding Hive data model.
- ❖ Perform data definition and data manipulation operations using HiveQL and apply these to perform analytics

UNIT - I

(12 Hours)

DATA ANALYTICS USING PIG

Introduction – Downloading and installing pig – Running Pig – Grunt – Pig’s Data model – Types – Schemas.

SELF STUDY:Types

UNIT - II

(12 Hours)

INTRODUCTION TO PIG LATIN

Preliminary matters - Input and Output – Relational operations – User defined functions-Advanced relational Operations -Integrating Pig with legacy code and map reduce – Controlling execution.

SELF STUDY:Relational operations

UNIT - III

(12 Hours)

DEVELOPING AND TESTING PIG LATIN SCRIPTS

Writing Evaluation and filter functions – Writing load and store functions –

HIVE - INTRODUCTION

Developing Hive – Services in Hive – Understanding Hive Data model.

UNIT - IV

(12 Hours)

HIVEQL: DATA DEFINITION

Databases – Alter database – Create Tables – Alter Tables – Manage Tables – Drop Tables.

HIVEQL: DATA MANIPULATION

Load Data into managed tables – Insert into tables from Queries - Creating Tables and Loading Them in One Query - Exporting Data.

SELF STUDY: Insert into tables from Queries

UNIT - V

(12 Hours)

HIVEQL QUERIES

SELECT ... FROM Clauses –Where Clauses – Group by clauses - Join Statements – ORDER BY and SORT BY- DISTRIBUTE BY with SORT BY- CLUSTER BY – casting - Queries that Sample Data – UNION ALL

HIVEQL VIEWS

HiveQL: Indexes - Schema Design – Tuning – Functions – Streaming - Customizing Hive File and Record formats – Security – Locking

SELF STUDY:ORDER BY and SORT BY

REFERENCES:

1. Alan Gates ,“Programming Pig”, First edition, O’Reilly Media, 2011
2. Hanish Bansal, Saurabh Chauhan ,“Apache Hive Cookbook”, Packt publishing, 2016

3. Jason Rutherglen, Dean Wampler, Edward Capriolo , “Programming Hive”, First edition, O’Reilly Media , 2012
4. “Alan Gates & Daniel Dai ,Pig :Data flow Scripting with Hadoop”, O’Reilly Media, 2016
5. BalaswamyVaddeman , “Beginning Apache Pig” , Apress Publications, 2016
6. Dayong Du, “Apache Hive Essentials”, Packet Publishing, 2015

WEB REFERENCES:

1. <https://cognitiveclass.ai/courses/introduction-to-pig/>
2. <https://data-flair.training/blogs/apache-hive-tutorial/>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM’S TAXONOMY)	PSOs ADDRESSED
CO 1	Understand the programming constructs of Pig and database management using HiveQL	K2	PSO1 & PSO2
CO 2	Write scripts using Pig latin and perform various HiveQLqueries by applying RDBMS concepts	K2, K3, K4	PSO1 & PSO2
CO 3	Apply the concepts of Pig and Hive in simple tasks	K2 & K3	PSO1 & PSO3
CO 4	Formulate and analyse different databases for different situations	K2, K3 & K5	PSO1 & PSO4
CO 5	Create real time applications	K2,K3 & K5	PSO1 & PSO5

II MCA
SEMESTER - III

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCA	19MCANW01	CRYPTOGRAPHY AND NETWORK SECURITY	SPECIALIZATION ELECTIVE-NETWORKING	4	4

COURSE DESCRIPTION

This course provides basic understanding of previous attacks on cryptosystems with the aim of preventing future attacks and to provide security using various cryptographic tools.

COURSE OBJECTIVE

- ❖ Understand the OSI security architecture and classical encryption techniques.
- ❖ To be able to secure a message over insecure channel by various means.
- ❖ Acquire knowledge on various algorithms, block and stream cipher models.
- ❖ Portray the principles of public key cryptosystems and MAC.

UNIT –IOVERVIEW AND CLASSICAL ENCRYPTION TECHNIQUES (12 Hours)

Computer Security Concepts – OSI Security Architecture – Security attacks – Security Services – Security mechanisms –Model for Network Security - Symmetric Cipher Model - Cryptography – Cryptanalysis and Brute Force Attack – Substitution techniques – Caesar Cipher – Monoalphabetic Ciphers – Playfair cipher – Polyalphabetic Cipher – Vigenere Cipher – Vernam Cipher.

SELF STUDY:Steganography, Transposition techniques

UNIT - II BLOCK CIPHERS, DES AND AES `

(12 Hours)

Traditional Block Cipher Structure – Stream Ciphers and Block Ciphers – Feistel Cipher Structure – Feistel Decryption Algorithm - Data Encryption Standard – DES Encryption – DES Decryption – Block Cipher Design Principles – AES Structure – AES Transformation Functions – Electronic Codebook – Cipher Block Chaining Mode – Cipher Feedback Mode – Output Feedback Mode.

UNIT- III PUBLIC-KEY CRYPTOGRAPHY & DIGITAL SIGNATURES(12 Hours)

Principles of Public Key Cryptosystems – Applications - Cryptanalysis - RSA Algorithm – Description – Computational Aspects – Security of RSA - Diffie - Hellman key Exchange – Algorithm – Key Exchange Protocols – Man in the middle attack – Message Authentication Requirements – Functions – Message encryption - Digital Signatures – Properties – Attacks and forgeries – Requirements – Direct Digital Signature.

SELF STUDY:Requirements of Public key cryptosystem

UNIT - IV TRANSPORT LEVEL AND WIRELESS NETWORK SECURITY(12 Hours)

Web Security Considerations - Web Security Threats – Web Traffic Security Approaches –Transport Layer security– Version number – MAC – Psuedo random functions – Alert Codes – Client Certificate Types – Cryptographic Computations- Wireless Security – Threats – Measures - Mobile Device Security – Threats - Strategy.

SELF STUDY :Kerberos, Message Authentication Codes Requirements

UNITV ELECTRONIC MAIL AND IP SECURITY

(12 Hours)

Internet Mail Architecture – Protocols - Pretty Good Privacy – Notation – Operational Description – Domain Keys identified Mail Architecture – Characteristics – DKIM strategy – DKIM Functional flow - IP Security Overview – Applications – Benefits – Routing Applications – Authentication plus Confidentiality – Key Determination Protocol – Header and Payload Formats.

SELF STUDY :Email Components

REFERENCES :

1. William Stallings, “Cryptography and Network Security Principles & Practice”, 7th Edition , Pearson Education Limited , 2018.
2. AtulKahate, “Cryptography and Network Security”,3rd Edition, Tata McGraw Hill, 2013.
3. William Stalling,“Network security Essentials”,Pearson publication.
4. Johannes A. Buchaman, “Introduction to cryptography”, Springer - Verlag 2013.

WEB REFERENCES:

1. www.cse-eb.iitkgp.ernet.in/~debdeep/courses_iitkgp/Crypto/index.htm
2. <https://www.tutorialspoint.com/cryptography/>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Evaluate the fundamentals of networks security, security architecture, threats and vulnerabilities	K2	PSO1
CO 2	Compare Stream ciphers and block ciphers.	K2, K3, K4	PSO2
CO 3	Apply the different cryptographic operations of public key cryptography.	K2 & K3	PSO3
CO 4	Pertain the various Authentication schemes to simulate different applications.	K2, K3 & K5	PSO2 & PSO4
CO 5	Analyze various Security practices and System security standards.	K2,K3 & K5	PSO5

II MCA
SEMESTER – IV

(For those who join in 2019 onwards)

PROGRAM ME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	19MCANW02	WIRELESS SENSOR NETWORKS	SPECIALIZATION ELECTIVE - NETWORKING	4	4

COURSE DESCRIPTION

This course provides knowledge on the architectures, functions and performances of wireless sensor systems and platforms. It also describes and analyze the specific requirements for applications in wireless sensor networks regarding energy supply, memory, processing and transmission capacity.

COURSE OBJECTIVE

- ❖ To understand the fundamental architecture of wireless and sensor networks
- ❖ To analyse the role of physical and data link layer and its protocol.
- ❖ To understand the impact of time synchronization, localization and positioning in WSN.
- ❖ To learn the rules of routing protocols in WSN.

UNIT I

(12 Hours)

INTRODUCTION - Challenges for Wireless Sensor Networks – Mobile ad hoc networks and wireless Sensor Networks – field buses and Wireless Sensor Networks – enabling Technologies for wireless sensor networks.

ARCHITECTURES – Single Node Architecture - Hardware Components – Energy Consumption of sensor nodes – Operating systems and execution environments - Examples of sensor nodes

NETWORK ARCHITECTURE– Sensor network scenarios – Optimization Goals and figures of merit – Design principles of WSN

SELF STUDY: Enabling Technologies for wireless sensor networks, Examples of sensor nodes

UNIT II

(12 Hours)

MAC PROTOCOLS– Fundamentals of MAC protocols - Low duty cycle protocols and wakeup concepts- contention based protocols – schedule based protocols – the IEEE 802.15.4 MAC protocol

LINK LAYER PROTOCOLS– Fundamentals - Error control - Framing – Link management

SELF STUDY:Link management

UNIT III

(12 Hours)

TIME SYNCHRONIZATION - Introduction – Protocols

LOCALIZATION AND POSITIONING –Properties of localization and positioning procedures – Mathematical basics for the lateration problem – single hop localization – Positioning in multi hop environment – Impact of anchor placement.

TOPOLOGY CONTROL– Motivation and basic ideas – Controlling topology in flat networks – power control – Hierarchical networks by dominating sets – hierarchical networks by clustering

SELF STUDY:Properties of localization and positioning procedures

UNIT IV

(12 Hours)

ROUTING PROTOCOLS – Gossiping and agent based uni cast forwarding – energy efficient unicast – broadcastand multicast – Geographic routing – Mobile

nodes - Data centric and content based networking – Introduction – Data centric routing – data aggregation – data centric storage

SELF STUDY: Geographic routing – Mobile nodes

UNIT V

(12 Hours)

TRANSPORT LAYER AND QUALITY OF SERVICE- Transport layer and QoS in wireless sensor networks – Congestion control and rate control

ADVANCED APPLICATION SUPPORT – advanced network processing – Security – Application specific support

SELF STUDY: Congestion control and rate control

REFERENCES :

1. Holger Karl & Andreas Willig, “Protocols and Architectures for Wireless Sensor Networks” , John Wiley, 2006
2. Carlos De MoraesCordeiro, Dharma Prakash Agrawal, “Ad Hoc and Sensor Networks: Theory and Applications”,2nd Edition, World Scientific Publishing, 2011.
3. WaltenegeDargie, Christian Poellabauer,“Fundamentals of Wireless Sensor Networks Theory and Practice”,John Wiley and Sons, 2010.
4. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach”, Elsevier, 2007.

WEB REFERENCES:

1. <https://www.elprocus.com/architecture-of-wireless-sensor-network-and-applications/>
2. https://en.wikipedia.org/wiki/wireless_sensor_network

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Explore the impact of WSN and its hardware components.	K2	PSO1 & PSO2
CO 2	Analyze the different protocols in MAC and Link layer	K2, K3, K4	PSO1 & PSO2
CO 3	Apply the concepts of localization, time synchronization and positioning in WSN	K2 & K3	PSO1 & PSO3
CO 4	Perform data routing and data aggregation	K2, K3 & K5	PSO1 & PSO4
CO 5	Design simple applications using sensor nodes incorporating security features.	K2,K3 & K5	PSO1 & PSO5

III MCA
SEMESTER – V

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	19MCANW03	HIGH SPEED NETWORKS	SPECIALIZATION ELECTIVE-NETWORKING	4	4

COURSE DESCRIPTION

This course covers the basics, architectures, protocols and technologies for high-speed networks. It includes LANs, Protocols, TCP/IP Suite, Data Networks, high speed LANs, link level flow and error control, transport level traffic control, routing, MPLS switching and Network security.

COURSE OBJECTIVE

- ❖ To highlight the features of different technologies involved in High Speed Networking and their Performance.
- ❖ To facilitate on the basis of ATM and Frame Relay concepts and their applications.
- ❖ To learn about the various high speed digital access and broadband technologies Switching techniques.

UNIT I

(12 Hours)

HIGH SPEED NETWORKS

Packet Switching Networks – Frame Relay Networks - Asynchronous Transfer Mode - ATM Protocol Architecture - ATM Logical Connections – ATM cell – ATM Service Categories – AAL - Fast Ethernet – Gigabit Ethernet – Fiber Channel – Wireless LANS – Applications – Requirements – Architecture of 802.11 – Services – Protocol layers

SELF STUDY: Asynchronous Transfer Mode

UNIT II

(12 Hours)

QUEUING ANALYSIS, CONGESTION CONTROL IN DATA NETWORKS AND INTERNETS

Queuing analysis – Queuing Models – Single Server Queues – Multi Server Queues Effects of Congestion – Congestion control – Traffic Management – Congestion control in Packet Switching Networks – Frame relay Congestion control

SELF STUDY: Congestion control

UNIT III TCP

(12 Hours)

TCP Flow control – TCP Congestion control – Retransmission – Timer Management – Exponential RTO Hackoff – KARN's Algorithm – Window Management – Performance of TCP over ATM

SELF STUDY: Window Management

UNIT IV

(12 Hours)

INTEGRATED AND DIFFERENTIATED SERVICES

Integrated Services Architecture – Approach – Components – Services – Queuing – Discipline – FQ – PS – BRFQ – GPS – WFQ – Random Early Detection – Differentiated services

SELF STUDY: GPS

UNIT V

(12 Hours)

PROTOCOLS FOR QOS SUPPORT

RSVP – Goals & Characteristics – Data flow – RSVP operations – Protocol Mechanisms – Multiprotocol Label Switching – operations – Label Stacking and Protocol details – RTP – Protocol Architecture, Data transfer Protocol, RTCP

SELF STUDY: Data flow

REFERENCES :

1. William Stallings, "HIGH SPEED NETWORKS AND INTERNET", Pearson Education, Second Edition, 2010
1. Behrouz A Forouzan, "Data Communication and Networking", 4th Edition, Tata Mc Graw Hill.
2. Harry J. R. Dutton, Harry, Jr. Dutton, Peter Lenhard, "High Speed Networking Technology", Prentice Hall, 2016.
3. Costa, "Planning and Designing High Speed Networks", Hewlett-Packard Company, Prentice Hall, 2016.

WEB REFERENCES:

1. <https://www.hi-speed.net.au>
2. <https://sterbenz.org/jpgs/tutorials/hsn>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Identify the building blocks and operation of high speed networking and ATM.	K2	PSO1 & PSO2
CO 2	Analyze the cause of congestion, traffic slow down and related factors for Quality of Service Identify.	K2, K3, K4	PSO1 & PSO2
CO 3	Apply the concepts learnt in this course to optimize performance of high-speed networks using Flow Control.	K2 & K3	PSO1 & PSO3
CO 4	Compare the different architectures used for HSN.	K2, K3 & K5	PSO1 & PSO4
CO 5	Describe the protocols that are used to design high speed networks.	K2,K3 & K5	PSO1 & PSO5

II MCA
SEMESTER – III

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	19MCAAD01	WEB PROGRAMMING TECHNIQUES	SPECIALIZATION ELECTIVE- APPLICATION DEVELOPMENT	4	4

COURSE DESCRIPTION

This course focuses on the two broad divisions of web development, front-end and back-end development. It gives information on how to load a web application, design and how to interact with web pages using HTML, CSS and JavaScript.

COURSE OBJECTIVES

- ❖ To be familiar with the structured approach to identify the needs, interests, and functionalities of a website.
- ❖ To write well-structured, easily maintained, standards-compliant CSS code to design creative web pages.
- ❖ To have an exposure on creating dynamic web pages using JavaScript.

UNIT I HTML5 FUNDAMENTALS

(12 Hours)

Introduction – Doctypes – Headings – Paragraphs – Text Formatting – Anchors and Hyperlinks – Tables – Comments – Image Maps – Input Control Elements – Forms.

SELF STUDY :Lists – Images

UNIT II ADVANCED FEATURES OF HTML 5

(12 Hours)

Div Element – Sectioning Elements – Navigation Bars –Output- Element–
Void Elements –Media Elements – Progress Element– Embed – Iframes –
Content Languages – SVG – Canvas – Tabindex – Global Attributes – HTML
Event Attribute – Character Entities

SELF STUDY :Label Element – Selection Menu Controls

UNIT III INTRODUCTION TO CSS&CSS 3

(12 Hours)

Importing a style sheet – Rules – Types – Selectors – Cascade – Fonts –
Text Styles – Colors – Positioning Elements – Box model and layout
Attribute selectors – Backgrounds– Box Shadows – Element Overflow –
Multicolumn Effect - Colors and Opacity – Text Effects – Web Fonts –
Transformations – Transitions

SELF STUDY :Pseudo Elements – Shorthand Rules – Borders

UNIT IV EXPLORING JAVASCRIPT

(12 Hours)

JavaScript and HTML Text –Operators – Global Variables – DOM
Expressions and control flow in JavaScript. Conditionals – Looping. Function,
Object & Arrays. Functions – Objects – Arrays

SELF STUDY :Variables –Expressions – Operators

UNIT V ECMASCRIPT 6&AJAX

(12 Hours)

Arrows – Classes- Enhanced object literals –default + rest + const –
iterators + for..of – Generators – Unicode – Modules – Module loaders – map +
set + weakmap + weakest - proxies – symbols – subclassablebuilt_ins –
promises – math + number +string +array +object APIS – binary and octal
literals – reflect API – tail calls.

Using XMLHttpRequest – Implementing AJAX – Sending XML Requests- Using.

SELF STUDY: Template strings – Destructuring – Framewoks for AJAX

REFERENCES :

1. “HTML 5 Notes for Professionals”, GoalKicker.com
2. Robin Nixon, “PHP, MYSQL, JavaScript & CSS”, O’Reilly, 2nd Edition,2012
3. “ECMAScript6– <https://github.com/lukehoban/es6features>
4. Chris Minnick, Ed Tittel, “*Beginning HTML5 and CSS3 For Dummies* ”, For Dummies; 1st edition2013
5. Chris Minnick, Eva Holland , “Coding with JavaScript For Dummies”, Wiley,2015
6. Kyle Simpson, “JS: ES6 & Beyond “ , Shroff/O'Reilly, First edition, 2016
7. DT Editorial Services, HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery), Dreamtech Press, Second edition, 2016

WEBREFERENCES :

1. https://www.w3schools.com/html/html5_intro.asp
2. www.css3.com
3. css3generator.com
4. <https://www.javascript.com>
5. es6-features.org

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Understand the basics of HTML tags	K2	PSO1 & PSO2
CO 2	Analyze the advanced features of HTML5.	K2, K3, K4	PSO1 & PSO2
CO 3	Implement the use of internal and external Cascading Style sheets (CSS) to format elements on single or group of pages	K2 & K3	PSO1 & PSO3
CO 4	Compose programs for the web and other contexts using the JavaScript programming language	K2, K3 & K5	PSO1 & PSO4
CO 5	Apply various ECMAScript 6 methods in building interactive websites.	K2,K3 & K5	PSO1 & PSO5

II MCA
SEMESTER – IV

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	19MCAA D02	INTERNET PROGRAMMING FRAMEWORKS	SPECIALIZATION ELECTIVE-APPLICATION DEVELOPMENT	4	4

COURSE DESCRIPTION

This course provides an overview of client-side web UI frameworks of Bootstrap 4. It focuses on grids and responsive design using CSS pre-processors, Less and Sass and the basics of Node.js. It takes the students to move to the next level by building data-driven web apps using React

COURSE OBJECTIVES

- ❖ To develop rich interactive web pages.
- ❖ To understand the modern technologies, components and frameworks for developing web pages.
- ❖ To build websites by apply mark-up languages for processing, identifying, and presenting of information in web pages.

UNIT - I React JS

(12 Hours)

Overview - Environment Setup –JSX- Components – State – Props overview – Probs Validation – Component API –Component life cycle – Forms – Events

SELF STUDY :Refs – Keys

UNIT II Angular

(12 Hours)

Architecture Overview–Environment Setup - Components-Modules - Data Binding- Event Binding – Templates – Directives -Pipes –Routing – Services

SELF STUDY :HTTP Service – Forms

UNIT III NODE.JS & BOOTSTRAP 4

(12 Hours)

BootstrapIntroduction– Grid System – Theme - Node.js Introduction – Modules – HTTP Module – File System - URL Module - NPM- Upload files – Email.

UNIT IV NODE.JS MYSQL & NODE.JS MONGODB

(12 Hours)

Node.js MySQL : Creating Database- Insert - Select - Where-Order By- Delete-Drop Table - Update - Limit- Join - Node.js MongoDB - Creating Database – Insert – Find - Query- Sort- Delete- Drop Collection- Update-Limit- Join.

SELF STUDY :Creating Collection – Creating Table

UNIT V LESS & SASS BASICS, JSON

(12 Hours)

Overview Of Less Basics–Variables–Mixins–Nesting–Operators–Escaping – Functions–Namespaces and Accessors–Maps–Scope–Comments–Importing–SaasBasics-Preprocessing–Variables–Nesting–Partials–Import–Mixins–Inheritance – Operatos – JSON Introduction-Syntax - PHP - HTML- JSONP.

SELF STUDY: Functions - JSON vs XML- Data Types - Stringify- Objects

REFERENCES :

1. Alex Banks, Eve Porcello, “Learning React: Functional Web Development with React and Redux”, 1st edition, O'Reilly Media, 2017.
2. Chandermani Arora, “Angular 6 by Example, 3rd edition, Packt Publishing Limited, 2018.
3. Basarat Syed, “Beginning Node.js”, 1st edition, Apress, 2014.
4. Lindsay Bassett , “Introduction to JavaScript Object Notation”, 1st edition , O'Reilly Media, 2015

WEB REFERENCES :

1. <https://nodejs.org/>
2. <https://angular.io/docs>
3. <https://reactjs.org/>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Analyze React Components, the building blocks and its interaction with other web applications	K2	PSO1 & PSO2
CO 2	Design websites using various Angular features including directives, components and services	K2, K3, K4	PSO1 & PSO2
CO 3	Compute and build applications using Node.JS along with the combination of Bootstrap.	K2 & K3	PSO1 & PSO3
CO 4	Apply the concepts of MongoDB & MySQL, the back-end databases	K2, K3 & K5	PSO1 & PSO4
CO 5	Utilize the conceptual and practical aspects of CSS Pre-processors and JSON.	K2,K3 & K5	PSO1 & PSO5

III MCA
SEMESTER – V

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDI TS
PSCA	19MCAAD03	SOFTWARE DEVELOPMENT FRAMEWORKS	SPECIALIZATION ELECTIVE – APPLICATION DEVELOPMENT	4	4

COURSE DESCRIPTION

This course provides an immersive experience in the technical, cultural and social aspects of Agile and DevOps.

COURSE OBJECTIVE

- ❖ To learn the software development process using agile.
- ❖ To comprehend the quality and risk management in software development.
- ❖ To understand the integration between development and operations in software project development.

UNIT I

(12 Hours)

MODERNIZING PROJECT MANAGEMENT

Project management needed a make over – Introducing Agile Project Management.

APPLYING AGILE MANIFESTOS & PRINCIPLES

Understanding the Agile Manifesto - Outlining the four values of Agile manifesto- Defining the 12 Agile principles - Agile Benefits.

AGILE APPROACHES:

Overview of lean- Overview of scrum - Overview of Extreme programming.

SELF STUDY :Agile Benefits

UNIT II

(12 Hours)

AGILE PLANNING AND EXECUTION:

Agile planning – Defining the product vision – Creating a product road map – completing the product backlog.

PLANNING RELEASES AND SPRINTS:

Refining requirements and estimates – Release planning – Sprint planning.

SHOWCASING WORK, INSPECTING AND ADAPTING:

The Sprint review – The sprint retrospective – Preparing for release.

SELF STUDY: Sprint planning

UNIT III

(12 Hours)

MANAGING SCOPE AND PROCUREMENT

Managing Agile scope - Managing Agile procurement

MANAGING TIME AND COST

Managing Agile schedule – Managing Agile budgets

MANAGING AGILE TEAM DYNAMICS& COMMUNICATION

Managing Agile Team Dynamics - Managing Agile communication – Managing Agile quality – Managing Agile risk.

SELF STUDY: Managing Agile communication

UNIT IV FUNDAMENTALS OF DEVOPS

(12 Hours)

The Definition of DevOps – What DevOps is not - Introduction – Traditional Project Setting – Agile Project Setting – Blame Game: Dev vs. Ops – Operations as Bottleneck - DevOps to Rescue – The Essence of DevOps

SELF STUDY Agile Project Setting

UNIT V

(12 Hours)

BUILDING BLOCKS OF DEVOPS

Measurement and Metrics – Improving flow of features – Improve And Accelerate Delivery

QUALITY AND TESTING

What is Quality – Pattern for Improving Quality.

SELF STUDY: Improving flow of features

REFERENCES :

1. Mark C.Layton , Steven J.Ostermiller , “Agile Project Management”, Wiley Publication II edition ,2018
2. MachaelHuttermann, “DevOps for developers”, Apress publication, 2012
3. Joseph joyner, “DevOps for Beginners” Speedy publishing LLC 2015
4. Robert Martin, “Agile software development, Principles patterns and practices” person new international edition, 2013
5. Greene Jennifer, “Learning Agile” Orielly series I edition 2014

WEB REFERENCES:

1. <https://martinfowler.com/agile.html>
2. <https://refactoring.com/>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Explain the fundamental principles and practices of the agile development methods.	K1	PSO1& PSO2
CO 2	Analyze the planning and execution of the agile manifesto	K1, K2,	PSO3
CO 3	Monitor the management to achieve complete product development.	K1 & K3	PSO5
CO 4	Practice the integration of development and operations in software projects.	K1, K2, K3 &	
CO 5	Present the software project by following the principles that best fit the technical and market demands.	K2 & K4	

GENERAL ELECTIVE - MCA

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	19MCAGE01	RESOURCE MANAGEMENT TECHNIQUES	GENERAL ELECTIVE	4	4

COURSE DESCRIPTION

This course provides solution to problems in different environment that needs decision making using optimization techniques

COURSE OBJECTIVE

- ❖ To provide the concept and an understanding of basic concepts in Operations Research Techniques for Analysis and Modeling in Computer Applications.
- ❖ To understand, develop and solve mathematical model of linear programming problems.
- ❖ To understand, develop and solve mathematical model of Transport and assignment problems.
- ❖ To understand network modeling for planning and scheduling the project activities

UNIT I Introduction

(12 Hours)

Operations Research – An Introduction- Features- Definition- Scientific Method- Models- Methods for solving OR Models- Methodology of OR- Advantages- Applications and Scope- LPP Model formulation – LPP Graphical Solution.

SELF STUDY: Advantages- Applications and Scope

UNIT II LINEAR PROGRAMMING PROBLEM

(12 Hours)

LPP - Standard form – Definition- Reduction of Feasible solution to a basic feasible solution- Simplex algorithm (Maximization Case) - Simplex algorithm (Minimization Case).

SELF STUDY:Reduction of Feasible solution to a basic feasible solution

UNIT III TRANSPORTATION & ASSIGNMENT PROBLEM

(12 Hours)

Transportation Problem – Initial Basic Feasible solution – North West Corner Method- Least Cost method- Vogel's Approximation Method- MODI Method- Unbalanced Transportation Problem. Assignment Problem – Hungarian Assignment Method

SELF STUDY: Unbalanced Transportation Problem

UNIT IV GAME THEORY

(12 Hours)

Game Theory- Two persons zero sum game- Games with saddle point- Games without saddle point- Graphical Method- LP Method- The rule of dominance

SELF STUDY: LP Method

UNIT V PERT & CPM

(12 Hours)

Project Management: PERT and CPM – Difference between PERT and CPM- Critical Path analysis- Problems in PERT analysis- Project , Time, Cost Trade off- Resource allocation.

SELF STUDY: Difference between PERT and CPM

REFERENCES :

1. J.K. Sharma , “Operations Research- Problems and Solutions”,Macmillan Publishers India Ltd,3 rd Edition, 2009.
2. KantiSwarup ,P.K.Gupta, Manmohan ,“Operations Research”, 13 th Edition, 2008.
3. S. Kalavathy ,“Operations Research”,Vikas publishing house private Ltd, 4th Edition,2013.
4. R. Paneerselvam, “Operations Research”, PHI learning Pvt Ltd, 2nd Edition, 2012.

WEB REFERENCES:

1. <https://lecturenotes.in/subject/573/operations-research-or>
2. <http://www.cs.toronto.edu/~stacho/public/IEOR4004-notes1.pdf>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Identify the applications of Operations Research and methods to solve business problems	K2	PSO1 & PSO2
CO 2	Apply linear programming to solve operational problem with constraints	K2, K3, K4	PSO1 & PSO2
CO 3	Apply transportation and assignment models to find optimal solution in warehousing and Travelling,	K2 & K3	PSO1 & PSO3
CO 4	Prepare project scheduling using PERT and CPM	K2, K3 & K5	PSO1 & PSO4
CO 5	Use optimization concepts in real world problems	K2, K3 & K5	PSO1 & PSO5

GENERAL ELECTIVE - MCA

(For those who join in 2019 onwards)

PROGRAMM E CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	19MCAGE02	FINANCIAL MANAGEMENT AND ACCOUNTING	GENERAL ELECTIVE	4	4

COURSE DESCRIPTION

This course provides an overview of financial concepts, process and operations from a managerial perspective.

COURSE OBJECTIVE

- ❖ To define the set of accounting method and disclosure practices from which firms select when providing information to external parties.
- ❖ The primary emphasis is to assist in developing the skills required to interpret, analyze and evaluate information contained in published financial statements.

UNIT I ACCOUNTING

(12 Hours)

Principles, Basic accounting concepts and conventions, journal, ledger – final accounts.

SELF STUDY: Ledger

UNIT II COSTING

(12 Hours)

Introduction to costing - cost elements - Classification of costing- Materials - Stock levels – FIFO, LIFO, Simple Average Method, Weighted Average Method (simple problem only)

SELF STUDY: Classification of costing

UNIT III FUND FLOW AND CASH FLOW STATEMENT

(12 Hours)

Meaning –objective- preparation of fund flow statement and cash flow statements.

SELF STUDY: Objective

UNIT IV

(12 Hours)

BUDGET AND BUDGETARY CONTROL:

Nature and scope, Importance.

MARGINAL COSTING:

Nature, scope and importance, Break-even analysis, Uses and limitations.

SELF STUDY: Uses and limitations

UNIT V TALLY

(12 Hours)

Introduction to tally – Accounting Information – Vouchers – Inventory – Purchase/Sales Orders – Invoices – Reports – Important Features of Tally.

SELF STUDY: Invoices

REFERENCES :

1. T.S.Reddy&A.Murthy, “Advanced Accountancy”, MarghamPublications , 2nd Revised Edition, 2014.
2. T.S.Reddy&Y.Hari Prasad Reddy, ”Cost Accounting” ,Margham Publications, Fourth Revised Edition, 2015.
3. T.S Reddy &Y.Hari Prasad Reddy, “Management Accounting”, Margham Publications Third Revised Edition- 2014.
4. S. Palanivel,“Tally 9: Accounting Software”, Margham Publications, 2015.
5. A.K.Nadani, “Simple Tally 9” BPB Publications, 2010.
6. R.L.Gupta&M.Radhaswamy, “Advanced accountancy”, Sultan chand& co, 2014.
7. S.N.Maheswari “Principles of Management accounting”, Sultan Chand & co, 2014.

8. R.S.N.Pillai& B.Bagavathi,“Cost accounting”, Sultan Chand & co, 2014.

WEB REFERENCES:

1. [https:// en.wikipedia.org/wiki/Financial_management](https://en.wikipedia.org/wiki/Financial_management)
2. <https://www.managementstudyguide.com/financial-management.htm>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Preparation and analysis of balance sheet.	K2	PSO1 & PSO2
CO 2	Predict the Classification of Costing.	K2, K3, K4	PSO1 & PSO2
CO 3	Decide the budget preparation and control of a company.	K2 & K3	PSO1 & PSO3
CO 4	Analyze the flow of funds.	K2, K3 & K5	PSO1 & PSO4
CO 5	Use Tally to implement the needs of financial accounting.	K2,K3 & K5	PSO1 & PSO5

GENERAL ELECTIVE - MCA

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	19MCAGE03	MANAGEMENT INFORMATION SYSTEMS	GENERAL ELECTIVE	4	4

COURSE DESCRIPTION

This course provides the concept and the role of management information systems to achieve strategic goals and to gain competitive advantages.

COURSE OBJECTIVE

- ❖ To impart a systematic knowledge of the management information technology.
- ❖ To enlighten the principles and practices of management with the usage of technology.
- ❖ To understand the global and security challenges.

UNIT – I

(12 Hours)

MIS IN DIGITAL FIRM, E-BUSINESS ENTERPRISE, STRATEGY MANAGEMENT

Concept - Definition – Role – Impact – Control System - Support – Effectiveness – MIS for a Digital Firm - E- Business Enterprise – Organization of Business - E-commerce – E-Communication – E-Collaborations – Real Time Enterprise – Technology options for real time enterprise - Corporate Planning - Strategic Planning- Types of Strategies – Short range planning – Tools of planning – Strategic Analysis of Business - Strategic Business Planning.

SELF STUDY :Technology of Information Systems

UNIT II

(12 Hours)

DECISION MAKING, INFORMATION, KNOWLEDGE, BUSINESS INTELLIGENCE, SYSTEMS ENGINEERING

Concepts – Process – Analytical modeling – Behavioral concepts – Organizational Decision Making- MIS and Decision Making - Concepts – Classification – Methods of Data and Information collection– Value of the information – Knowledge and Knowledge Management systems – Business Intelligence – MIS and the information and Knowledge - Concepts – Control – Types – Complexity – Classes – General Model – Analysis – Development – SSAD - OOA – OOSAD Development Life Cycle.

SELF STUDY :Data Processing

UNIT III

(12 Hours)

BUSINESS PROCESS RE-ENGINEERING, DECISION SUPPORT SYSTEMS AND KNOWLEDGE MANAGEMENT, ENTERPRISE MANAGEMENT SYSTEM

Business process – Business Process Model – Value Stream Model – Delays - Relevance of IT – MIS and BPR - Concept – GDSS – DSS in E- enterprise – Knowledge management systems – Knowledge based Expert System - EMS – ERP System –Model – Benefits – Product Evaluation – Implementation –SCM – CRM.

SELF STUDY :Database concepts

UNIT IV

(12 Hours)

TECHNOLOGY OF INFORMATION SYSTEMS , UNIFIED COMMUNICATION AND NETWORKS, DATABASE AND CLIENT SERVER ARCHITECTURE

Data processing – Transaction Processing – Application Processing – Information System Processing – OLAP – TQM - Networks – Topology – Features – Data communication– Examples – Unified Communication - Components – WiMax Technology - Concepts – Models – Design – RDBMS - Client server architecture - Client server Implementation Strategies – MIS and RDBMS.

SELF STUDY :Database Models

UNIT V

(12 Hours)

DATA WAREHOUSE, E-BUSINESS TECHNOLOGY , SECURITY CHALLENGES

Data in Data warehouse- Architecture – Design – Organization and Management – Implementation – Data Warehouse and MIS - Introduction - Models – Internet – Security – Electronic payment Systems – Web enabled Strategic and Business management – Content management systems- Enterprise portal - MIS in Web - Security threat – Control – Management – Disaster Management – Information Security.

SELF STUDY :Electronic payment Systems

REFERENCES:

1. Waman S Jawadekar, “Management Information Systems”, Tata McGraw Hill, 4th Edition, 2011.
2. James A O’ Brien, George M Marakas, Ramesh Behl, “Management Information Systems ”, Tata McGraw Hill, 9th Edition ,2010.
3. Gordan B. Davis, Margrethe H. Olson, “Management Information Systems”, Tata McGraw Hill, 2nd Edition, 2011.
4. Goyal D. P, “Management Information Systems: Managerial Perspectives”, Vikas Publishing House Pvt. Ltd., 4th Edition, 2014.

WEB REFERENCES:

1. https://en.wikipedia.org/wiki/Management_information_system
2. <https://www.inc.com/encyclopedia/management-information-systems-mis.html>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Analyze and synthesize business information needs to facilitate evaluation of strategic alternatives.	K2	PSO1 & PSO2
CO 2	Apply MIS knowledge and skills learned to facilitate development, deployment and management of information systems.	K2, K3, K4	PSO1 & PSO2
CO 3	Predict the use of information technology for business processes.	K2 & K3	PSO1 & PSO3
CO 4	Assess the use of technology of Information Systems for effective management.	K2, K3 & K5	PSO1 & PSO4
CO 5	Identify the security features and global issues in organization and society.	K2, K3 & K5	PSO1 & PSO5

GENERAL ELECTIVE - MCA

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCA	19MCAGE04	E-COMMERCE	GENERAL ELECTIVE	4	4

COURSE DESCRIPTION

This course provides information on the combination of Internet with E-Commerce, options available for doing business on the Internet, features that helps to build E-Commerce web sites, marketing issues, payment options, security issues and customer service.

COURSE OBJECTIVE

- ❖ To illustrate the management's role and identify strategies involved in an e-commerce model.
- ❖ To provide a fundamental understanding of the different types and key components on business models.
- ❖ To become familiar with state of the art Electronic Model, Payment and Supply Chain Mechanisms..

UNIT – I INTRODUCTION TO ELECTRONIC COMMERCE (12 Hours)

Introduction to electronic commerce - What is electronic commerce?, Benefits of electronic commerce, Impact of electronic commerce, Classification of electronic commerce, Application of electronic commerce technologies.

SELF STUDY :Benefits of Electronic Commerce

UNIT II ELECTRONIC COMMERCE: BUSINESS MODELS (12 Hours)

What is business models?, Native content based models -Information content model, Information exchange model, Transplanted content model -

Subscription model, Advertising model, Affiliate model, Native transaction models - Digital products merchant model, Web hosting and internet services, Metamediary , Transplanted transaction models - Electronic store model, Brokerage model.

SELF STUDY :Electronic store model

UNIT III

(12 Hours)

ELECTRONIC COMMERCE: NETWORK INFRASTRUCTURE

Local area network, Topologies, Transmission media, Wireless transmission, Wide area network, Internet, TCP/IP reference model.

SELF STUDY :Local area network

UNIT IV ELECTRONIC PAYMENT SYSTEMS

(12

Hours)Online payment systems, Pre-paid electronic payment systems - Ecash, Mondex, Milicent, Netbill, Post-paid electronic systems - Ikp, Cybercash, SET, Nettecheque, First Virtual.

SELF STUDY :Milicent

UNITV SECURING NETWORK TRANSACTION

(12 Hours)

Transaction security, security services, Cryptology - Introduction to cryptography, Cryptanalysis, Conventional Encryption Model, Public key Cryptosystems, Comparison of conventional and public key encryption systems, Digital signatures, Electronic mail security.

SELF STUDY :Electronic mail security

REFERENCES:

1. Bharat Bhaskar, "Electronic Commerce – Framework Technologies and Applications", Tata McGraw Hill 4thEdition ,2013.
2. Ravi Kalakota& A.B. Whinston, "Electronic Commerce – A Manager's Guide", Pearson Education,2000

3. AgarwalaKamlesh, N and AgarwalaDeeksha, “Business on the Net_Introduction to the E-Com”., Macmillan India 2000
4. P. T. Joseph,” E-Commerce: A Managerial Perspective”, PHI, 2004

WEB REFERENCES:

1. <https://en.wikipedia.org/wiki/E-commerce>
2. <https://www.shopify.com/encyclopedia/what-is-ecommerce>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM’S TAXONOMY)	PSOs ADDRESSED
CO 1	Gain a comprehensive understanding of the E-Commerce landscape, current and emerging technology and infrastructure underpinnings of the business.	K2	PSO1 & PSO2
CO 2	Analyze the impact of E-commerce on business models and strategy.	K2, K3, K4	PSO1 & PSO2
CO 3	Develop an understanding on how internet can help business grow/ Describe the infrastructure for E-commerce	K2 & K3	PSO1 & PSO3
CO 4	Assess electronic payment systems	K2, K3 & K5	PSO1 & PSO4
CO 5	Gain an understanding on the importance of security, privacy, and ethical issues as they relate to E-Commerce.	K2,K3 & K5	PSO1 & PSO5

GENERAL ELECTIVE - MCA

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCA	19MCAGE05	CYBER FORENSICS	GENERAL ELECTIVE	4	4

COURSE DESCRIPTION

This course provides the investigation of computer-related crimes with the goal of obtaining evidence to be presented in a court of law.

COURSE OBJECTIVE

- ❖ Understand the definition of computer forensics fundamentals.
- ❖ Describe the types of computer forensics technology.
- ❖ Analyze various computer forensics systems.
- ❖ Learn to duplicate and preserve digital evidence.

UNIT – I COMPUTER FORENSICS FUNDAMENTALS

(12 Hours)

Introduction - Use in Law Enforcement - Assistance to Human Resources - Services - Benefits of Forensics Methodology - Steps Taken by Specialists – Users of Computer Forensic Evidence - Types of Computer Forensics Technology - Military Forensic Technology - Types of Law Enforcement - Types of Business Technology - Specialized Forensics Techniques - Hidden Data - Spyware and Adware - Encryption Methods and Vulnerabilities - Protecting Data - Internet Tracing Methods - Security and Wireless Technologies - Avoiding Pitfalls with Firewalls.

SELF STUDY :Biometric Security Systems

UNIT II COMPUTER FORENSICS EVIDENCE AND CAPTURE (12 Hours)

Data Recovery -Definition - Data Backup and Recovery – Data Recovery Solution - Hiding and Recovering Hidden Data - Evidence Collection and Data Seizure – Obstacles - Types - Rules - Volatile Evidence - Methods of Collection - Artifacts - Collection Steps - The Chain of Custody - Reconstructing the Attack – Preservation of Digital Evidence and Digital Crime Scene - Computer Evidence Processing Steps – Legal Aspects - Computer Image - Verification and Authentication- Special Needs of Evidential Authentication.

SELF STUDY :Controlling Contamination, The Chain of Custody

UNIT III COMPUTER FORENSICS ANALYSIS (12 Hours)

Discovery of Electronic Evidence - Electronic Document Discovery: A Powerful New Litigation Tool - Identification of Data - Timekeeping - Forensic Identification and Analysis of Technical Surveillance Devices - Reconstructing Past Events - How to Become a Digital Detective - Useable File Formats - Unusable File Formats - Converting Files - Networks - Network Forensics Scenario - A Technical Approach - Destruction of Email – Damaging Computer Evidence - Tools Needed for Intrusion Response to the Destruction of Data.

SELF STUDY :System Testing

UNIT IV THE IW ARSENAL AND TACTICS OF THE MILITARY (12 Hours)

Overview of Military Tactics - Offensive Ruinous IW Tools and Tactics – Offensive Containment IW Tools and Tactics - Defensive Preventive IW Tools and Tactics – Defensive Ruinous IW Tools and Tactics - Defensive Responsive Containment IW Tools and Tactics - Countering Sustained Terrorist IW Tactics - Dealing with Random Terrorist IW - The Future of Information Warfare Arsenal – Weapons of the Future - The Global Positioning System - Snoop, Sniff, and Snuff Tools - Email Wiretaps Like Carnivore Can Steal Sensitive Correspondence - IW Weapons of the Future.

SELF STUDY :Nanotechnology

UNITV SURVEILLANCE TOOLS FOR IW OF THE FUTURE (12 Hours)

Monitoring Everything - The Cyber Footprint and Criminal Tracking - The Implications of Cookies and Integrated Platforms - Wintel Inside, or How Your Computer Is Watching You - Data Mining - The Internet Is Big Brother - The Wireless Internet: Friend or Foe - Advanced Computer Forensics - Advanced Encryption: The Need to Conceal - Advanced Hacking - Advanced Tracker Hackers - The Problems of the Present.

SELF STUDY :Cyber Surveillance

REFERENCES:

1. John R. Vacca, "Computer Forensics: Computer Crime Scene Investigation", Second Edition , 2005.
2. Kevin Mandia, Chris Prosise, Matt Pepe, "Incident Response and Computer Forensics ", Tata McGraw -Hill, New Delhi, 2014.
3. Nelson Phillips and EnfingerSteuart, "Computer Forensics and Investigations",Cengage Learning, New Delhi, 2016.
4. Bill Nelson, Amelia Phillips, Chris Steuart,"Guide to Computer Forensics and Investigations processing Digital Evidence", Fifth Edition, Tata McGraw - Hill, New Delhi, 2016.

WEB REFERENCES:

1. <https://homelandforensics.com/forensics.htm>
2. https://en.wikipedia.org/wiki/Computer_forensics

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Predict the forensics fundamentals and the various technologies used to avoid computer crimes	K2	PSO1
CO 2	Illustrate different methods to collect and preserve digital evidence and Digital Crime Scene.	K2, K3, K4	PSO2 & PSO4
CO 3	Identify and Analyze Forensic Technical Surveillance Devices.	K2 & K3	PSO3
CO 4	Evaluate the Various tools and tactics followed in military.	K2, K3 & K5	PSO2 & PSO4
CO 5	Demonstrate the Usage of surveillance tools for tracking cyber criminals	K2,K3 & K5	PSO2 & PSO5

GENERAL ELECTIVE - MCA

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCA	19MCAGE06	ETHICS IN COMPUTING	GENERAL ELECTIVE	4	4

COURSE DESCRIPTION

This course provides the basis for ethical decision-making and the methodology for reaching ethical decisions concerning computing matters.

COURSE OBJECTIVE

- ❖ To construct defensible arguments from an ethical point of view concerning the issue of computer hacking.
- ❖ To have an overview knowledge of protective measures against computer crime.
- ❖ To comprehend relevant legislation and international initiatives for equal rights.
- ❖ To compare knowledge of different existing ethics frameworks and professional ethics standards for computer professionals.

UNIT – I INTRODUCTION

(12 Hours)

Computer Ethics- an overview- Identifying an ethical issue – Ethics and the law – Ethical theories – Professional Codes of conduct – An ethical dilemma – Framework for ethical decision making - Computer Hacking- Introduction – Definitions – Destructive Programs – Hacker Ethics – Legal constraints – Professional Constraints – Ethical positions on hacking – Ethical Dilemma.

SELF STUDY :Activities: Ethics and the law - Arguments against hacking

UNITII INTERNET CRIME AND IPR

(12 Hours)

Aspects of Internet Crime - Introduction – What is Computer Crime – computer Security Measures – The Computer misuse Act – Professional duties and obligations - Intellectual property rights - Introduction - The nature of intellectual property - Intellectual property legislation - The extent and nature of software piracy - Ethical and professional issues - Free software and open source code - An ethical dilemma.

SELF STUDY :Researching a computer crime case

UNIT III INTERNET TECHNOLOGIES AND PRIVACY (12 Hours)

Regulating Internet content - Introduction - In defence of freedom of expression - Censorship - Laws upholding free speech - Free speech and the Internet - Ethical and professional issues - An ethical dilemma - Personal privacy and computer technologies Introduction - Valuing privacy – Internet technologies and privacy - Privacy legislation - The Data Protection Act, 1998 -Professional and ethical issues - An ethical dilemma

SELF STUDY :Internet Technologies and free expression

UNIT IV EMPOWERING COMPUTERS IN THE WORKPLACE

(12

Hours)Computer technologies: accessibility issues - Introduction - Principle of equal access -Obstacles to access for individuals - Legislation - Enabling the disabled – Professional responsibility - An ethical dilemma - Empowering computers in the workplace - Introduction - Computers and employment - Computers and the quality of work - Computerised monitoring in the workplace –Telecommuting.

SELF STUDY :Obstacles to equal access – Monitoring illegal activities

UNITV TOWARDS THE FUTURE

(12 Hours)

The failure of IT projects - Introduction - The problems of producing successful IT projects - How the profession is addressing the problem of IT failure - The relationship between professional codes of conduct and IT projects - An overview of national legislation - Towards the future: some ethical and social questions - Introduction - The database society - Restricting choice: digital rights management - Review of the ethical dilemmas - The pace of change.

SELF STUDY :Inferring personal information.

REFERENCES

1. Penny Duquenoy, Simon Jones, Barry G Blundell , “Ethical, Legal and Professional Issues in Computing”, Middlesex University Press, 2008
2. George Reynolds, “Ethics in Information Technology”, 2nd Edition, Thomson CourseTechnology.
3. Charles P .Pfleeger, Shari Lawrence Pfleeger, “Security in Computing” ,4th Edition,Pearson Prentice Hall.

WEB REFERENCES:

1. http://www.infosectoday.com/Articles/Intro_Computer_Ethics.htm
http://www.tutorialspoint.com/professional_ethics/

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Predict the relationship between the law, ethics and computer technology	K2	PSO1
CO 2	Outline the philosophical and ethical debates with the ideas and the nature of intellectual creativity.	K2, K3, K4	PSO2 & PSO4
CO 3	Design the impact of computer technology on free speech.	K2 & K3	PSO3
CO 4	Formulate the ethical and legal issues of the impact that computing technologies had on workplace.	K2, K3 & K5	PSO2 & PSO4
CO 5	Develop a personal standpoint in relation to DataBase society and the usage of biometric data	K2,K3 & K5	PSO2 & PSO5

GENERAL ELECTIVE - MCA

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCA	19MCAGE07	ENTREPRENEURSHIP DEVELOPMENT	GENERAL ELECTIVE	4	4

COURSE DESCRIPTION

This course provides the skills necessary to succeed as an entrepreneur. It includes the fundamentals of starting and operating a business, developing a business plan, obtaining financing, marketing a product or service and developing an effective accounting system

COURSE OBJECTIVE

- ❖ Understand the need of entrepreneurial discipline.
- ❖ To let the entrepreneur set or reset the objectives of his business and work individually and along with his group.
- ❖ Analyze the environment set up relating to small industry and business.

UNIT – I ENTREPRENEUR

(12 Hours)

Introduction – Evolution of the Concept of Entrepreneur – Characteristics of Successful Entrepreneurs – The Charms of Becoming an Entrepreneur – The Entrepreneurial Decision Process – Functions of Entrepreneur – Need for an Entrepreneur- Types of Entrepreneurs- Distinction between an Entrepreneur and a manager –Entrepreneur – Social Entrepreneur.

SELF STUDY :Social Entrepreneur

UNIT II ENTREPRENEURIAL COMPETENCIES

(12 Hours)

Meaning of Entrepreneurial Competency – Major Entrepreneurial Competencies – Developing Entrepreneurial Competencies – Factors Affecting Entrepreneurship Growth: Factors Affecting Entrepreneurship- Economic Factors – Non- economic Factors – Government Actions.

SELF STUDY :Government Actions.

UNIT III WOMEN ENTREPRENEURSHIP

(12 Hours)

Concept of Women Entrepreneur – Functions of Women Entrepreneurs – Growth of Women Entrepreneurship in India – Problems of Women Entrepreneurs – Developing Women Entrepreneurship.

SELF STUDY :Problems of Women Entrepreneurs

UNIT IV EDPS, INSTITUTIONAL FINANCE TO ENTREPRENEURS(12 Hours)

Meaning of EDP – Need for EDPs – Objectives of EDPs – Entrepreneurship Development Programmes (EDPs) in India: A Historical Perspective – Course Contents and Curriculum of EDPs – Phases of EDP- Evaluation of EDPs – Problems of EDPs - Need for Institutional Finance – Institutional Finance- Commercial Banks – Other Financial Institutions.

SELF STUDY :Other Financial Institutions

UNIT V

(12 Hours)

PROJECT APPRAISAL ,FORMULATION OF BUSINESS PLANS

Concept of Project Appraisal – Methods of Project Appraisal – Economic Analysis – Financial Analysis – Market Analysis – Technical Feasibility – Managerial Competence – Environmental Clearance for SMEs – Environmental Restrictions for SSI Sector – The Environmental clearance Process - Meaning of Business Plan- Contents of Business Plan – Significance of Business Plan – Formulation of Business Plan – Planning Commission’s Guidelines for Formulating Project Report – Network Analysis – Business Plan Formulation.

SELF STUDY :The Environmental clearance Process

REFERENCES:

1. S S Khanka , “Entrepreneurial Development”, S. Chand Publishing Revised edition ,2012
2. S Anil Kumar, “Entrepreneurship Development” new age international publishers edition, 2003
3. Janakiram B, “Entrepreneurship Development: Text and Cases” Excel Books India, 2011

WEB REFERENCES:

1. https://www.tutorialspoint.com/entrepreneurship_development/entrepreneurship_development_tutorial.pdf
2. https://www.macmillanihe.com/resources/sample-chapters/9781137430359_sample.pdf

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Highlight the salient characteristics of successful entrepreneur	K2	PSO1 & PSO2
CO 2	Enumerate the competencies relevant for Entrepreneurial development.	K2, K3, K4	PSO1 & PSO2
CO 3	Delineate the growth of women Entrepreneurship in India.	K2 & K3	PSO1 & PSO3
CO 4	Identify the major problems faced in conducting EDPs.	K2, K3 & K5	PSO1 & PSO4
CO 5	Discuss the methods of project appraisal used for small scale enterprises.	K2,K3 & K5	PSO1 & PSO5

GENERAL ELECTIVE - MCA

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	19MCAGE21	RESEARCH METHODOLOGY	GENERAL ELECTIVE	4	4

COURSE DESCRIPTION

This course provides an overview of various methods employed in quantitative and qualitative research.

COURSE OBJECTIVE

- ❖ Understand the basic concepts of research and its methodologies.
- ❖ Identify a research problem stated in a study.
- ❖ Prepare a conventional research report / thesis.

UNIT I INTRODUCTION

(12 Hours)

Meaning of research – Objective of research – Motivation in research – Types of research – Research approaches – Significance of research – Research methods versus Methodology – Research and scientific method – Importance of knowing how research is done – Research process – Criteria of good research – Problems encountered by researchers in India

SELF STUDY:Types of Research

UNIT II DEFINING THE RESEARCH PROBLEM

(12 Hours)

What is research problem? – Selecting the problem – Necessity of defining the problem - Research Design: Meaning of research design – Need for research design –Features of a good design – Important concepts relating to research design – Different research designs – Basic principles of experimental designs.

SELF STUDY: Research problem

UNIT III MEASUREMENT AND SCALING TECHNIQUES

(12 Hours)

Measurement in research – Measurement scales – Sources of error in measurement – Tests of sound measurement – Technique of developing measurement tools – scaling – Meaning of scaling – Scale classification bases- Important scaling techniques – Scale construction techniques - Methods of Data Collection: Collection of primary data – Observation method – Interview method – Collection of data through schedules – Difference between Questionnaires and schedules – Some other methods of data collection – Collection of secondary data – Selection of appropriate method for data collection – Case study method

SELF STUDY: Case study method

UNIT IV PROCESSING AND ANALYSIS OF DATA

(12 Hours)

Processing operations – Some problems in processing – Elements/Types of Analysis- Statistics in research – Measures of central tendency – Measures of dispersion – Measures of Asymmetry – Measures of relationship – Simple regression analysis – Multiple correlation and regression – Partial correlation – Association in case of attributes

UNIT V TESTING OF HYPOTHESES

(12 Hours)

What is a Hypothesis? – Basic concepts concerning testing of Hypotheses - Procedure for Hypothesis testing – Measuring the power of a Hypothesis testing – Tests of Hypotheses- Important parametric tests – Hypothesis testing of means – Hypothesis testing for differences between means - Interpretation and report writing: Meaning of interpretation – Why interpretation? – Technique of interpretation – Precaution in interpretation – Significance of report writing – Different steps in writing report – Layout of the research report – Types of reports – Oral Presentation – Mechanics of writing a research report – Precautions for writing research reports

SELF STUDY: Types of reports

REFERENCES :

1. Kothari, C.R (2013), “Research Methodology – Methods and Techniques”, 2ND Edition. Wiley Eastern Limited
2. R. Panneerselvam, “Research Methodology”, 4th Edition. Prentice Hall India Learning Private Limited, 2014
3. Ranjit Kumar, “Research Methodology – A step- by-step guide for beginners”, 3rd Edition. Pearson Education, 2011
4. Deepak Chawla and NeenaSondh , “Research Methodology, Concepts and Cases”, VikasPublishingHousePvt. Ltd., 2011

WEB REFERENCES:

1. https://edutechwiki.unige.ch/en/Research_methodology_resources
2. <https://csus.libguides.com/>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Predict the different stages of research process.	K2	PSO1 & PSO2
CO 2	Apply methods to collect best data.	K2, K3, K4	PSO1 & PSO2
CO 3	Assess the suitable research design & work.	K2 & K3	PSO1 & PSO3
CO 4	Compare categorical and continuous measures.	K2, K3 & K5	PSO1 & PSO4
CO 5	Analyze the process of various reports writing.	K2, K3 & K5	PSO1 & PSO5

GENERAL ELECTIVE - MCA

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCA	19MCAGE22	DATA MINING AND DATA WAREHOUSING	GENERAL ELECTIVE	4	4

COURSE DESCRIPTION

This course provides the basic concepts, principles, methods, implementation techniques and applications of data mining.

COURSE OBJECTIVE

- ❖ To know then scope and necessity of Data mining & Data warehousing for the Society.
- ❖ To understand & analyze the various algorithms for Knowledge Extraction.
- ❖ To be familiar with the outcome of a real time scenario.

UNIT I

(12 Hours)

INTRODUCTION:

Why Data Mining?, What is Data Mining, What kinds of Data Can be Mined?, What kinds of Patterns can be Mined?, Which Technologies are used?, Which kinds of Applications Are Targeted?, Major Issues in Data Mining.

GETTING TO KNOW YOUR DATA:Data Objects and Attribute types.

DATA PRE-PROCESSING:Data Pre-processing an Overview.

SELF STUDY:Applications

UNIT II

(12 Hours)

DATA WAREHOUSING AND ONLINE ANALYTICAL PROCESSING

Data Warehouse: Basic Concepts, Data Warehouse Modeling: Data Cube & OLAP, Data Warehouse Design & Usage, Data Warehouse Implementation, Data Generalization by attribute oriented induction.

SELF STUDY:Data Warehouse: Basic Concepts

UNIT III

(12 Hours)

MINING FREQUENT PATTERNS, ASSOCIATIONS AND CORRELATIONS: BASIC CONCEPTS & METHODS:

Basic Concepts, Frequent Itemset Mining Methods

ADVANCED PATTERN MINING:

Pattern Mining – a Road Map, Pattern Mining in Multilevel, Multidimensional Space.

UNIT IV

(12 Hours)

CLASSIFICATION:Basic Concepts, Decision tree Induction, Bayes Classification Methods,

CLUSTER ANALYSIS- BASIC CONCEPTS & METHODS:Cluster Analysis, Partitioning Methods.

OUTLIER DETECTION:Outliers and Outlier Analysis, Outlier Detection Methods.

SELF STUDY: Cluster Analysis

UNIT V DATA MINING TRENDS AND RESEARCH FRONTIERS (12 Hours)

Mining Complex Data types, Other Methodologies of Data Mining, Data Mining Applications, Data Mining and Society, Data Mining Trends.

SELF STUDY :Data Mining Applications

REFERENCES :

1. Jiawei Han, Micheline Kamber, Jian Pei , “Data mining Concepts and Techniques”, Third Edition, Morgan Kaufman Publishers, 2012.
2. Bharat Bhushan Agarwal, Sumit Prakash Tayal, “Data Mining and Data Warehousing”,Laxmi Publications, Ltd., 2009
3. Margaret H Dunham ,“Data Mining: Introductory And Advanced Topics” Pearson Education India, 2006
4. Usama M.Farrad, GeogoryPiatetsky – Shapiro, Padhrai Smyth and RamasamyUthurusamy, “ Advances in Knowledge Discovery and Data Mining”, The M.I.T. Press 1996.
5. Ralph Kimball, “The Data Warehouse Life Cycle Toolkit”, John Wiley & Sons Inc., 1998.

WEB REFERENCES:

1. https://www.tutorialspoint.com/data_mining
2. <https://www.guru99.com/data-warehouse-architecture.htm>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Practice the pre-processing operations of data.	K2	PSO1 & PSO2
CO 2	Compare & contrast OLTP, OLAP and Data mining as techniques for extracting knowledge from a Data Warehouse.	K2, K3, K4	PSO1 & PSO2
CO 3	Perform Association Rule Mining for Market Basket Analysis.	K2 & K3	PSO1 & PSO3
CO 4	Design & deploy the appropriate Classification and Clustering techniques.	K2, K3 & K5	PSO1 & PSO4
CO 5	Explore the recent trends in data mining.	K2, K3 & K5	PSO1 & PSO5

GENERAL ELECTIVE - MCA

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCA	19MCAGE23	DIGITAL IMAGE PROCESSING	GENERAL ELECTIVE	4	4

COURSE DESCRIPTION

This course provides an introduction to the basic concepts, methodologies and algorithms of digital image processing focusing image enhancement, image analysis and object recognition.

COURSE OBJECTIVES

- ❖ To study the image fundamental principles and mathematical transforms necessary for image processing.
- ❖ To learn the image enhancement, restoration techniques used in digital image processing.
- ❖ To understand about color images and compression techniques

UNIT I

(12 Hours)

INTRODUCTION AND DIP FUNDAMENTALS

DIP Definition - Origin of DIP- Fundamental steps in DIP - Elements of Visual Perception- Image sampling and Quantization

SELF STUDY:Some basic Relationships between pixels

UNIT II

(12 Hours)

INTENSITY TRANSFORMATION AND SPATIAL FILTERING

Background- Smoothing spatial filters- Sharpening spatial filters.

SELF STUDY: basic intensity transformation

UNIT III

(12 Hours)

IMAGE RESTORATION AND RECONSTRUCTION

Model - Restoration in the process of noise only Spatial filtering - mean filters- Order statistic filters- Adaptive filters – Periodic noise reduction by Frequency domain filtering- Band Reject filters - Band pass filter - Notch Filter- Optimum Notch Filtering.

SELF STUDY:Noise Models

UNIT IV

(12 Hours)

COLOR IMAGE PROCESSING

Color Fundamentals - Color Models – Pseudo color image processing- Basis of full color image processing- Color Transformations - Smoothing and Sharpening Image segmentation based on Color - Noise in color images - Color image compression.

SELF STUDY:Color components

UNIT V

(12 Hours)

IMAGE COMPRESSION

Huffmann Coding- LZW coding- Run Length coding- Digital Image Watermarking.

SELF STUDY:Arithmetic Coding.

REFERENCES

1. Rafael C. Gonzalez, Richard E.,“Digital Image Processing”, 3rd Edition- Woods Pearson India Education Pvt. Ltd.- 2016
2. Scott Umbaugh, “Computer Vision and Image Processing- a practical approach using CVIP tools”

3. Anil K.Jain, “Fundamentals of Digital Image Processing”, Person Education, 2003

WEB REFERENCES

1. <https://imagej.net/Welcome>
2. <https://imagej.nih.gov/ij/docs/examples/index.html>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	To review the fundamental concepts of a digital image processing system.	K2	PSO1 & PSO2
CO 2	To examine various types of images, their intensity transformations and spatial filtering.	K2, K3, K4	PSO1 & PSO2
CO 3	To analyze the different types of noises and the filters used to restore and reconstruct the images.	K2 & K3	PSO1 & PSO3
CO 4	To create color images and pseudo images with smoothing and sharpening techniques.	K2, K3 & K5	PSO1 & PSO4
CO 5	To compare the various lossy and lossless compression mechanisms.	K2, K3 & K5	PSO1 & PSO5

GENERAL ELECTIVE - MCA

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCA	19MCAGE 24	ARTIFICIAL INTELLIGENC E & EXPERT SYSTEMS	GENERAL ELECTIVE	4	4

COURSE DESCRIPTION

This course provides the basic principles of artificial intelligence. It will cover problem solving paradigms, constraint propagation and search strategies in the areas of applications including knowledge representation, natural language processing, expert systems, vision and robotics.

COURSE OBJECTIVE

- ❖ To learn the methods of solving problems using Artificial Intelligence.
- ❖ To have an understanding of the basic issues of knowledge representation, blind and heuristic search.
- ❖ To have a basic proficiency in a traditional AI language and ability to write simple to intermediate programs in expert systems.

UNIT – I AI PROBLEMS AND PROBLEM CHARACTERISTICS (12 Hours)

The AI Problems – The underlying assumption - AI techniques – The level of the model – Criteria for success - Problems , Problem space and search – Defining the problem as a state space search – Production Systems – Problem characteristics – Production system characteristics – Issues in the design of search programs- Additional problems.

SELF STUDY :Problem characteristics

UNIT II SEARCH TECHNIQUES

(12 Hours)

Heuristic search techniques – Generate and test – Hill climbing – Best first search – Problem reduction – Constraint satisfaction – Means ends analysis. Knowledge Representation Issues- Representations and Mappings- Approaches to Knowledge Representation – Issues in Knowledge Representation – The Frame Problem.

SELF STUDY :Constraint satisfaction

UNIT III USING PREDICATE LOGIC

(12 Hours)

Using predicate logic – Representing simple facts in logic – Representing instance and ISA relationship – Computable functions and predicates – Resolution – Natural deduction - Representing knowledge – Using rules – Procedural versus declarative knowledge – Logic programming – forward versus backward reasoning – Matching – Control knowledge.

SELF STUDY :Natural deduction

UNIT IV FILLER STRUCTURE AND GAME PLAYING

(12 Hours)

Weak Slot and Filler Structure: Semantic Nets- Frames. Strong Slot and Filler Structure: Conceptual Dependency- Scripts-CYC. Game playing- The minimax search procedure- Adding alpha beta cutoffs- additional refinements- Iterative Deepening.

SELF STUDY :Scripts

UNITV AI LEARNING AND EXPERT SYSTEMS

(12 Hours)

What is Learning – ROTE Learning - Learning by Taking Advice – Learning in Problem solving – Learning from Examples: Induction – Explanation-based Learning - Discovery – Analogy – Formal Learning Theory - Expert Systems – Representing and using domain knowledge – Expert System Shells – Explanation – Knowledge Acquisition.

SELF STUDY :Knowledge Acquisition

REFERENCES:

1. Elaine Rich, Kevin Knight, “Artificial Intelligence”, McGraw Hill Education Pvt Ltd, III Edition.
2. Mishra Ravi Bhushan, “Artificial Intelligence”, PHI learning Pvt. Ltd, 2011
3. Kaushik saroj, “Artificial Intelligence” , Cengage learning India Pvt. Ltd, 2011.

WEB REFERENCES:

1. http://en.wikipedia.org/wiki/Artificial_intelligence
2. http://www.cee.hw.ac.uk/~alison/ai3notes/subsection2_6_2_3.html
3. <http://starbase.trincoll.edu/~ram/cpsc352/notes/heuristics.html>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Identify problems that are amenable to solution by AI methods.	K2	PSO1 & PSO2
CO 2	Formulate search problems and implement search algorithms using admissible heuristics.	K2, K3, K4	PSO1 & PSO2
CO 3	Design and carry out an empirical evaluation of different algorithms on a predicate logic and state the conclusions that the evaluation supports.	K2 & K3	PSO1 & PSO3
CO 4	Analyze games playing as adversarial search problems and implement optimal and efficient solutions.	K2, K3 & K5	PSO1 & PSO4
CO 5	Apply the concepts of Expert Systems in machine learning.	K2, K3 & K5	PSO1 & PSO5

GENERAL ELECTIVE - MCA

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCA	19MCAGE25	SOFT COMPUTING	GENERAL ELECTIVE	4	4

COURSE DESCRIPTION

This course provides the principal constituents of soft computing that is fuzzy logic, neural network theory and probabilistic reasoning. The course explores the features that are employed in various associated techniques.

COURSE OBJECTIVE

- ❖ To master the various fundamental models of artificial neural networks.
- ❖ To cater the knowledge of Neural Networks and use these for controlling real time systems.
- ❖ To use the fuzzy logic and neural network for application related to design and manufacture.

UNIT – I FUNDAMENTALS OF NEURAL NETWORKS

(12 Hours)

Basic Concepts of Neural Networks – Human Brain - Model of An Artificial Neuron – Neural Network Architectures –Single Layer Feedforward Network – Multilayer Feedforward Network – Recurrent Networks - Learning Methods – Taxonomy of Neural Network Architectures –History of Neural Networks Research-Early Neural Networks Architectures – Rosenblatt’s Perception – ADALINE Network – MADELINE Networks.

SELF STUDY :Single Layer Feedforward Network

UNIT II BACK PROPAGATION NETWORKS

(12 Hours)

Architecture of back propagation network – The Perceptron Model – The Solution – Single Layer Artificial Neural Network – Model for Multilayer Perceptron - Back Propagation Learning – Input Layer Computation – Hidden Layer Computation – Output Layer Computation – Calculation of Error – Training of Neural Network – Method of Steepest Descent – Effect of Learning Rate – Adding a Momentum Term – Backpropagation Algorithm - Applications – Design of Journal Bearing – Classification of Soil – Hot Extrusion of Steel - Selection Of Various Parameters in BPN – Number of Hidden Nodes – Momentum Coefficient – Sigmoidal Gain – Local Minima – Learning Coefficient.

SELF STUDY :Single Layer Artificial Neural Network

UNIT III ADAPTIVE REASONANCE THEORY

(12 Hours)

Introduction –Cluster Structure – Vector Quantization – Classical ART Networks – Simplified SRT Architecture - ART 1 – Architecture of ART1 – Special Features of ART1 Models – ART1 Algorithm - ART2 – Architecture – ART2 Algorithm - Applications –Character Recognition Using ART1 – Classification of Soil – Prediction of Load from Yield Line Patterns of Elastic Plastic Clamped Square Plate - Sensitivities of ordering of data.

SELF STUDY :Vector Quantization

UNIT IV

(12 Hours)

FUZZY LOGIC PRINCIPLES, CLASSICAL SETS AND FUZZY SETS

The Case for Imprecision - A Historical Perspective - The Utility of Fuzzy Systems - Limitations of Fuzzy Systems - The Illusion: Ignoring Uncertainty and Accuracy - Uncertainty and Information - The Unknown - Fuzzy Sets and Membership - Chance Versus Fuzziness - Sets as Points in Hypercubes - Classical Sets - Operations on Classical Sets - Properties of Classical (Crisp) Sets - Mapping of Classical Sets to Functions - Fuzzy Sets - Fuzzy Set Operations - Properties of Fuzzy Sets - Alternative Fuzzy Set Operations.

SELF STUDY :Limitations of Fuzzy Systems

UNIT V

(12 Hours)

CLASSICAL RELATIONS AND FUZZY RELATIONS, PROPERTIES OF MEMBERSHIP FUNCTIONS, FUZZIFICATION, AND DEFUZZIFICATION

Cartesian Product - Crisp Relations - Cardinality of Crisp Relations - Operations on Crisp Relations - Properties of Crisp Relations - Composition - Fuzzy Relations - Cardinality of Fuzzy Relations - Operations on Fuzzy Relations - Properties of Fuzzy Relations - Fuzzy Cartesian Product and Composition - Tolerance and Equivalence Relations - Crisp Equivalence Relation - Crisp Tolerance Relation .

Features of the Membership Function - Various Forms - Fuzzification - Defuzzification to Crisp Sets - λ -Cuts for Fuzzy Relations - Defuzzification to Scalars.

SELF STUDY :Cartesian Product.

REFERENCES:

1. Rajasekaran. S..VijayalakshmiPai. G.A. "Neural Networks, Fuzzy Logic and Genetic Algorithms", Prentice Hall of India Private Limited, 2003
2. Timothy J.Ross, "Fuzzy logic with Engineering Applications", McGraw Hill, 1995
3. Klir.G, Yuan B.B. "Fuzzy sets and Fuzzy Logic Prentice Hall of India private limited, 1997.
4. LauranceFausett, "Fundamentals of Neural Networks", Prentice hall, 1992.
5. Gen, M. and Cheng R. "Genetic Algorithm and Engineering Design", john wiley 1997.

WEB REFERENCES:

1. http://en.wikipedia.org/wiki/Neural_network
2. http://en.wikipedia.org/wiki/Fuzzy_logic
3. <https://books.google.co.in/books?isbn=8120321863>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Explore the functional components of artificial neural networks..	K2	PSO1 & PSO2
CO 2	Examine the principles of back propagation networks.	K2, K3, K4	PSO1 & PSO2
CO 3	Expose the students to the concepts of predicting the functionalities of ART.	K2 & K3	PSO1 & PSO3
CO 4	Analyze the logic principle of classical sets and fuzzy set operations in fuzzy set theory.	K2, K3 & K5	PSO1 & PSO4
CO 5	Identify the concept of fuzzification and defuzzification involved in various systems.	K2,K3 & K5	PSO1 & PSO5

GENERAL ELECTIVE - MCA

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSCA	19MCAGE26	CLOUD COMPUTING	GENERAL ELECTIVE	4	4

COURSE DESCRIPTION

This course provides a comprehensive study of cloud concepts and capabilities across the various Cloud service models including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), and Identity as a Service (IDaaS).

COURSE OBJECTIVES

- ❖ To introduce the broad perspective of cloud architecture and model
- ❖ To Gain knowledge on the concept of Virtualization and design of cloud Services
- ❖ To understand the issues on cloud storage & security.

UNIT -I

(12 HRS.)

BASICS OF CLOUD COMPUTING AND CLOUD ARCHITECTURE

Defining Cloud Computing - Cloud Types - The NIST model - The Cloud Cube Model Deployment models Service models -Examining the Characteristics of Cloud Computing - Paradigm shift Benefits of cloud computing Disadvantages of cloud computing - Assessing the Role of Open Standards

Understanding Cloud Architecture - Exploring the Cloud Computing Stack - Infrastructure - Platforms - Virtual Appliances - Communication Protocols – Applications

SELF STUDY :Connecting to Cloud - The Jolicloud Netbook OS - Chromium OS

UNIT –II CLOUD SERVICES AND APPLICATIONS

(12 HRS.)

Understanding Services and Applications by Type - Defining Infrastructure as a Service (IaaS) - IaaS workloads - Pods, aggregation, and silos - Defining Platform as a Service (PaaS) - Defining Software as a Service (SaaS) - SaaS characteristics - Open SaaS and SOA - Salesforce.com and CRM SaaS

SELF STUDY :Defining Identity as a Service (IDaaS) - IDaaS interoperability - User authentication and Authorization

UNIT –III ABSTRACTION VS. VIRTUALIZATION

(12 HRS.)

Understanding Abstraction and Virtualization - Using Virtualization Technologies -Load Balancing and Virtualization - Advanced load balancing - The Google cloud - Understanding Hypervisors -Virtual machine types - VMware vSphere - Understanding Machine Imaging - Porting Applications - The Simple Cloud API - AppZero Virtual Application Appliance

Using PaaS Application Frameworks – Drupal - Using SaaS Application Frameworks - Google App Engine – Using IaaS Application Frameworks - Amazon Elastic Compute Cloud (EC2) - Windows Azure.

SELF STUDY :Virtualization Practicum

UNIT –IV CLOUD MANAGEMENT AND CLOUD SECURITY

(12 HRS.)

Managing the Cloud - Administrating the Clouds - Management responsibilities - Lifecycle management - Cloud Management Product - Emerging Cloud Management Standards - Cloud Security - Securing the Cloud - The security boundary - Security service boundary - Security mapping - Securing Data - Brokered cloud storage access - Storage location and tenancy - Encryption - Auditing and compliance

SELF STUDY :DMTF cloud management standards - Cloud Commons and SMI

UNIT –V

(12 HRS.)

CLOUD BASED STORAGE AND COMMUNICATING WITH CLOUD

Working with Cloud-Based Storage -- Cloud storage in the Digital Universe - Cloud storage definition - Provisioning Cloud Storage - Unmanaged cloud storage - Managed cloud storage - Creating cloud storage systems - Virtual storage containers -Exploring Cloud Backup Solutions - Backup types -Cloud backup features - Cloud attached backup - Cloud Storage Interoperability - Cloud Data Management Interface (CDMI) -Open Cloud Computing Interface (OCCI) - Communicating with the Cloud - Exploring Instant Messaging - Instant messaging clients - Instant messaging interoperability - Micro-blogs or Short Message Services - Exploring Collaboration Technologies

SELF STUDY :Using Social Networks - Features - List of social networking sites - Privacy and security - Interaction and interoperability

REFERENCES:

1. Barrie Sosinsky, "Cloud Computing Bible", Wiley India Pvt. Ltd, 2013.
2. John W.RittingHouse, James F.Ransome, "Cloud Computing Implementation, Management and Security", CRC Press, 2013.
3. Kris Jamsa, Jones & Bartlett , "Cloud Computing" , Learning Publishers 2014.
4. Anthony T. Velte, Toby J. Velte, RoberElsenpeter, "Cloud Computing – A Practical Approach" , Mc Graw Hill publications, 2013.
5. Rajkumarbuyya, James Broberg, Andrzej Goscinski, " Computing Principles & Paradigms", Wiley India Pvt. Ltd., 2013.

WEB REFERENCES :

1. <https://lecturenotes.in/subject/366/cloud-computing-cc>
2. <https://www.guru99.com/cloud-computing-for-beginners.html>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Examine the characteristics of Cloud Computing and the architecture	K1	PSO1
CO 2	Define Infrastructure and Identify service models.	K1, K2	PSO2, PSO3
CO 3	Relate abstraction and virtualization and cloud computing frameworks.	K1 & K3	PSO3
CO 4	Manage and administrate cloud.	K1, K2, K3	PSO4, PSO5
CO 5	Explore cloud based storage and collaboration technologies.	K2 & K4	PSO3, PSO4

GENERAL ELECTIVE - MCA

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	19MCAGE27	ADVANCED DBMS TECHNIQUES	GENERAL ELECTIVE	4	4

COURSE DESCRIPTION

This course provides knowledge on the advanced topics of DBMS including query optimization, concurrency, complex queries, transaction management, organization of database systems and advanced indexing.

COURSE OBJECTIVES

- ❖ To learn the concept of data models and the advanced relational designs.
- ❖ To understand the internal storage structures using different file and indexing techniques which will help in physical DB design.
- ❖ To have an introductory knowledge about the storage, query processing techniques, transaction processing, and concurrency control and recovery procedures.

UNIT I ADVANCED DESIGN AND QUERY LANGUAGES

(12 Hours)

Advanced Relational Database Design – Multivalued Dependencies – Theory – Rules – Dependency Preservation – Join Dependencies – Definition – Project Join Normal Form Domain Key Normal Form – Domain Declaration – Key Declarations – General Constraints

SELF STUDY: Relational Operations

UNIT II DATABASE MODELS**(12 Hours)**

Network Model - Basic Concepts – Data Structure Diagrams - The Database Task Group (DBTG) CODASYL Model – Data Retrieval – Update Facility – Set Processing Facility – Mapping of Networks to Files – Hierarchical Model – Basic Concepts – Tree Structure Diagrams – Data-Retrieval – Update Facility – Virtual Records – Mapping of Hierarchy to Files.

SELF STUDY: Relational Operations**UNIT III****(12 Hours)****DATA STORAGE AND QUERYING (IMPLEMENTATION TECHNIQUES)**

Storage – Physical Storage Media– File Organization – Indexing Basic Concepts – Ordered Indices – Multiple Key Access – Multiple Single Key Indices – Indices on Multiple Keys – Covering Indices – Static Hashing – Hash Functions – Bucket Overflow – Hash Indices – Dynamic Hashing – Data Structures – Queries and Updates – Static Vs Dynamic Hashing.

SELF STUDY: RAID**UNIT IV TRANSACTION MANAGEMENT****(12 Hours)**

Transaction Concept – Simple Transaction Protocol – Transaction Atomicity Durability – Transaction Isolation – Serializability – Concurrency Control – Lock Based Protocols – Timestamp Based Protocols — Recovery System – Recovery and Atomicity – Recovery Algorithm – Buffer Management.

SELF STUDY: Validation Based Protocols**UNIT V ADVANCED DATABASES****(12 Hours)**

Parallel Databases – I/O Parallelism – Interquery parallelism – Intraquery parallelism Distributed Databases – Homogenous Databases – Heterogeneous

Databases – Cloud Based Databases – Specialty Databases – Object Based Databases – Structured types and Inheritance in SQL - Reference Types.

SELF STUDY: Complex Data types

REFERENCES :

1. Abraham Silberschatz, Henry F. Korth, S.Sudarshan, “Database System Concepts” , Tata McGraw Hill publishers, 6th Edition, 2015.
2. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Addison-Wesley, 2011.
3. Raghu Ramakrishnan, “Database Management Systems”, 4th Edition, McGraw-Hill College Publications, 2015.

WEB REFERENCES :

1. <https://tutorialspoint.com/dbms/>
2. <https://wileyindia.com/advanced-database-management-systemm.html>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Design the basic concepts of the advanced database design and dependencies.	K2	PSO1 & PSO2
CO 2	Compare the different data models	K2, K3, K4	PSO1 & PSO2
CO 3	Compile the implementation concepts of storage structures	K2 & K3	PSO1 & PSO3
CO 4	Analyze on the advanced transaction management techniques	K2, K3 & K5	PSO1 & PSO4
CO 5	Discuss on the advanced databases	K2,K3 & K5	PSO1 & PSO5

ADVANCE LEARNERS COURSE - MCA

(For those who join in 2019 onwards)

PROGRAM ME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSCA	19MCAALO 1	HUMAN COMPUTER INTERACTION	ADVANCED LEARNERS	4	4

COURSE DESCRIPTION

This course introduces the fundamental theories and concepts of human computer interaction. It provides knowledge on analyzing interaction problems from a technical, cognitive and functional perspective.

COURSE OBJECTIVE

- ❖ Learn the foundations of Human Computer Interaction
- ❖ Be familiar with the design technologies for individuals and persons with disabilities
- ❖ Be aware of mobile HCI
- ❖ Learn the guidelines for user interface.

UNIT I

(12 Hours)

FOUNDATIONS OF HCI

The Human: Introduction – Input/Output Channels – Human Memory – Thinking: Reasoning and problem solving;

The Computer: Introduction – Text entry Devices – Positioning, pointing and drawing – Display devices – Devices for virtual reality and 3D interaction - Memory – Processing and networks;

SELF STUDY: Devices for virtual reality and 3D interaction

UNIT II

(12 Hours)

THE INTERACTION: Models of interaction – Models of interaction – Frameworks and HCI – Ergonomics – Interaction styles – Elements of the WIMP interface – Interactivity- the context of the interaction

PARADIGMS : Introduction – Paradigms for interaction

SELF STUDY:Interactivity- the context of the interaction

UNIT III

(12 Hours)

INTERACTION DESIGN BASICS: Introduction – the process of design – User focus – the process of design – scenarios – navigation design – screen design – Iteration and prototyping.

HCI IN SOFTWARE PROCESS: Introduction – software life cycle – usability engineering – Prototyping in practice – design rationale.

SELF STUDY:software life cycle

UNIT IV

(12 Hours)

DESIGN RULES: Introduction – principles to support usability- standards - guidelines – rules and heuristics – HCI patterns.

EVALUATION TECHNIQUES: Goals of evaluation – evaluation through expert analysis – evaluation through user participation – choosing an evaluation method.

SELF STUDY: HCI patterns , Choosing an evaluation method.

UNIT V

(12 Hours)

UNIVERSAL DESIGN: Introduction – Universal design principles – Multi modal interaction – Designing web sites for screen readers – choosing the right kind of speech – Designing for diversity

USER SUPPORT: Introduction – Requirements of user support – Approaches to user support –Adaptive help systems

SELF STUDY:Designing for diversity , Approaches to user support

REFERENCES:

1. Alan Dix, Janet Finlay , “Human-Computer Interaction”,3rd edition, Pearson India
2. UzmaShaheen, Shweta Saini , ”Human Computer Interaction”, A. B. Publication
3. Dan Olsen, “Human Computer Interaction”, Ceneage Learning India Pvt Ltd
4. Preece, Rogers, Sharp,“Interaction Design : Beyond Human - Computer Interaction”, Wiley Publication
5. Cohen, Jacobs, Shneiderman, Plaisant, “Designing the User Interface: Strategies for Effective Human-Computer Interaction”, Pearson Education

WEB RESOURCES:

- 1.<https://www.hcibib.org/>
- 2.<https://www.interaction-design.org/literature/topics/human-computer-interaction>

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Design effective dialog for HCI	K2	PSO1 & PSO2
CO 2	Design effective HCI for individuals and persons with disabilities	K2, K3, K4	PSO1 & PSO2
CO 3	Assess the importance of user feedback	K2 & K3	PSO1 & PSO3
CO 4	Explain the HCI implications for designing websites	K2, K3 & K5	PSO1 & PSO4
CO 5	Develop meaningful user interface	K2,K3 & K5	PSO1 & PSO5