LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)

FOR UNDERGRADUATE PROGRAMMES

Department of Computer Science and Applications

Effective from June 2024

SYLLABUS

(2024 Restructured Curriculum)

Bachelor of Computer Applications

SCHOOL OF COMPUTATIONAL SCIENCES

LOYOLA COLLEGE (AUTONOMOUS)

CHENNAI 600034

College of Excellence

PREFACE

BCA (Bachelor of Computer Applications) is the study of algorithmic processes, computational machines, and computation itself. As a discipline, BCA spans a range of topics from theoretical studies of algorithms, computation, and information to the practical issues of implementing computational systems in hardware and software.

The curriculum is expected to assist in the maintenance of the standards used in Hardware and Software Technologies across the country by reviewing and revising a vast set of frameworks of agreed/expected graduate attributes, qualification descriptors, and programming learning outcomes. These subjects must be studied by the students of all the branches of Computer Science.

The practical based approach to the curriculum planning intends to deliver the knowledge and concepts of various subjects like Programming techniques of Hardware, Operating systems, Processors, Software and Firmware, Network and Communications, Relational databases and programming languages and tools cutting across the Software and IT industry to be learned at BCA level. Based on Computer science technology, the curriculum involves implementations of all the above-mentioned languages and tools.

The curriculum is designed based on some of the important skill-sets outlined by employers. Good knowledge and understanding of these subjects are critical for any exposure in the IT Industry. Each subject is of critical importance considering the future of the students in the field given that the advancement from here might be into research and development, IT professionals, or an entrepreneur.

The students are expected to learn the curriculum with advanced tools and technologies like graphical representations and available online tools for implementing the written code. The curriculum has been designed in such a way that students are exposed to modern tools. In this curriculum, more emphasis is given to content related to sustainability, skill acquisition, and entrepreneurship.

This curriculum and the knowledge of the practical application of the subjects will help students to apply their knowledge in the future course of their higher education, career or research. To cope with the industry needs, demands, and the advancement of technology the students are expected to have expertise in each subject.

The curriculum, teaching pedagogy, and assessment methods are assigned with appropriate cognitive levels as per BLOOM's Taxonomy. The OBE-based evaluation methods will pave way for the assessment of the cognitive levels of the students and evaluate the expected course outcome attainment.

VISION AND MISSION OF LOYOLA COLLEGE

VISION

Towards holistic formation of youth, grounded in excellence, through accompaniment to serve the humanity.

MISSION

- ➢ To provide inclusive education through an integral and holistic formative pedagogy.
- ➢ To promote skills that prepare them for the future.
- ➢ To kindle in young minds the spirit of social and environmental justice with a blend of academic excellence and empathy.
- ➢ To stimulate critical and conscientious scholarship leading to meaningful and innovative human capital.

CORE VALUES

- ➢ Cura Personalis
- ➢ Pursuit of Excellence
- ➢ Moral Rectitude
- ➢ Social Equity
- ➢ Fostering solidarity
- ➢ Global Vision
- ➢ Spiritual Quotient

VISION AND MISSION OF THE DEPARTMENT

VISION:

To be the premier department in shaping young minds to achieve eminence in digital transformation.

MISSION

To provide a learning ambience and curiosity to explore new avenues with social responsibilities.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

(School of Computational Sciences)

PEO 1	**LEARNING ENVIRONMENT AND LIFE LONG LEARNING** To access academic facilities in an environment of inclusiveness and inquisitiveness for effective and immersed learning throughout life to attain excellence in the chosen field of computational sciences.
PEO 2	**GLOBALLY RELEVANT CURRICULUM AND SCIENTIFIC TEMPERAMENT** To think innovatively, analyze scientifically and make decisions appropriately, for handling contemporary global concerns through the knowledge earned in the computational sciences curriculum.
PEO 3	**ACADEMIC EXCELLENCE AND CORE COMPETENCY** To excel in modern computational techniques and compete in higher studies/career, for addressing contemporary challenging problems with ease.
PEO 4	**SKILL DEVELOPMENT AND ENTREPRENEURSHIP** To develop analytical, logical and critical problem solving skills for executing professional work and become experts/entrepreneurs in the field of computational sciences.
PEO 5	**ENVIRONMENT AND SUSTAINABILITY** To identify real world problems concerning environment and other issues; and apply the expertise in the computational sciences, to face the challenges and provide sustainable solutions.
PEO 6	**PROFESSIONALISM AND ETHICS WITH SOCIAL RESPONSIBILITY** To equip themselves with the necessary competency towards professionalism in the computational sciences maintaining ethical standards in addressing the needs of industry and society.

PROGRAMME OUTCOMES (POs)

(School of Computational Sciences)

PO1	**DISCIPLINARY KNOWLEDGE & INFORMATION/DIGITAL LITERACY** To acquire literacy in the respective discipline of computational sciences and demonstrate scholarly knowledge in the information-digital era.
PO2	**SELF DIRECTED AND LIFE-LONG LEARNING** To adapt oneself to technological advancements in computing and engage in life- long self-learning for personal development in the context of interdisciplinary nature of future endeavors.
PO3	**SUSTAINABLE SOCIAL AND ENVIRONMENTAL CONSCIOUSNESS** To realize social and environmental problems and contribute the computational expertise to face the challenges and provide sustainable solutions.
PO4	**CRITICAL THINKING, ANALYTICAL REASONING & PROBLEM SOLVING** To critically reason out, analyze and develop solutions through variouscomputational techniques for real time problems.
PO5	**SCIENTIFIC REASONING AND PROFESSIONALISM** To apply scientific reasoning in the approach to handle professional matters, and manifest the core competencies, adhere to collaborative efforts within ethical frameworks and emerge as professionals holding key positions.
PO6	**SKILL DEVELOPMENT FOR LEADERSHIP AND ENTREPRENEURSHIP** To construct togetherness with people by building professional skills and provide effective leadership progressing to become experts/entrepreneurs in the field of Computational Sciences.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

BCA (Computer Applications)

PSO 1	To acquire adequate knowledge and gain theoretical and practical competence in programming languages, free and open source platforms to meet the global demands and challenges in the future
PSO 2	To develop creative on-demand ethically sound software applications to solve the real world problems in a systematic and professional way.
PSO3	To facilitate lifelong learning, critical thinking, analytical reasoning, zest for higher studies and innovations resulting in holistic development.
PSO 4	To exhibit proficiency in globally relevant multidisciplinary areas of computing with due environmental considerations.
PSO 5	To cater to the needs of the industry and the society in the context of rapid technological changes by providing sustainable solutions.
PSO 6	To employ a contemporary and comprehensive curriculum resulting in creating innovative successful career paths to be a socially responsible entrepreneur with core principles and ethics.
PSO 7	To collaborate and work as a team to assess the goals scientifically with common objectives and agile communication skills to meet performance expectations leading to effective decision making.

RESTRUCTURED UG CURRICULUM 2024 - SCIENCE TEMPLATE

	I	II	III	IV	V	VI	Hr	Cr
PART I: Ability Enhancement Course	GL 3(3)	GL 3(3)	GL 3(3)	GL 3(3)			12	12
PART II: Ability Enhancement Course	GE 6(3)	GE 6(3)	GE 5(3)	GE 5(3)			22	12
PART III: Discipline Specific Core (DSC)	MC 12(12)	MC 12(12)	MC 12(12)	MC 8(8)	MC 22(22)	MC 20(20)	86	86
Discipline Specific Elective (DSE)				ME 4(4)	ME 4(4)		8	8
Skill Enhancement Course(SEC)					RC 4(4)	MS 10(8)	14	12
						IN(4)		4
	AR 6(4)	AR 6(4)	AO 5(3)	AO 5(3)			22	14
		MOOC/ SS*	MOOC/ SS*	MOOC/ SS*	MOOC/ SS*			
			CD (BT/ AT/NME) 3(2)	CD (BT/ AT/NME) 3(2)			6	4
PART IV: Generic Elective Course (GEC)	FC 3(1)	FC 3(1)	FC 2(1)	FC 2(1)			10	4
	CC*	CC(1) *						1
PART V: Life Skills (LSK)			OR*	OR* (2)				2
Hours/Credits	30 (23)	30 (24)	30 (24)	30 (26)	30 (30)	30 (32)	180	159

- **GL**-General Language
- **GE**-General English
- **MC**-Major Core; **AR**-Allied Required; **AO**-Allied Optional; **ME**-Major Elective; **MS**-Major Skill; **IN**-Internship; **SS**-Self Study; **CD**-Cross Disciplinary; **RC**-Research and Competency Skill; **MOOC**-Massive Open Online Course
- **BT**-Basic Tamil; **AT**-Advanced Tamil; **NME**-Non-Major Elective; **FC**-Foundation Course
- **CC**- Co-curricular Activities; **OR**-Outreach.

DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS

OVERALL COURSE STRUCTURE

Restructured LOCF curriculum effective from June 2024

SEM	SUBJECT CODE	COURSE TITLE	SUBJECT CATEGORY T/L/P	SUB PART DISCRIPTION	HOURS	CREDIT
I		General Language-I	T	GL	3	3
I		General English-I	T	GE	6	3
I		Foundation Course	T	FC	3	1
I	UCA1MC01	Programming Techniques using Python	T	MC	4	4
I	UCA1MC02	Python Programming Lab	L	MC	4	4
I	UCA1MC03	Computer Organization and Architecture	T	MC	4	4
I	UCS1AR01	Operation Research	T	AR	6	4
SEM						
II		General Language-II	T	GL	3	3
II		General English-II	T	GE	6	3
II		Foundation Course	T	FC	3	1
II	UCA2MC01	Programming with Java	T	MC	4	4
II	UCA2MC02	Data Structures	T	MC	4	4
II	UCA2MC03	Data Structures using Java Lab	L	MC	4	4
II	UCS2AR01	Business Statistics	T	AR	6	4
SEM						
III		General Language-III	T	GL	3	3
III		General English-III	T	GE	5	3
III		Foundation Course	T	FC	2	1
III	UCA3MC01	Relational Database Management Systems	T	MC	4	4
	UCA3MC02	Relational Database Management Systems Lab	L	MC	4	4
III	UCA3MC03	Data Communication & Networks	T	MC	4	4
III	UCA3AO01 /	Web Design / Web	L	AO	5	3

	UCA3AO02	Analytics Lab				
III	UCA3CD01	Animation	L	NME	3	2
SEM						
IV		General Language-IV	T	GL	3	3
IV		General English-IV	T	GE	5	3
IV		Foundation Course	T	FC	2	1
IV	UCA4MC01	Web Programming with ASP.Net	T	MC	4	4
IV	UCA4MC02	Web Programming with ASP.Net Lab	L	MC	4	4
IV	UCA4ME01/ UCA4ME02/ UCA4ME03/ UCA4ME04	Internet of Things/ Cloud Computing/ UI/UX Design Lab / Block Chain Technology	L T	ME	4	4
IV	UCA4AO01/ UCA4AO02	Power BI / Web Development Lab	L	AO	5	3
IV	UCA4CD01	Web Design	L	NME	3	2
SEM						
V	UCA5MC01	PHP and MYSQL	T	MC	4	4
V	UCA5MC02	PHP and MYSQL Lab	L	MC	4	4
V	UCA5MC03	Full Stack Web Development Lab	L	MC	6	6
V	UCA5MC04	Operating System	T	MC	4	4
V	UCA5MC05	Software Engineering	T	MC	4	4
	UCA5ME01/ UCA5ME02	Robotic Process Automation Lab / Introduction to Big data Lab	L	ME	4	4
	UCA5RC01	Research Methodology	T	RC	4	4
SEM						
VI	UCA6MS01/ UCA6MS02	Mobile App Development / Machine Learning using Python	T	MS	5	4
VI	UCA6MS03/ UCA6MS04	Mobile App Development Lab / Machine Learning using Python Lab	L	MS	5	4
VI	UCA6MC01	Artificial Intelligence	T	MC	4	4

VI	UCA6MC02	Natural Language Processing	L	MC	6	6
VI	UCA6MC03	Cyber Security	T	MC	4	4
VI	UCA6MC04	Project	L	MC	6	6
VI	UCA6IN01	Internship		IN		4
	Total				180	159

COURSE DESCRIPTOR

(Syllabus)

SEMESTER-I

Course Code	UCA1MC01
Course Title	**Programming Techniques using Python**
Credits	4
Hours/Week	4
Category	MC – Theory
Semester	I
Regulation	2024

Course Overview

1. Summary of topics related to fundamentals of computer and algorithmic problem solving.
2. Introductory programming concepts using python.
3. Fundamental concept in programming and problem solving using python.
4. Fundamental concepts- conditionals , iteration, string manipulation
5. Concepts of files and exception.

Course Objectives

1. To understand the basics of algorithmic problem solving.
2. To learn to solve problems using Python conditionals and loops.
3. To define Python functions and use function calls to solve problems.
4. To use Python data structures – lists, tuples, dictionaries to represent complex data.
5. To do input/output with files in Python..

Prerequisites	Basics of mathematics and statistics.

SYLLABUS				
Unit	Content	Hrs	COs	Cognitive Level
I	Algorithms, building blocks of algorithms - notation (pseudo code, flow chart, programming language), Python interpreter and interactive mode, Python Data types ,variables, expressions, statements, precedence of operators, comments.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
II	Conditionals: conditional statements, Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, recursion; Strings: string slices, immutability, string	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

	functions and methods, array and array operations.			
III	Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; List comprehension. Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; Dictionary comprehension, advanced list processing, set and set operations.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
IV	Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exception handling, exceptions.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
V	Modules, importing modules, Python Libraries-Creating user interfaces using TKinter-The basics of Numpy arrays –Data manipulation with pandas.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

TextBooks

1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and programming", 1st Edition, BCS Learning Development Limited, 2017.

Suggested Readings

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.

2. Venkatesh and MadhavanMukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.

3. John V Guttag, Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data'', Third Edition, MIT Press.

4. Eric Matthes, "Python Crash Course, A Hands – on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.

5. Martin C. Brown, "Python: The Complete Reference", 4th Edition, McGraw Hill, 2018.

Web Resources

1. https://www.python.org/

2. https://www.freecodecamp.org/

3.https://www.techwithtim.net

Course Outcomes (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO 1	Understand algorithmic solutions to simple computational problems.	K1, K2
CO 2	Execute simple Python programs using sequences data ,Modules and libraries	K3, K4
CO 3	Create simple Python programs using conditionals and looping and create user interface using Tkinder library.	K5, K6

Course Code	UCA1MC02
Course Title	**Python Programming Lab**
Credits	04
Hours/Week	04
Category	Major Core (MC) –Practical
Semester	I
Regulation	2024

Course Overview

1. Fundamentals of computer and algorithmic problem solving.

2. Understanding of python data types and libraries.

3. Understanding of conditional statements functions, string, arrays.

4. Fundamental concepts- – lists, tuples, dictionaries.

5. Fundamental concepts of files and exception.

Course Objectives

1. To understand the problem solving approaches.
2. To learn the basic programming constructs in Python.
3. To practice various computing strategies for Python-based solutions to real world problems.
4. To use Python data structures – lists, tuples, dictionaries.
5. To do input/output with files in Python.

Prerequisites	Basic knowledge in Programming language.

SYLLABUS				
Unit	Content	Hrs	COs	Cognitive Level
I	1. Write a python program to perform arithmetic operations. 2 Write a python program to prepare Students Marks Statement. 3. Write a python program to calculate Electricity Bill.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

II	4. Write a python program to exchange the values of two variables. 5. Write a python program to circulate the values of n variables. 6. Write a python program to distance between two points.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
III	7. Write a python program to create array and sum of array of N numbers using Numpy. 8. Write a python program to read CSV file using Pandas. 9. Write a python program to draw line and bar chart using matplotlib.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
IV	10. Write a python program to perform List operations 11. Write a python program to perform List operations 12. Write a python program to perform Dictionary operations.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
V	13. Write a python program to perform word count and copyfile. 14. Write a python program to demonstrate exceptional handling. 15.Write a python program to perform Voter's age validation,	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

Text Books

1.Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition,

   O'Reilly Publishers, 2016.

2.Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and programming",

   1st Edition, BCS Learning Development Limited, 2017.

Suggested Readings

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.

2. Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and   Data Scientists", 1st Edition, Notion Press, 2021.

3. John V Guttag, Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data'', Third Edition, MIT Press.

4. Eric Matthes, "Python Crash Course, A Hands – on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.

5. Martin C. Brown, "Python: The Complete Reference", 4th Edition, McGraw Hill, 2018.

Web Resources

1. https://www.python.org.

2. https://www.freecodecamp.org/

3. https://www.techwithtim.net

CourseOutcomes(COs) and CognitiveLevel Mapping

COs	CO Description	Cognitive Level
CO1	Develop algorithmic solutions to simple computational problems.	K1,K2
CO2	Develop and execute program for real time problems	K3, K4
CO3	Write Python programs using lists. tuples, dictionary and files	K5, K6

Course Code	UCA1MC03
Course Title	COMPUTER ORGANIZATION AND ARCHITECTURE
Credits	04
Hours/Week	04
Category	Major Core (MC) – Theory
Semester	I
Regulation	2024

Course Overview

1. Computer Organization and Architecture deals with the design of fundamental blocks for building a computer system.
2. The course familiarizes the logic circuits and components, computer architecture, and CPU organization.
3. This course delivers Common- bus- system, Instruction cycle, Addressing modes and various instructions

Course Objectives

1. To understand computer system architecture and organization.
2. To explore the various functional blocks computer organization.
3. To identify and analyze the concepts of Input/ Output organization.
4. To illustrate the Addressing modes with registers, and storage units.

Prerequisites	Basic knowledge on Digital Logic Circuits and Boolean Algebra.

SYLLABUS				
Unit	Content	Hrs	COs	Cognitive Level
I	Digital Computers, Logic Gates, Boolean algebra -Map Simplification: Product-of-Sums Simplification-Don't-Care Conditions, Combinational Circuits: Half, Full adder.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
II	Flip Flops- SR, D, JK, T, Digital Components: Decoders-Encoders- Multiplexers, Register: Registers with Parallel Load-Shift Registers: Bi-directional Shift Registers with Parallel Load.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
III	Memory Unit., Data types: Number System- Octal and Hexadecimal number, Decimal representation. Complements, Arithmetic addition- Arithmetic subtraction, grey code, error detection code.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
IV	Basic Computer Organization: Instruction codes - Stored Program Organization - Indirect Address - Computer Registers - Common Bus System -Computer Instructions, Instruction Formats.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
V	Central Processing Unit: General Register Organization Addressing Modes-Data Transfer and Manipulation: Set of Basic Operations - Data Transfer Instructions, Data Manipulation Instructions : Arithmetic Instructions -	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6

	Logical and Bit Manipulation - Shift Instructions , program control instruction.			

Text Books

1. M.Morris Mano,Computer System Architecture,Third Edition,Prentice Hall of India, 2007

Suggested Readings

1. AndrewS.Tanenbaum, Structured Computer Organization, Fourth Edition, Prentice Hall Of India,1998.
2. William Stallings,"Computer Organization and Architecture",Eighth Edition,Pearson Education,2012.
3. Carl Hamacher, "Computer Organization", Fifth Edition, McGraw Hill International,2011.

Web Resources

1. https://www.youtube.com/watch?v=3nqy68pdNHs
2. https://www.geeksforgeeks.org/introduction-of-k-map-karnaugh-map/
3. https://youtu.be/-paFaxtTCkI?si=Aqt2mvQkMwPNPoR-

Course Outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO 1	To identify and understand the organization of computer and its Architecture.	K1, K2
CO 2	To distinguish the various types of instructions and its functions.	K3, K4
CO 3	To construct microprocessor instructions and to address the memory and registers	K5, K6

Course Code	UCS1AR01
Course Title	OPERATION RESEARCH
Credits	04
Hours/Week	06
Category	Allied Required - Theory
Semester	I
Regulation	2024

Course Overview

1. Operation research is designed to understand the role and need of it in the field of computer applications.
2. This course aims to identify the scope, objectives, and models of operation research.
3. It focuses on understanding, working with various techniques of resource planning and scheduling.
4. The course utilizes and implements methods in project planning.

Course Objectives

1. To understand the history and necessity of operation research for scientific way of problem solving.
2. To design mathematical model for the real –time problems and to solve operational problems.
3. To apply decision-making in real-time problems by using scientific methodologies.

Prerequisites	Basics of mathematics and statistics

<div align="center">SYLLABUS</div>

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Introduction to Operations research: Basic definition, Scope, objectives, Phases, models and limitations of Operations research. Linear Programming: Formulation of LPP– Graphical solution of LPP and simplex method.	18	CO1 CO2 CO3	K1, K2, K3 K4, K5, K6
II	Transportation problems-unbalanced Transportation Problem-Finding basic feasible solution–North-west corner rule-least cost-Vogel's approximation method. Assignment Problems–Hungarian method for Optimal solution.	18	CO1 CO2 CO3	K1, K2, K3 K4, K5, K6
III	Sequencing and scheduling problems: Job sequencing-n-jobs through two machines, N-jobs through three machines, two jobs through machines. Maintenance and replacement problems: Models for routine	18	CO1 CO2 CO3	K1, K2, K3 K4, K5, K6

	maintenance and preventive maintenance decision– Replacement models that deteriorate with time and those fail completely.				
IV	PERT and CPM techniques – Network-activity, node-dummy activity-Fulkerson rule- Constructing the network-Critical path analysis–Three time estimates for PERT.	18	CO1 CO2 CO3	K1, K2, K3 K4, K5, K6
V	Game Theory-Introduction-Characteristics of Games –Mini-max(Max-min) criterion of optimality -Models in Game Theory –Rules of Dominance to reduce the size of matrix.	18	CO1 CO2 CO3	K1, K2, K3 K4, K5, K6

Text Books

1. Iyer, P.Sankara,"Operations Research", Tata McGraw-Hill, 2008.
2. Rajagopal, K., "Operations Research", PHI Learning ,2012.

Suggested Readings

1. Kalavathy.S, "Operations Research", Vikas publication, Fourth edition.
2. Taha.H.A, "Operations research– an introduction" Pearson Prentice Hall, Eighth Edition.
3. Gupta, P.K. and Hira,D.S,"Operations Research",S.chand&sons, Seventh Edition.

Web Resources

1. https://web.itu.edu.tr/topcuil/ya/OR.pdf
2. https://kanchiuniv.ac.in/coursematerials/Game%20theory.pdf
3. https://www.tutorialspoint.com/industrial-engineering-operations-research/index.asp

Course Outcomes (COs) and Cognitive Level Mapping

	OPERATION RESEARCH (AR)	COGNITIVE LEVEL
CO 1	To describe and represent the basics of operation research methodologies.	K1, K2
CO 2	To construct models for given problems and analyse the problem models.	K3,K4
CO 3	To evaluate the optimality of the solutions and design the real time system using OR techniques.	K5,K6

Course Code	UCA2MC01
Course Title	**Programming with Java**
Credits	04
Hours/Week	04
Category	Major Core (MC) –Theory
Semester	II
Regulation	2024

Course Overview
1. To understand and know the importance of OOPs in real-world problems. 2. To familiarize with controls structures and looping statements. 3. To emphasize the importance of interfaces and packages. 4. It also covers concurrent programming techniques and handling errors.

Course Objectives
1. To understand and apply Object Oriented Programming Principle to solve real world problems. 2. To implement re-usability for efficient software development. 3. To create packages and manage concurrent processes using threads in java. 4. To explore and utilize the error handling features in Java.

Prerequisites	Basic knowledge on programming.

SYLLABUS				
Unit	Content	Hrs	COs	Cognitive Level
I	Fundamentals of Object Oriented Programming: Basic Concepts of OOPS-Benefits of OOPS- Applications of OOPS. Java Evolution: Java Features-Simple java program-java tokens -java virtual machine. Constants-Variables, Data Types – Scope of variables-type casting- Operators and Expressions.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
II	Decision Making and Branching Statements, Decision Making and Looping Statements. Arrays, Strings. Classes, Objects and Methods: Constructors.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

III	Methods overloading- Static Members-Inheritance-Overriding methods-Final variable and methods-Final Class - Finalizer methods-Abstract methods and classes.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
IV	Interfaces: Defining Interface- Extending Interface-Implementing Interface-Accessing Interface Variable. Packages: Putting Classes Together- Java API Packages – Using System Packages – Naming Conventions – Creating Packages – Accessing a Package – Using a Package – Adding a Class to a Package.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
V	Multi threaded Programming: Creating Threads, Extending a Thread class- Life cycle of a Thread, Thread Priority- Implementing Runnable Interface. Managing errors and Exceptions: Exceptions - Exception Handling Code-Multiple Catch Statements- Using Finally-Throwing our own Exceptions.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

Text Book

1. Programming with Java, E. Balagurusamy, Tata McGraw-Hill, 2019, Sixth Edition.

Suggested Readings

1.Java - The Complete Reference, Schildt Herbert and Peter Naughton, Tata McGraw-Hill, 2019, Eleventh Edition.

2.Programming with Java, Dr. C. Muthu, Tata McGraw-Hill, 2010, Second Edition, University of Chicago Press and Ivy Press Ltd., p.193.

Web Resources

1. https://www.tutorialspoint.com/java/index.htm
2. https://www.javatpoint.com/java-tutorial

Course Outcomes (Cos) and Cognitive Level Mapping

COs	Programming with Java(MC)	Cognitive Level
CO 1	Understand the fundamental concepts of object-oriented programming in Java	K1, K2
CO 2	Analyze programming constructs with objects, Classes, inheritance, packages, and interfaces.	K3, K4
CO 3	Develop simple applications to solve real-world problems.	K5, K6

Course Code	UCA2MC02
Course Title	Data Structures
Credits	04
Hours/Week	04
Category	Major Core (MC) – Theory
Semester	II
Regulation	2024

Course Overview

1. This course introduces the fundamentals of data structures.
2. Learn to write programs for different Data Structures.
3. This Develop programming skills which require to solve given problem.
4. This course provides the systematic organization of data in a computer system.
5. It helps to critique an appropriate data structure by analyzing the given data.

Course Objectives

1. To provide the knowledge of basic data structure and their implementations.
2. To understand the functionality of different data structures.
3. To use the appropriate data structure in context of solution of given problem.
4. To understand the fundamental trade-offs in the design of the data structures.

Prerequisites	Basic knowledge on data types.

SYLLABUS				
Unit	**Content**	**Hrs**	**COs**	**Cognitive Level**
I	Introduction and Overview: Basic Terminologies related to Data Structures, Types of Data Structures, Advantages of Data Structures, Classification of data structure, Arrays- Single dimensional Array- two dimensional Array- Multidimensional Array.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
II	Sorting – sorting Techniques- Bubble sort, Selection sort, Insertion sort, Stacks- Representation of stack- Operations on stack, Queues- Representation of Queues-operations on queues, Circular Queue- Representation of Queues- operations on circular queues.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

III	Arithmetic Expressions: Evaluation of a postfix expression, transforming infix expression into postfix, Linked List- Singly Linked List: Representation - Traversing, Searching, Inserting, Deleting, Doubly Linked List: Representation-Traversal, Inserting, Deleting	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
IV	Recursion – Factorials, Trees – Tree terminology, Binary Trees-inserting, deleting, Traversing Binary Trees -Pre order, In-order, Post order.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
V	Hashing, double hashing, collisions, Graphs: Graph Theory Terminology- Breadth first search, Depth first search, Weighted Graphs- Shortest-Path problem.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6

Text Books

1. Seymour Lipschutz, Data Structures, Schaum's Outline series, 1st Edition, 2013.
2. Narasimha Karumanchi, Data Structure and Algorithms Made easy in Java,2nd Edition, 2011

Suggested Readings

1. Narasimha Karumanchi, Data Structures and Algorithms made easy Career Monk Publications, 2nd Edition, 2016.
2. Michael T. Goodrich; Roberto Tamassia; Michael H. Goldwasser; Subhasish Banerjee, Data Structures and Algorithms in Java,2022.

Web Resources

1. https://www.javatpoint.com/data-structure-introduction
2. https://www.mygreatlearning.com/blog/data-structures-using-java/
3. https://www.udemy.com/course/data-structures-and-algorithms-in-java/
4. https://everythingcomputerscience.com/books/schoolboek-data_structures_and_algorithms_in_java.pdf

Course Outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO 1	To recognize and understand the usage of common data structures.	K1, K2
CO 2	To employ the concept of data structures in problem solving.	K3, K4
CO 3	To analyze the various data structures and its operations.	K5, K6

Course Code	UCA2MC03
Course Title	**Data Structures using Java Lab**
Credits	04
Hours/Week	04
Category	Major Core (MC) – Practical
Semester	II
Regulation	2024

Course Overview

1. This course introduces the implementation of data structures in java.
2. Learn to write programs for different Data Structures.
3. This develop programming skills which require to solve given problem.
4. It also deals with concurrent programming techniques.

Course Objectives

1. This course is aimed to understanding of OOP concepts and basics of Java programming.
2. To explore and utilize the error handling features in Java.
3. To use the appropriate data structure in context of solution of given problem.
4. To understand the fundamental trade-offs in the design of the data structures.

Prerequisites	Basic knowledge on programming using data structure concept.

SYLLABUS				
Unit	Content	Hrs	COs	Cognitive Level
I	1. Implement Control flow and Loopings 2. Exercise with classes and objects 3. Explore scope of variables 4. Explore String handling functions	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
II	5. Make use of code reusability using Inheritance 6. Attain the concept of Abstraction with Abstract classes 7. Explore Method Overloading concept 8. Utilize Method Overriding concept 9. Implement the concept of Interface 10. Make use of Packages	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
III	11. Implement concurrent programming using threads 12. Exercise to handle Exceptions.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6

	Implement the following Data structures concept	12	CO1	K1, K2, K3,
	13. Arrays		CO2	
	14. Singly linked list		CO3	K4, K5, K6
IV	15. Doubly Linked List			
	16. Circular Linked List			
		12	CO1	K1, K2, K3,
	Algorithms		CO2	
V	17. Searching		CO3	K4, K5, K6
	18. Sorting			

Text Books

1. Programming with Java, E. Balagurusamy, Tata McGraw-Hill, 2019, Sixth Edition.
2. Narasimha Karumanchi, Data Structure and Algorithm Made easy in Java, 2nd Edition, 2011

Suggested Readings

1. Java - The Complete Reference, Schildt Herbert and Peter Naughton, Tata McGraw-Hill, 2019, Eleventh Edition.
2. Michael T. Goodrich; Roberto Tamassia; Michael H. Goldwasser; Subhasish Banerjee, Data Structures and Algorithms in Java,2022.

Web Resources

1. https://www.javatpoint.com/java-practice-programs
2. https://www.w3resource.com/java-exercises/
3. https://www.w3schools.in/data-structures-tutorial/intro/
4. https://everythingcomputerscience.com/books/schoolboek-data_structures_and_algorithms_in_java.pdf

Course Outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO 1	To implement the programming concepts in Java.	K1, K2
CO 2	To understand the Object-Oriented Programming concepts in java.	K3, K4
CO 3	To experiment with programming constructs like objects, classes, inheritance, packages and interfaces.	K5, K6

Course Code	UCS2AR01
Course Title	BUSINESS STATISTICS
Credits	04
Hours/Week	06
Category	Allied Required - Theory
Semester	II
Regulation	2024

Course Overview

1. Understand basic statistical concepts and terminology.
2. Learn techniques for summarizing and visualizing data.
3. Apply correlation and regression analysis in business situations.
4. Use appropriate T-test for given data and interpret the results.
5. Use statistical inference to make decisions and draw conclusions.

Course Objectives

1. To introduce basic concepts of Statistics
2. To provide statistical techniques for business data analysis.
3. Learn techniques for summarizing and visualizing data.
4. Analyze and interpret the data in business states.
5. Apply statistical inference to make decisions and form conclusions.

Prerequisites	Basic knowledge of Statistics

SYLLABUS

Unit	Content	Hrs	COs	Cognitive Level
I	**Introduction:** Definition and function of statistics – Importance of statistics in business and computer applications – Collection of Data: Primary and Secondary data – Sampling and Sampling Design: Simple Random Sampling and Stratified Random Sampling.	18	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
II	**Descriptive statistics:** Frequency distribution and data visualization measures of central tendency: Mean, Median and Mode – Measures of dispersion: Range, variance, standard deviation.	18	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
III	**Correlation:** Scatter plot, Pearson correlation coefficient, spearman rank correlation, simple linear regression model, properties of correlation, properties of regression coefficients and regression lines.	18	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
IV	**Time Series:** Components of Time Series, measurement trend – Graphic method, Methods of semi-average, Methods of moving average, Methods of least square – Applications.	18	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
V	**Testing of Hypothesis:** Hypothesis, Type I & II errors, levels of significance, P value. One sample t-test, two sample independent t-test, paired t-test and one way Analysis of Variance (ANOVA).	18	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6

Text Books
1. S. P. Gupta, 2014. Statistical Methods, Sultan Chand & Sons, New Delhi, 1426pp.

Suggested Readings
1. Vittal, P.R.(1993) Business Statistics. Margham Publications, Madras
2. Gupta, S.P. (1980), Statistical Methods-Sultan Chand and Sons Publishers. New Delhi.
3. Yule and Kendall (1993). Introduction totheory of Statistics. Universal Book Stall, New Delhi. Croxton and Cowden (1956). Applied General Statistics. Sir Isaac Pitman and Sons. Ltd., London.
4. Gupta,S.C. and Kapoor,V.K. (1980). Sultan Chand and Sons Publishers, New Delhi.
5. Taha,H.A. (1997). Operations Research. Macmillan Publishing Housing Co., New Delhi.
6. Kanti Swarup, Gupta, P.K. and Man Mohan (1996), Sultan Chand and Sons (P) Ltd., New Delhi.

Web Resources:
1. https://www.tutorialspoint.com/statistics/
2. https://www.surveysystem.com/correlation.htm
3. https://www.investopedia.com/terms/r/regression.asp
4. https://www.academia.edu/2191454/Chapter5_Index_number
5. https://www.itl.nist.gov/div898/handbook/pmc/section4/pmc4.htm

Course Outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO 1	Understand the importance and scope of statistics theory and methods in business decision making. Differentiate between descriptive and inferential statistics and explain their respective roles in data analysis.	K1, K2
CO 2	Analyze and compare the frequency distribution to measure the dispersion and other range of measures with a visualization measures.	K3, K4
CO 3	Apply a variety of statistical techniques to analyze business data, including hypothesis testing, correlation analysis, regression analysis, and time series analysis. Interpret the results of statistical analyses in the context of specific business problems and make data-driven recommendations.	K5, K6

SEMESTER III

Course Code	UCA3MC01
Course Title	**Relational Database Management Systems**
Credits	4
Hours/Week	4
Category	Major Ccore - Theory
Semester	III
Regulation	2024

Course Overview

1. This course is designed to provide the basics of data management.
2. This provides the skill to design and develop databases to maintain the real world data.
3. This course provides back-end programming skills.
4. The aim of the course is to write efficient queries to retrieve data based on the requirement.

Course Objectives

1. To understand the basics of databases and database management.
2. To create and manipulate tables (Data Storages).
3. To write simple queries to fetch data from the databases.
4. To create stored objects using PL/SQL and perform error handling.

Prerequisites	Fundamental Programming Skills.

SYLLABUS				
Unit	Content	Hrs	COs	Cognitive Level
I	Introduction to Database Systems - DBMS-File management systems- FMS versus DBMS-Overview of database management -Introduction to SQL- DBMS Models- Database System Architecture -Relational model- Relational Databases introduction - Relational Algebra-Database integrity- Keys-views- Database design- Functional dependencies- Normalisation and Normal forms- ER modelling.	12	CO1 CO2 CO3	K1,K2, K3,K4, K5,K6
II	Transaction Processing - Transaction - Recovery-Transaction Models- Two-Phase commit - Concurrency problems- Locking-Deadlocks-Transaction serialisability isolation levels- Database Security –Database control- Users and database privileges-Filtering Table privileges-Statistical databases-Query	12	CO1 CO2 CO3	K1,K2, K3,K4, K5,K6

	execution and optimization-Advanced topics in DBMS- Deductive databases-Internet and DBMS- Multimedia databases-Digital Libraries- Mobile databases.			
III	Introduction to SQL types -DDL Data types-Creating and managing tables-Creating and managing constraints- Error codes- DML Retrieval of data- Sorting Case structure-DCL and DTL. SQL Queries-Arithmetic operations-Restricting with where clause-Built-in Functions -Number functions- Character functions-Conversion functions- Date functions-Grouping data -Distinct function-Null value function-Decode- Case- Joins- Set operation- Sub queries-Correlated sub queries.	12	CO1 CO2 CO3	K1,K2, K3,K4, K5,K6
IV	PL / SQL Fundamentals Block Structure - data types Variable Declaration-Anchored declaration-Assignment operation- Bind variables Printing in PL/SQL Control structures-IF statement and LOOP statements-Case statement- Nested blocks - DML in PL/SQL - PL/SQL cursors- Cursor For loop- Built-in Exceptions-User Defined Exceptions.	12	CO1 CO2 CO3	K1,K2, K3,K4, K5,K6
V	Creating and managing views- creating Sequences, indexes and synonyms-.Composite data types-Records-Tables- Varray - Creation and usage of Procedures, Functions, Packages and Triggers-Instead of Trigger-Overloading packages-Data dictionary views. Case study: Preparing SSLC marks statement using Packages.	12	CO1 CO2 CO3	K1,K2, K3,K4, K5,K6

Text Books
1. AtulKahate , Introduction to database management System, Pearson Education, First Edition, 2004.
2. Nilesh Shah, Database Systems Using Oracle, Pearson Education, Second Edition, 2011.

Suggested Readings
1. Steven Feuerstein and Bill Pribyl, Oracle PL/SQL Programming, O'Reilly, Fourth Edition, 2014.
2. Kevin Loney, Oracle 11g, The Complete reference, Oracle Press, First Edition, 2009.

Web Resources

1. https://docs.oracle.com/cd/E11882_01/server.112/e40540.pdf
2. https://www.oracletutorial.com/
3. https://www.javatpoint.com/oracle-tutorial

Course Outcomes (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO 1	To understand the basics of backend programming with data storages.	K1, K2
CO 2	To construct statements to validate the data storage schemas and ensure the effective retrieval.	K3, K4
CO 3	To recommend blocks of codes to solve real world problems	K5, K6

Course Code	UCA3MC02
Course Title	**Relational Database Management Systems Lab**
Credits	4
Hours/Week	4
Category	Major Core - Practical
Semester	III
Regulation	2024

Course Overview

1. This course provides the skill to design and develop databases to keep the real word data.
2. This course provides back-end programming s kills.
3. The aim of the course is to write efficient queries to retrieve data based on the requirement.
4. This will also provide skills in stored objects and back-end validations.

Course Objectives

1. To create and manipulate tables (Data Storages).
2. To write simple queries to fetch data from the databases.
3. To perform back-end programming through PL/SQL and perform error handling.
4. To create stored objects and validate through constraints.

Prerequisites	Fundamental Programming Skill.

SYLLABUS				
Unit	Content	Hrs	COs	Cognitive Level
I	1. Creating, modifying and dropping tables 2. Inserting, modifying and deleting rows of a table. 3. Creating tables with Adding, Dropping, disabling /enabling constraints	12	CO1 CO2 CO3	K1,K2, K3,K4, K5,K6
II	4. Retrieving rows with Character functions. 5. Retrieving rows with Number and Date functions. 6. Retrieving rows with aggregate functions.	12	CO1 CO2 CO3	K1,K2, K3,K4, K5,K6
III	7. Retrieving values through multiple tables. 8. Fetching rows through Sub queries. 9. Using Case and Decode.		CO1 CO2 CO3	K1,K2, K3,K4, K5,K6
IV	10. PL/SQL blocks with control structures. 11. PL/SQL blocks with Cursors.	12	CO1 CO2	K1,K2,

	12. Working with Exception Handling.		CO3	K3,K4, K5,K6
	13. Working with Functions, Procedures, and Packages.			
	14. Working with triggers			
V	15. Working with Sequences, Synonyms, views and indexes. 16. Lock the tables in different modes. 17. Demonstrate deadlocs. 18. Preparing SSLC marks statement using packages. 19. Tracking the deleted transactions in bank automatically using Triggers.	12	CO1 CO2 CO3	K1,K2, K3,K4, K5,K6

Text Book

Nilesh Shah, Database Systems Using Oracle, Pearson Education, Second Edition, 2011.

Suggested Readings

1. Steven Feuerstein and Bill Pribyl, Oracle PL/SQL Programming, O'Reilly, Fourth Edition, 2014.
2. Kevin Loney, Oracle 11g, The Complete reference, Oracle Press, First Edition, 2009.

Web Resources

1. https ://docs.oracle. com/cd/E 1 1 882_0 1/server. 1 12/e40540.pdf
2. https://www.oracletutorial.com/
3. https://www.javatpoint.com/oracle-tutorial

Course Outcomes (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO 1	To infer the basics of backend programming with data storages, with validations.	K1, K2
CO 2	To discover the appropriate methodologies to get desirable output through queries.	K3, K4
CO 3	To develop a block of codes to solve real world problems, with ethical usage through stored objects.	K5, K6

Course Code	UCA3MC03
Course Title	**Data Communication and Networks**
Credits	4
Hours/Week	4
Category	Major Core - Theory
Semester	III
Regulation	2024

Course Overview

1. This course outlines the fundamental techniques of computer networks.
2. This course deals with the network architecture and the functionalities of different layers.
3. It also focuses on network principles, data transmission standards and transmission media.
4. It familiarizes error detection and correction mechanisms.

Course Objectives

1. To understand the layered architecture and protocols of computer networks.

2. To elaborate the background concepts, and functionalities of application layer, transport layer, and

network layer.

3 .To Study and analyze the flow and error control schemes.

4 .To Present ample details about the protocols, technologies and standards that are used by each layer
as it relates to the internet.

Prerequisites	Basics concepts of communication, digital electronics and computers.

SYLLABUS				
Unit	Content	Hrs	COs	Cognitive Level
I	**Introduction:** Data Communications, Networks, Network Types, Protocol Layering, TCP/IP Protocol Suite, OSI Model.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
II	**Physical Layer:** Signals, Signal impairment, Digital Transmission, Analog Transmission, Multiplexing, Transmission Media	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

III	**Data Link Layer:** Introduction, Data Link control, Media Access control, Link layer addressing. **Network layer:** Services, Packet Switching, Performance, Routing Algorithm, Unicast routing protocol, Broadcast routing protocol, Multicast routing protocol, IGMP.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
IV	**Transport Layer:** Transport layer Services, Transport layer protocols, User datagram protocol, Transmission control protocol	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
V	**Application Layer:** Introduction, client/server paradigm, standard applications: WWW and HTTP, FTP, Electronic Mail, TELNET – Firewalls – Network Management System – SNMP, Socket interface programming.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6

Text Book

Behrouz A. Forouzan, "Data Communication and Networking with TCP/IP Protocol Suite", Sixth Edition, McGraw Hill Publisher, 2022.

Suggested Readings

1. Dr.RajKumar, Dr.T.Harikrishna, Dr.JustinSophia.I, Ms.V.HemaValpadsau," Data Communication and computer Network for Beginners", NTL Technology, First Edition, 2023.
2. Doug Lowe,"Networking All-in-One For Dummies", Wiley board, Eight Edition, 2021.
3. Business Data Communi Jerry FitzGerald, Alan Dennis, Alexandra Durcikova, "Business Data Communications and Networking, Fourteenth Edition, 2020.
4. James F Kurose and Keith W Ross "A Top-Down Approach: Computer Networking", Pearson Education , 2012.

Web Resources

1. https://dokumen.pub/qdownload/ise-data-communications-amp-networking-with-tcp-ip-protocol-suite-6nbsped-1260597822-9781260597820.html.
2. https://nptel.ac.in/courses/106105082
3. https://ocw.mit.edu/courses/6-263j-data-communication-networks-fall-2002/
4. https://www.classcentral.com/course/data-communication-network-services-9160

Course Outcomes (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO 1	To understand and explore the basics of Computer Networks and Various Protocols.	K1, K2
CO 2	To explain and analyze the transmission of data through network communication using layered concepts.	K3, K4
CO 3	To assess error free data transmission using the transmission techniques and to construct optimal network connections for effective data transmissions	K5, K6

Course Code	UCA3AO01
Course Title	Web Design
Credits	03
Hours/Week	05
Category	Allied Optional (AO) – Practical
Semester	III
Regulation	2024

Course Overview

1. This course enables designing of standard website using HTML, CSS, JavaScript and Bootstrap.

2. This course aims to introduce planning and designing of effective web pages.

3. The course explores the different elements and features involved in producing a functional multi-page website.

4. It also focuses on developing web elements using Bootstrap that could be incorporated into web pages.

Course Objectives

1. To develop dynamic web pages using HTML, CSS, JavaScript and Bootstrap.

2. To recognize the techniques of responsive web design using Bootstrap.

3. To simplify the development of informative web pages.

4. To learn Ethical and Professional Web Design Practices

Prerequisites	Basic knowledge of Windows and Computer languages

SYLLABUS				
UNIT	**CONTENT**	**HOURS**	**COs**	**COGNITIVE LEVEL**
I	HTML 5: Introduction-Basic Tags-Formatting and font tags-comment- Working with color- Elements of html: Tables- Images-Working with List -Links Tables- Frame and Frameset-Forms and Controls. 1. Implementing Background design, Color & Text Tags 2. Implementing Image Tags, List Tags, Hot Text using Hyperlink Tags. 3. Implement Image Link and File Link to	15	CO1 CO2 CO3	K1,K2,K3 K4,K5,K6

	upload images and necessary documents. 4. Implementing Frames and Framesets. 5. Designing Forms			
II	Introduction to Cascading Style Sheet -using CSS background images-color and properties- Manipulating texts using fonts- border and boxes margins- padding lists -positioning using CSS - Types of Style Sheets-Class and ID selector - Inline Menu-DIV and CSS layout. 6. Implementing Cascading Style Sheets. 7. Apply inline CSS to create a menu. 8. Use different font styles: font, color etc., 9. Demonstrate internal and external CSS	15	CO1 CO2 CO3	K1,K2,K3 K4,K5,K6
III	Introduction to JavaScript-Understanding Variables, constants, data types, operators, control statements and Looping. 10. Implementing JavaScript in HTML. 11. Implementing operators in Java script. 12. Demonstrate control statements in Java script. 13. Implement the Looping Concepts in Java script.	15	CO1 CO2 CO3	K1,K2,K3 K4,K5,K6
IV	Introduction to Java script Functions- Objects: Object, Array, String and Math. Java scripts Events: mouse events, keyboard, form events and document events. Java script Validation: Form validation and email validation. 14. Design a web page using a user defined function 15. Implementing Array concept in JavaScript. 16. Demonstrate Events in JavaScript. 17. Implement form validation and Email validation.	15	CO1 CO2 CO3	K1,K2,K3 K4,K5,K6
V	Bootstrap: Bootstrap Layout-Bootstrap tables- Bootstrap List-Bootstrap Form- Bootstrap object- navigation. 18. Create a web page using bootstrap elements. 19. Create a web page using bootstrap objects. 20. Implement bootstrap navigation.	15	CO1 CO2 CO3	K1,K2,K3 K4,K5,K6

Course Outcomes (Cos) and Cognitive Level Mapping

	WEB DESIGN (AO)	COGNITIVE LEVEL
CO1	To define and understand the use of HTML tags and the principles behind Bootstrap framework.	K1, K2
CO2	To illustrate the use of HTML, CSS and Java Script in designing and creating a web page.	K3,k4
CO3	To Develop Professional and Ethical Web Design Practices	K5,k6

Course Code	UCA3AO02
Course Title	Web Analytics Lab
Credits	03
Hours/Week	05
Category	Allied Optional (AO) – Lab
Semester	III
Regulation	2024

Course Overview
1. This course aims at understanding the measurement, analysis, and report for optimizing web usage.
2. Provides in-depth knowledge of analyzing website traffic, and its application in business strategies.
3. Explores various categories and types of web analytics tools and methods.
4. Gives detailed explanation of web analytics concepts, including Google Analytics

Course Objectives
1. To gain insights of business analytics for making informed decisions.
2. To learn about the capabilities and strengths of various web analytics tools.
3. To discover how to leverage analytics to assess and enhance business advertising strategies.
4. To get acquainted with the basics of Google Analytics, for tracking and analyzing web data.

Prerequisites	Basic knowledge on the Internet.

SYLLABUS				
Unit	**Content**	**Hrs**	**COs**	**Cognitive Level**
I	Introduction to Web Analytics: How web Analytics work, Metrics and Dimensions. 1. Sign in to the web analytics tools. 2. Create the data collection setup.	15	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
II	Learning about Users through Web Analytics- Visitor Analysis-Demographics—Location, Technology—Browser & OS, Traffic Analysis- Source and Medium, Organic Search. 3. Explore the Real Time Active user. 4. Create a report to view the Demographics-Location. 5. Crete a report to view the Device Category.	15	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

III	Measuring the Effects of Changes: Types of Changes- Conversion Rate- Redirect Traffic- Time on Page and Other Continuous Metrics. 6.Create a report for overview acquisition with caparison. 7.Create an ecommerce purchased report. 8.Create the Conversion performance report. 9.Create a report view the pages and screens.	15	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
IV	Google sites: Create a web page – Google form - Publish Settings - Analytics 10.Create a web page using Google sites. 11.Create a web page with google form. 12.Create a web site and publish.	15	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
V	Google Analytics: Features, benefits and Limitations – Working strategy of Google Analytics – Difference of Google analytics from others - Google analytics tools 13.Explore the Free form and path exploration templet. 14.Collect the data of active user behavior for your web site. 15.Create a new exploration using different metrics.	15	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6

Text Books
1. Michael Beasley, "Practical Web Analytics for User Experience", Morgan, 2ⁿᵈ Edition 2014

Suggested Readings
1. Brian Clifton, "Advanced Web Metrics with Google Analytics", Wiley Publishing Inc, 3rd Edition, 2012.
2. Michael Beasley, "Practical Web Analytics for User Experience", Morgan, 1stEdition 2013.

Web Resources
1. https://www.montclair.edu/information-technology/wp-content/uploads/sites/168/2020/02/Google-Sites-New-Guide_Final.pdf
2. https://www.tutorialspoint.com/web_analytics/web_analytics_quick_guide.htm
3. https://youtu.be/OIVhhgNQjak?feature=shared

Course Outcomes (Cos) and Cognitive Level Mapping

COs	Web Analytics Lab (AO)	Cognitive Level
CO 1	To demonstrate and understand the concepts in web analytics.	K1, K2
CO 2	To build and analyze the data in Google Analytics.	K3, K4
CO 3	To compare and interpret the content on the web using various analytical tools.	K5, K6

Course Code	UCA3CD01
Course Title	**Animation**
Credits	02
Hours/Week	03
Category	NME
Semester	III
Regulation	2024

Course Overview

1. Animation deals with the illusion of moving images.

2. This course covers various animation styles and techniques using flash.

3. It focuses on the drawing, designing and applying many effects using animation.

4. It helps to conceptualize design for the media industry.

Course Objectives

1. To understand the concepts and techniques of animation.

2. To explore the 2D animation techniques using flash.

3. To acquire knowledge on traditional and 3D animation methods.

4. To design, develop and transform messages through animated applications.

Prerequisites	Familiarity with drawing skills and basic computer knowledge.

SYLLABUS				
UNIT	**CONTENT**	**HOURS**	**Cos**	**COGNITIVE LEVEL**
I	Getting acquainted: Starting Flash and opening a file – getting to know the workspace – Working with Library panel – Understanding the timeline – Organizing layers in a timeline – Using the properties inspector – Using the tools panel – Previewing your movie – Modifying the content and stage. 1. Exploring the flash workspace 2. Working with Timeline and Layers. 3. Previewing and Modifying content.	**09**	CO1 CO2 CO3	K1,K2,K3 K4,K5,K6

II	Working with Graphics: Understanding strokes and fills – Creating shapes – Making selections – Editing shapes – Using gradient and bitmap fills – Creating curves – Creating transparencies - Creating and editing text - Aligning and distributing objects – Converting and exporting art 4. Creating and editing shapes with strokes and fills. 5. Applying gradients, curves and transparencies. 6. Working with text, aligning objects and exporting art	**09**	CO1 CO2 CO3	K1,K2,K3 K4,K5,K6
III	Creating and Editing Symbols: Creating symbols - Editing and managing symbols – Changing the size and position of instances – Changing the color effect of instances – Understanding display options – Applying filters for special effects. 7. Creating and managing symbols. 8. Modifying symbol instances. 9. Applying filters and display options.	**09**	CO1 CO2 CO3	K1,K2,K3 K4,K5,K6
IV	Animating Symbols: About animation – animating position – Animating transparency – animating filters – Changing the path of the motion – Frame by frame animation – animating 3D motion 10. Generating motion tweens. 11. Motion Path animation. 12. Frame by Frame and 3D motion animation.	**09**	CO1 CO2 CO3	K1,K2,K3 K4,K5,K6
V	Animating shapes and using masks: Animating shapes – Creating a shape tween – Changing the pace – Adding more shape tweens – Creating a looping animation – Animating colour – Creating and using Masks – Easing a shape tween 13. Shape tween and colour animation. 14. Looping animation with multiple shape tweens. 15. Creating and using a mask animation.	**09**	CO1 CO2 CO3	K1,K2,K3 K4,K5,K6

Text Book

Adobe Flash Professional CC, The Official training workbook from Adobe, Russel Chun, 2015.

Suggested Readings

1. Adobe Flash Professional CS6, Russel Chun, Adobe, 2012, First edition.

2. Flash CS6: The Missing Manual, Chris Grover, O'Reilly Media, 2012.

Web Resources

1. https://www.adobe.com/in/learn/animate

2. https://helpx.adobe.com/in/animate/using/frame-by-frame-animation.html

3. https://helpx.adobe.com/in/animate/using/shape-tweening.html

Course Outcomes (COs) and Cognitive Level Mapping

	ANIMATION (NME)	COGNITIVE LEVEL
CO 1	To identify and understand the basics of flash.	K1, K2
CO 2	To apply and illustrate the various effects in animation.	K3, K4
CO 3	To assess, construct and develop movies using animation.	K5, K6

Course Code	UCA4MC01
Course Title	**WEB PROGRAMMING WITH ASP.NET**
Credits	4
Hours/Week	4
Category	Major Core - Theory
Semester	IV
Regulation	2024

Course Overview

1. This course deals with ASP.NET Server controls, HTML controls, Validation controls and Data controls.
2. It deals with file stream classes and file operations.
3. It introduces database-driven web development with ADO.NET and SQL Server.
4. It covers how to publish and manage ASP.NET web applications using **Azure** for hosting, scaling, and monitoring.

Course Objectives

1. To develop ASP.NET Web applications using standard controls, HTML controls, Validation controls and Data controls.
2. To implement file handling operations and file uploading.
3. To develop database applications using ADO.NET and SQL Server.

4. To publish an ASP.NET web application on Azure.

Prerequisites	Programming skills and basic knowledge of Database.

SYLLABUS				
Unit	Content	Hrs	COs	Cognitive Level
I	The .NET Framework: .NET Languages, Common Language Runtime, .NET Class Library - ASP.NET: Anatomy of a Web Form - Page Directive, Doctype, Writing Code - Code-Behind Class, Adding Event Handlers, Anatomy of an ASP.NET Application - ASP.NET File Types, ASP.NET Web Folders-HTML Server Controls.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

		12	CO1	K1,K2,K3,
II	Web Controls: Web Control Classes, Web Control Base Class, List Controls, Table Controls, Web Control Events and AutoPostBack, Page Life Cycle State Management: ViewState, Cross-Page Posting, Query String, Cookies, Session State, Configuring Session State, Application State.		CO2 CO3	K4,K5,K6
III	Validation: Validation Controls- Rich Controls: Calendar Control, AdRotator Control, MultiView Control.-Files and streams-File Stream classes - File Modes – File Share – Reading and Writing files – Creating, Moving, Copying and Deleting files – File uploading.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
IV	ADO.NET: Data Provider Model, Direct Data Access - Creating a Connection, Commands, DataReader, Disconnected Data Access - Data Binding: Single-Value Data Binding, Repeated-Value Data Binding, Data Controls: GridView, DetailsView, FormView	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
V	Introduction to Microsoft Azure– Hosting a Simple ASP.NET Application - Managing ASP.NET Applications - Publishing an ASP.NET Website - Monitoring and Managing Web Apps - Case study: Creating a Web application and Deploying the Project on Azure (Railway ticket reservation, Online Examination,.).	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6

Text Books

1. Matthew MacDonald, Beginning ASP.NET 4 .5 in C#, APRESS, First edition, 2012.

2. Mathew, Mac Donald, The Complete Reference ASP.NET, Tata McGraw-Hill, Standard edition, 2017.

3. Santiago FernándezMuñoz,Exam Ref AZ-204 Developing Solutions for Microsoft Azure,Microsoft Press,1st Edition ,2020.

Suggested Readings

1. Herbert Schildt, The Complete Reference C#.NET, Tata McGraw-Hill, I edition, 2015.

2. ImarSpaanjaars, Beginning ASP.NET 4.5.1: in C# and VB,Wrox; 1st edition,2014.

3. Anne Boehm, Joel Murach, Murach's C# 2015, Mike Murach& Associates Inc. I edition, 2016.

4. Stephen Walther, Kevin Hoffman, ASP.NET 4 Unleashed, Pearson; First Edition ,2010.

5. Tarek S. Sherif, Microsoft Azure for Developers: Implementing Cloud Design Patterns, Apress, 1st Edition, 2017.

Web Resources

1.https://www.javatpoint.com/asp-net-tutorial

2.https://www.w3schools.com/asp/webpages_intro.asp

3.https://www.c-sharpcorner.com/article/introduction-to-Asp-Net/

4. https://www.tutorialspoint.com/asp.net/index.htm

5.https://learn.microsoft.com/en-us/training/azure/

Course Outcomes (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO 1	To remember and understand the goals and objectives of the .NET framework and ASP.NET with C# language.	K1, K2
CO 2	To construct and analyze Web applications using server Controls and Data Controls.	K3, K4
CO 3	To choose ASP.NET framework in developing web applications using ADO.NET and SQL SERVER.	K5, K6

Course Code	UCA4MC02
Course Title	**WEB PROGRAMMING WITH ASP.NET LAB**
Credits	4
Hours/Week	4
Category	Major Core - Practical
Semester	IV
Regulation	2024

Course Overview
1. This course deals with ASP.NET Server controls, HTML controls, Validation controls and Data controls. 2. It deals with file stream classes and file operations. 3. It introduces database-driven web development with ADO.NET and SQL Server. 4. It covers how to publish and manage ASP.NET web applications using **Azure** for hosting, scaling, and monitoring.

Course Objectives
1. To develop ASP.NET Web applications using standard controls. 2. To create rich database applications using ADO.NET. 3. To handle SQL Server Database using ADO.NET. 4. To publish an ASP.NET web application on Azure.

Prerequisites	Programming skills and basic knowledge of Database.

SYLLABUS				
Unit	**Content**	**Hrs**	**COs**	**Cognitive Level**
I	1. Create an exposure of Web applications and tools 2. Application using Html Controls 3. Web application using Server Controls 4. Web application using Web controls.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
II	5. Web application using List controls 6. Web Page design using Rich control. 7. Working with File concepts. 8. Validate user input using Validation controls.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

III	9. Implementation of Cookies. 10.Transferring the data from one page to another page using Session variable 11.Transferring the data using View State management. 12. File Uploading using file upload control	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
IV	13.Web application using Data Controls. 14.Data binding with Web controls. 15. Data binding with Data Controls. 16. Database application to perform Commands.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
V	17. Student Portal using Azure. 18. Online Forum or Community Platform using Azure. 19. Creating a Scalable Ticketing System Using Azure 20. Online examination using Azure.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6

Text Books

1. Matthew MacDonald, Beginning ASP.NET 4 .5 in C#, APRESS, First edition, 2012.

2. Mathew, Mac Donald, The Complete Reference ASP.NET, Tata McGraw-Hill, Standard edition, 2015.

3. Santiago Fernández Muñoz, Exam Ref AZ-204 Developing Solutions for Microsoft Azure,Microsoft Press,1st Edition ,2020.

Suggested Readings

1. Herbert Schildt, The Complete Reference C#.NET, Tata McGraw-Hill, I edition, 2015.

2. ImarSpaanjaars, Beginning ASP.NET 4.5.1: in C# and VB,Wrox; 1st edition,2014.

3. Anne Boehm, Joel Murach, Murach's C# 2015, Mike Murach& Associates Inc. I edition, 2016.

4. Stephen Walther, Kevin Hoffman,ASP.NET 4 Unleashed, Pearson; First Edition ,2010.

5. Tarek S. Sherif, Microsoft Azure for Developers: Implementing Cloud Design Patterns, Apress,1st Edition ,2017.

Web Resources

1.https://www.javatpoint.com/asp-net-tutorial

2.https://www.w3schools.com/asp/webpages_intro.asp

3.https://www.c-sharpcorner.com/article/introduction-to-Asp-Net/

4. https://www.tutorialspoint.com/asp.net/index.htm

5. https://learn.microsoft.com/en-us/training/azure/

Course Outcomes (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO 1	To remember and understand Web controls for Web applications.	K1, K2
CO 2	To construct and analyze Web applications using server Controls and Data Controls.	K3, K4
CO 3	To choose ASP.NET framework in developing web applications using ADO.NET and SQL SERVER.	K5, K6

Course Code	**UCA4ME01**
Course Title	**Internet Of Things**
Credits	4
Hours/Week	4
Category	Major Elective – Theory
Semester	IV
Regulation	2024

Course Overview

1. The course introduces students to the fundamentals of IoT and its applications using the ESP32 microcontroller.

2. It aims to provide hands-on experience in programming the ESP32 and interfacing it with various sensors and actuators.

3. The course covers the implementation of networking and communication protocols, including Wi-Fi, Bluetooth, HTTP, and MQTT.

4. The course highlights the importance of cloud integration and data management techniques for IoT systems with security.

Course Objectives

1. To understand the basic concepts of IoT and the architecture of the ESP32 microcontroller.

2. To develop the ability to interface sensors and actuators with the ESP32 for creating functional IoT systems.

3. To implement networking and communication protocols in IoT projects using the ESP32.

4. To integrate IoT systems with cloud platforms for data storage, analysis, and remote access and apply techniques to protect IoT systems.

Prerequisites	Programming and hardware knowledge.

SYLLABUS				
Unit	**Content**	**Hrs**	**COs**	**Cognitive Level**
I	Introduction to IoT and ESP32 - Basic IoT Device: LED Control - ESP32 setup, GPIO control, basic web server implementation- Sensor interfacing, data logging - Sensor interfacing, GPIO, basic alarm system concepts.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

	1. Build an IoT device that controls an LED via button press or web interface. 2. Develop a smart doorbell that sends a notification on button press. 3. Set up an ESP32 to log environmental data (e.g., temperature) on an SD card.			
II	Introduction to ESP32 Programming and Peripheral Interfacing - GPIO, PWM, sensor interfacing- programming logic-data processing- I2C, data display. 4. Control fan speed with ESP32 based on temperature readings. 5. Create a smart lighting system controlled by motion sensors or a schedule. 6. Build a water level indicator using an ultrasonic sensor and ESP32.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
III	Introduction to ESP32 Networking and Communication Protocols - Wi-Fi, HTTP server, web interface development - Bluetooth, GPIO, communication protocols- HTTP/MQTT, secure communication - data transmission. 7. Develop a smart light system controllable via Wi-Fi/web interface. 8. Implement a Bluetooth-based home automation system with ESP32. 9. Build a door lock system remotely controlled over Wi-Fi.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
IV	Introduction to Cloud Integration and IoT Data Management- real-time monitoring. Data analytics -remote control, Data logging, cloud integration, analytics. 10. Upload temperature data to a cloud platform for monitoring. 11. Create a remote health monitoring system that sends vital signs to the cloud. 12. Design a smart irrigation system with cloud-based control and monitoring.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
V	Advanced IoT Projects and Security – Secure communication, data encryption, IoT security. Secure communication, cloud integration, real-time data transmission. Energy management. 13. Develop a smart door lock system with secure communication protocols. 14. Create a surveillance system that securely transmits camera data to the cloud. 15. Build a smart grid system for energy management with secure data transmission.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6

Text Books
1. AgusKurniawan, "Internet of Things Projects with ESP32," Packt Publishing, First Edition, 2019.
2. Neil Cameron, "Programming with the ESP32: A Comprehensive Guide to IoT Development," Elektor, First Edition, 2020.

Suggested Readings
1. Rajesh Singh, "IoT and Smart Cities: The Future of Urban Development," CRC Press, First Edition, 2020.
2. Simon Monk, "Programming the ESP32: Getting Started with the ESP32 Development Board," Maker Media, First Edition, 2021.
3. Chetan K. Dhamangaonkar, "IoT Development with ESP32: Building IoT Solutions Using the ESP32 Microcontroller," Apress, First Edition, 2020.

Web Resources
1. https://www.iotforall.com/what-is-iot
2. https://randomnerdtutorials.com/esp32-arduino-ide-setup/
3. https://www.hackster.io/
4. https://www.instructables.com/

Course Outcomes (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO 1	To identify and understand the fundamental concepts of IoT and the architecture of the ESP32 microcontroller.	K1, K2
CO 2	To examine and implement sensor and actuator interfacing with the ESP32 and analyze the data collected for IoT applications.	K3, K4
CO 3	To summarize and apply networking and communication protocols for IoT devices, and deploy secure IoT systems integrated with cloud platforms.	K5, K6

Course Code	UCA4ME02
Course Title	Cloud Computing
Credits	4
Hours/Week	4
Category	Major Elective – Theory
Semester	IV
Regulation	2024

Course Overview

1. Ability to understand service delivery models of a cloud computing architecture.
2. The course aims in understanding cloud services.
3. Explores the ideas of cloud management.
4. It highlights service providers and the defined services.

Course Objectives

1. To comprehend various computing paradigms.
2. To understand the services and fundamentals of cloud computing.
3. To deliberate on the architecture and services of cloud.
4. To explore various cloud service providers and models.

Prerequisites	Computer network and Distributed system.

SYLLABUS				
Unit	Content	Hrs	COs	Cognitive Level
I	**Computing Paradigms:** High-Performance Computing: Parallel – Distributed - Cluster - Grid - Cloud - Mobile - Quantum – Optical - Nano computing. Introduction to Amazon Web Services. 1. Introduction to AWS IAM	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
II	**Cloud Computing Fundamentals**: Motivation for Cloud Computing, The Need - Defining and definition of Cloud Computing, - Cloud Computing Is a Service, Is a Platform - Principles of Cloud computing - Characteristics - Cloud Deployment Models. AWS global infrastructure. 2. Build your own VPC and launch a web server.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

	3. Introduction to Amazon EC2.			
III	**Cloud Computing Architecture and Management:** Cloud architecture - Layer - Anatomy of the Cloud - Network Connectivity in Cloud Computing - Applications, on the Cloud, Managing the Cloud Infrastructure - Managing the Cloud application - Migrating Application and approaches of Cloud - Cloud Migration -security. 4. Activity - AWS Lambda 5. Activity - AWS - Elastic Beanstalk	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
IV	**Cloud Service Models:** Infrastructure as a Service - Characteristics and suitability of IaaS- Pros and Cons of IaaS - Platform as a Service - Characteristics of PaaS - Suitability of PaaS, Pros and Cons of PaaS, Providers, Software as a Service - Characteristics and suitability of SaaS - Pros and Cons of SaaS - - Other Cloud Service Models. Network and content delivery - compute and storage., Amazon Elastic Compute Cloud, Amazon Simple Storage Service. 6.Working with EBS 7. Build a Database server.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
V	**Cloud Service Providers:** EMC, EMC IT, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Microsoft, Windows Azure, SharePoint, IBM, Cloud Models, IBM Smart Cloud, SAP Labs, SAP HANA Cloud Platform, Virtualization Services Provided by SAP, Sales force, Sales Cloud, Service Cloud: Knowledge as a Service, Rack space, VMware, Manjra soft, Aneka Platform. 1. Scaling and load balance the architecture 2. Find a procedure to transfer the files from one virtual machine to another virtual machine. 3. Install Hadoop single node cluster and run simple applications like wordcount.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6

Text Book
K. Chandrasekhran, "Essentials of cloud Computing", CRC press, Taylor & Francis Group, 2015.

Suggested Readings
1. RajkumarBuyya, James Broberg and Andrzej M. Goscinski "Cloud Computing: Principles and Paradigms", Wiley, 2015. 2. Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, "Distributed and Cloud Computing", Elsevier, 2014. 3. Tim Mather, SubraKumaraswamy, ShahedLatif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance", O'Reilly, SPD, 2015.

Web Resources
1. https://www.techtarget.com/searchcloudcomputing/definition/cloud-computing 2. https://www.acecloudhosting.com/blog/top-10-free-online-resources-to-learn-cloud-computing/ 3. https://tutorialsdojo.com/fundamentals-of-cloud-computing/

Course Outcomes (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO 1	To define and recognize the fundamentals of cloud computing	K1, K2
CO 2	To relate various services and ethics of cloud storage architectures	K3, K4
CO 3	To expertise diverse service provider models and entrepreneur the same.	K5, K6

Course Code	UCA4ME03
Course Title	**UI / UX Design Lab**
Credits	4
Hours/Week	4
Category	Major Elective (ME) – Practical
Semester	IV
Regulation	2024

Course Overview

1. To provide students with the knowledge of user -centered methods in graphic design on screens.
2. The students will be given exposure to wireframing and Prototyping software in the UI and UX Design tool.
3. Students will gain essential skills that are in high demand across industries
4. To understand how users interact with the design through surveys, interviews, and usability tests.

Course Objectives

1. To understand user experience and its process.
2. To understand the definition and principles of UI/UX Design.
3. To understand the various components, Tools and methods of UX.
4. To understand the relation between interaction design and user's expectations.

Prerequisites	Basic knowledge on design principles.

SYLLABUS				
Unit	Content	Hrs	COs	Cognitive Level
I	Introduction to UI and UX design: User Interface Vs. User Experience- Wireframe-Resolution- Existing UI kit- working with text- basic colors in wireframe- free icons-Adding footers- LoremIpsum- new pages- Artboards- Prototyping- adding interactivity- popup modal. **Exercises:** 1. To design a responsive layout for a societal application. 2. To explore various UI interaction patterns.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

II	Stylish UI Kit - Buttons- loading bars- Scrollbars-Fields-Rating-loading icons- tag icon-Search bars-Dropdown- Playback - Pagination- Picture Slider-Newsletter Sign up- Radial loading Bar- Pricing Table -Navigation bar - Radial Progress bars -Sliders- Log in, Rating- Newsletter Sign up- Tabs. **Exercises:** 3. To develop an Interface with Proper UI Style Guides. 4. To develop Wireflow diagram for application using figma 5. To apply the design thinking process for a new product.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
III	Group and symbol Navigation: Working with groups- Isolation mode- symbols usage- video navigation- repeat grids- Time saving- Navigation tricks- Video player. **Exercises:** 6. Brainstorming feature for proposed product 7. Defining the Look and Feel of the new Project.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
IV	Color Theory and Typography: Understanding the mood of your color palette- combining colors- Tools for designing color- color resources- Introduction to Typography - Type Origin and use- Serif type Family- Sans Serif type Family- Choosing Typography- Combining Fonts. **Exercises:** 8. Create a Sample Pattern Library for the product (Mood board, Fonts, Colors based on UI principles) 9. Sketch, design with popular tool and build a prototype and perform usability testing and identify improvements.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
V	UI and UX Design: Design for Mobile phone mockup -IOS and Android importance and differences -Mobile APP and website design-Placeholder content and plugins- Assest panel-Voice interactions -User Testing- Exporting. **Exercises:** 10. Create a mockup mobile UI screens for any mobile app. 11. Create a mockup web UI screens for any web application. 12. Create a portfolio for your mockup mobile	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6

		and web project.			

Text Books

1. Designing and Prototyping Interfaces with Figma, Packt Publishing, 2nd Edition, 2023.
2. Jesse James Garrett, "THE ELEMENTS of USER EXPERIENCE", PHI, 2011.

Suggested Readings

1. Shneiderman, Ben, and Catherine Plaisant , "Designing the User Interface: Strategies for

   Effective Human-Computer Interaction",4th ed.Addison Wesley, 2014.

2. Alan Cooper, Robar Riemann and Drave Cronin, About face 3, The essentials of interaction design, 2014.

Web Resources

1. https://bit.ly/3AJ9DIM

2. https://designcode.io/figma-handbook

3. https://uxdesign.cc/

4. https://www.figma.com/resource-library/design-basics/

5. https://designlab.com/figma-101-course/introduction-to-figma

Course Outcomes (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO 1	To understand the differences between usability and user Experience	K1, K2
CO 2	To evaluate professional efficiency in UI through a series of practical assignments.	K3, K4
CO 3	To create the industry-standard tools and specific project deliverables in UI/UX.	K5, K6

Course Code	UCA4ME04
Course Title	**BLOCKCHAIN TECHNOLOGY**
Credits	4
Hours/Week	4
Category	Major Elective (ME) – Theory
Semester	IV
Regulation	2024

COURSE OVERVIEW

1. Blockchain technology encompasses the fundamentals of cryptocurrency security.

2. The aim of the course is to introduce cryptocurrency and investigate its types.

3. The course explores smart contracts and applications.

4. It course highlights the different aspects of Blockchain Security.

COURSE OBJECTIVES

1. To understand crypto currencies and explore the uses of Blockchain

2. To be able to explain the different components involved in Blockchain.

3. To analyze the importance of crypto currency security.

4. To comprehend the risks involved in distributed ledger technology.

Prerequisites	Basic knowledge on cyber security.

SYLLABUS				
UNIT	**CONTENT**	**Hrs.**	**COs**	**COGNITIVE LEVEL**
I	Origin of Blockchain –Blockchain solution – Components of Blockchain– Block in a Blockchain – Technology and Future – Blockchain Types and Consensus Mechanism: Decentralization and Distribution – Types of Blockchain,	12	CO1 CO2 CO3	K1,K2,K3, K4,K5, K6
II	Cryptocurrency -Bitcoin, Altcoin and Token: Bitcoin and the Cryptocurrency – Cryptocurrency Basics – Types of Cryptocurrencies – Cryptocurrency usage – Public Blockchain System: Public Blockchain – The Bitcoin Blockchain.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
III	Smart Contracts: Smart Contract – Characteristics of Smart Contract – Types of	12	CO1 CO2	K1,K2,K3,

	Smart Contracts – Types of Oracles – Smart Contracts in Ethereum –Consortium Blockchain: Introduction –Key characteristics of consortium Blockchain-Hyper ledger Platform - Overview of Ripple -Overview of Corda.		CO3	K4,K5,K6
IV	Security in Blockchain: Security Aspects – Security and Privacy challenges – Performance and Scalability – Identity Management and Authentication- Regulatory Compliance and Assurance -Safeguarding Blockchain Smart Contract (DApp) -Security Aspects in Hyperledger Fabric.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
V	Applications of Blockchain: Blockchain in Banking - Finance – Education – Energy – Blockchain and IoT –Limitations and Challenges of Blockchain: Limitations-Challenges. Case Study: Retail -:Health care.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

Text Book

Chandramouli Subramanian, Asha A George, Abhilash K A and Meena Karthikeyan, "Blockchain Technology", Universities Press, 1st Edition, 2020.

Suggested readings

1. Kumar Saurabh, AshutoshSaxena "Blockchain Technology Concepts and Applications", Wiley, 1st Edition, 2020.

2. Don Tapscott, Alex Tapscott, "Blockchain Revolution" Paperback, 1st Edition, 2018.

Web Resources

1. https://www.javatpoint.com/blockchain-tutorial
2. https://www.tutorialspoint.com/blockchain/index.htm

Course Outcomes (Cos) and Cognitive Level Mapping

Cos	CO Description	COGNITIVE LEVEL
CO 1	To define and understand the concepts of cryptocurrency.	K1, K2
CO 2	To apply the different applications of Blockchain and analyse the smart contracts.	K3, K4
CO 3	To evaluate the security aspects of Blockchain and adopt the various structures of blockchain.	K5, K6

Course Code	UCA4AO01
Course Title	**POWER BI**
Credits	03
Hours/Week	05
Category	Allied Optional - Practical
Semester	IV
Regulation	2024

COURSE OVERVIEW

1. This course provides the knowledge of POWER BI components.

2. It focuses on data modeling and data formatting.

3. It aims to build analytics into data models.

4. It familiarizes on visualization and formatting the reports for publication.

COURSE OBJECTIVES

1. To get the skills in importing data, cleaning and formatting.

2. To establish relationships between tables and to embed business definitions into Data Analysis Expressions.

3. To get exposure in performance optimization through built-in functions.

4. To apply advance analytics and produce Custom Visuals.

Prerequisites	Basic knowledge in data representation and tabulation.

UNIT	CONTENT	HOURS	Cos	COGNITIVE LEVEL
I	Introduction to Power BI, Data loading &Transformation: Overview of PowerBI Components (PowerQuery, Power Pivot, Power View, Power Map), Installing and Setting up PowerBI Desktop, Understanding PowerBI Service and PowerBI ReportServer, Connecting to Data Sources(Excel,CSV,SQLServer,Web, APIs) 1. Importing and Cleaning Data in Power Query 2. Data Shaping and Transformation Techniques 3. Merging and Appending Queries 4. Handling Missing and Duplicate Data	15	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

	5. Data Profiling &Optimizing Queries			

II	Data Modeling & Relationships:
	
	Building a Power BI Data Model, Designing a multi fact data model, Implementing multi fact data model, Handling one-to-many and many-to-many relationships, Assigning Data formatting and categories, Configuring default summarization and sorting, Setting the visibility of columns and Tables, Embedding business definitions into DAX measures
	
	   1. Understanding Data Models in PowerBI
	   2. Creating Relationships between Tables
	   3. Star and Snowflake Schema Concepts
	   4. Using Calculated Columns and Measures
	   5. Introduction to DAX (DataAnalysis Expressions)
		15	CO1
			CO2
			CO3
				K1,K2,K3,
				
				K4,K5,K6

III	Advanced DAX Functions:
	
	Building analytics into data models with DAX, Integrating math and statistical analysis via DAX, Supporting virtual table relationships, Creating browsable model hierarchies and groups, Aggregate functions, Time Intelligence functions, Logical and conditional functions, Performance Optimization.
	
	   1. Basic vs. Aggregation DAX Functions
	   2. Time Intelligence Functions (YTD,MTD,QTD)
	   3. Logical & Conditional Functions (IF,SWITCH)
	   4. Filter and Row Contexts
	   5. Performance Optimization in DAX
		15	CO1
			CO2
			CO3
				K1,K2,K3,
				
				K4,K5,K6

IV	Data Visualization, Reports & Publishing:
	
	Authoring Power BI reports, Building rich and intuitive power BI reports, Crating table and Matrix visuals, Utilizing visualization types, Enhancing exploration of reports, Integrating card Visualization, Applying filters in different scopes, Formatting reports for publication, Deigning Mobile report layouts, Creating Power BI dashboards.
	
	   1. Preparing sales and margin report page.
	   2. Creating Bar, Line, Pie and Table Visuals
	   3. Waterfall chart for variance analysis
	   4. Conditional Formatting and Custom Tooltips
	   5. Designing Interactive Dashboards
	   6. Sharing Reports & Dashboards
		15	CO1
			CO2
			CO3
				K1,K2,K3,
				
				K4,K5,K6

V	PowerBI Advanced Features: Building a complete date dimension table, Preparing the date dimension via Query Editor, Authoring date intelligence metrics, Developing advanced date intelligence metrics, Implementing Dynamic User-Based visibility in Power BI, Designing Dynamic security models in Power BI, Applying advance analytics and Custom Visuals. 1. Date dimension planning and design 2. Add date intelligence column via join 3. Role playing date dimensions through calculated columns 4. Deploying security roles in Power BI 5. Clustered column chart, Line Chart, through Analytics pane measures. 6. Bullet chart custom visuals	15	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

Text Book

Microsoft PowerBI Cookbook, Dmitry Anoshin and Brett Powell, Packt Publishing, 2017.

Suggested Readings

1. Introducing Microsoft Power BI, Alberto Ferrari and Macro Russo, Microsoft press, 2016.
2. Collect, Transform and Combine Data using Power Query in Excel and Power BI, Gil Raviv, Microsoft press, 2019.
3. The Definitive Guide to DAX, Marco Russo, Alberto Ferrari, Kindle, 2nd Edition.

Web Resources

1. https://www.simplilearn.com/tutorials/excel-tutorial/power-query-in-excel
2. https://thetacdn.blob.core.windows.net/assets/2021:PowerBIGuides/Power%20BI%20for%Beginners%20 -%202020.pdf
3. https://learn.microsoft.com/en-us/power-bi/
4. https://community.powerbi.com/
5. https://dax.guide/
6. https://www.sqlbi.com/.

Course Outcomes (COs) and Cognitive Level Mapping

	POWER BI	COGNITIVE LEVEL
CO 1	To understand the Power BI components and data transformation from traditional data sources.	K1,K2
CO 2	To build data modeling and handling relationships.	K3,K4
CO 3	To perform data visualization and prepare reports.	K5,K6

Course Code	UCA4AO02
Course Title	WEB DEVELOPMENT LAB
Credits	3
Hours/Week	5
Category	Allied Optional - Practical
Semester	IV
Regulation	2024

Course Overview

1. Web Development course enables standard website design using HTML, CSS, JavaScript and Angular JS.

2. The aim of the course is to introduce planning and designing syntactically correct effective web pages.

3. JavaScript is commonly utilized on the client side to improve user experience and its associated capabilities is highlighted.

4. The different elements of the course explore the various page layout techniques, text formatting, graphics, images and producing a functional multi-page website.

Course Objectives

1. To develop dynamic web pages using HTML, CSS, JavaScript and Angular JS

2. . To explore various CSS style elements.

3. To obtain knowledge about Events, Objects and Forms in JavaScript.

4. To perform client side validation using JavaScript.

Prerequisites	Basic Knowledge of web pages.

<div align="center">SYLLABUS</div>

Unit	Content	Hrs	COs	Cognitive Level
I	Introduction to HTML- HTML5 - Headings Images-Using Images as Hyperlinks- and Horizontal Rules-Lists-Tables- Forms- Internal Linking-meta Elements. 1. Various text formatting tags. 2. Linking documents and images.	15	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

	3. Creation of frames, Targeting the named frames.			
	4. Creation of Lists.			
	5. Table tags.			
	6. Form elements.			
	7. Develop a website for Student details(personal and Academic) using HTML.			
II	Introduction to Cascading Style Sheets: Inline Styles - Embedded Style Sheets-Linking External Style Sheets. 8. Internal CSS with the style elements. 9. Inline CSS with style elements. 10. External CSS with style elements. 11. Update Student details web page with CSS.	15	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
III	JavaScript: Introduction to Scripting-Decision Making: Equality and Relational Operators Assignment Operators- Increment and Decrement Operators- Control Statements - Functions- Arrays. 12. Simple programs (Arithmetic operations) 13. Working with arrays. 14. User defined functions 15. Update Student website by applying functions.	15	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
IV	JavaScript: Events Objects - Forms. 16. Popup boxes. 17. Objects. 18. Validation of Forms. 19. Update Student details website with Objects and forms.	15	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
V	Introduction to Angular: Typescript: Built-in Types – Classes – Utilities – Working with Angular CLI – Building Blocks of Angular: Modules – Components – Templates – Metadata – Data Binding – Directives. 20. Using Command Line Interface to create new Application. 21. Create navigation from one page to another Page. 22. Develop a simple web page for Employees using Angular.	15	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6

Text Books

1. Paul Deitel , Harvey Deitel, Abbey Deitel, Internet & World Wide Web, how to Program, Pearson International, Revised fifth edition, April 2018.

2. Nathan Murray, Felipe Coury, Ari Lerner and Carlos Taborda, ng-book: The Complete Guide to Angular, Fullstack.io, 2018.

Suggested Readings

1. Robin Nixon, Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating Dynamic Websites, O'Reilly Media ,3 edition, 2018.

2. Sergey Akopkokhyants, Stephen Radford· Web Development with Bootstrap 4 and Angular Packt Publishing, 2016.

3. Sridhar Rao Chivukula, Aki Iskandar, Web Development with Angular and Bootstrap, Packt Publishing, 3rd Edition, 2019.

Web Resources

1. https://www.youtube.com/watch?v=YP2Y-Rebtl4

2. https://www.youtube.com/watch?v=BI2BsmDvIyM

3. https://www.youtube.com/watch?v=-BynRAhw0UE

4. https://www.youtube.com/watch?v=v0IgI8vYD_

Course Outcomes (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO 1	To understand the use of HTML tags and JavaScript programming principles and techniques.	K1, K2
CO 2	To illustrate the use of HTML and CSS in designing a web page and analyze the aesthetics of design.	K3, K4
CO 3	To evaluate the techniques behind responsive web design and to develop a dynamic and functional complete website.	K5, K6

Course Code	UCA4CD01
Course Title	Web Design
Credits	02
Hours/Week	03
Category	NME - Practical
Semester	IV
Regulation	2024

Course Overview

1. Web design introduces basic concepts of internet and web design using HTML and CSS

2. The aim of the course is to introduce planning and designing effective web pages.

3. The different elements of the course explore the various page layout techniques, text formatting, graphics and images

4. This course also focuses on the developing web elements that can be incorporated in the web pages and hosting the web pages.

Course Objectives

1. To understand the principles of creating an effective web page.

2. To recognize and learn the techniques of web design using HTML and CSS

3. To develop aesthetic web pages using various design principles.

4. To apply the learned techniques and develop websites using various software tools.

Prerequisites	Basic Knowledge of technology

SYLLABUS

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	HTML5 Fundamentals: Basic Elements of HTML: Introduction to HTML tags for creating the structure of web pages. Formatting Text: Applying basic text formatting using HTML tags. 1. Various tags in HTML 2. Text formatting tags in HTML.	9	CO1, CO2, CO3	K1, K2, K3

II	Organizing Content: Using lists and headings to organize content. HTML Tables: Structuring data using HTML tables for better presentation and Organization. 3. Creating different types of list 4. Creating tables with different attributes.	9	CO1, CO2, CO3	K3, K4
III	Creating Links: Making hyperlinks to connect web pages. Adding Images: Inserting images onto web pages and understanding image formats. Colors and Styling: Applying colors and basic styles to web elements. 5.Creating different types of hyperlinks 6.Images in web pages	9	CO1, CO2, CO3	K4, K5
IV	Introduction to CSS: Understanding the role of Cascading Style Sheets in styling web pages. 7.Apply inline styles in HTML page 8. Apply internal styles in HTML page 9. Apply external styles in HTML page.	9	CO1, CO2, CO3	K5, K6
V	Introduction to Web Publishing or Hosting - Creating the Web Site - Saving the site - Working on the web site - Creating web site structure - Creating Titles for web pages - Themes-Publishing web sites. 10.Creating websites 11.Publishing the web pages	9	CO1, CO2, CO3	K5, K6

Text Books

1. Duckett, J. (2011). Beginning HTML, XHTML, CSS, and JavaScript. Germany: Wiley.
2. HTML 5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, AJAX, PHP and jQuery, 2ed, Dreamtech Press, 2016

Suggested Readings

1. Misra, A., Kumar Singh, A. (2011). Introduction to Web Technology. India: Laxmi Publications.
2. York, R., Pouncey, I. (2011). Beginning CSS: Cascading Style Sheets for Web Design. Ukraine: Wiley.

Web Resources

1. https://www.w3schools.com/html/
2. https://www.codecademy.com/learn/learn-html

COURSE OUTCOMES (COs)

Web Design		Cognitive level
CO1	To identify and discuss the different web designing techniques.	**K1, K2**
CO2	To illustrate and apply web pages using HTML and CSS.	**K3, K4**
CO3	To evaluate and publish the web pages.	**K5, K6**

Course Code	UCA5MC01
Course Title	**PHP AND MYSQL**
Credits	4
Hours/Week	4
Category	Major Core - Theory
Semester	V
Regulation	2024

Course Overview

1. PHP is a widely-used free, open source and server side scripting language for web development.
2. MYSQL is a free and open source popular RDBMS to store and access data.
3. This course helps in understanding the PHP and MYSQL connectivity and Database accessibility
4. This also gives in-depth knowledge of developing dynamic web page and real time web application using PHP and MYSQL.

Course Objectives

1. To understand the overview of web development.
2. To learn the basics of PHP and MYSQL.
3. To understand the concept of database management and accessibility.
4. To enable the students to develop dynamic web pages and real time applications.

Prerequisites	Basic Knowledge of HTML5, CSS, Database functionality.

SYLLABUS				
Unit	Content	Hrs	COs	Cognitive Level
I	Introduction to Dynamic web content - HTTP –HTML -Benefits of PHP, MySQL, Introduction to CSS, HTML5, Apache Web Server –XAMP – Introduction to PHP : Incorporating PHP within HTML – The structure of PHP - Expressions and Control Flow in PHP : Expressions – operators – conditionals – looping – Casting – PHP Dynamic Linking .	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
II	PHP functions and objects: PHP functions – Including and Requiring Files.Declaring a class – Objects: creating – accessing – cloning. Constructors – PHP Destructors – writing methods – Declaring: properties, constants – Static properties and methods –	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

	Inheritance.			
III	PHP Arrays: Basic Access – for each…as loop – Multidimensional arrays – Array Functions. Practical PHP: Using Printf – Date and Time Functions. – File handling functions: create-read – copy – move – delete- update- upload.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
IV	My SQL basics – MY SQL commands - Data Types – Working with tables –Indexes- Querying a MYSQL Data base – Joins – subqueries –backup and restore - Accessing MYSQL using PHP –Querying a MySQL Database with PHP - Preventing SQL injection – using placeholders.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
V	Form Handling: Building forms – retrieving submitted data – input types – Cookies: setting, accessing, destroying. – HTTP Authentication – Sessions: starting – ending – setting timeout – security. Developing dynamic web pages and real time applications using PHP and MYSQL.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

Text Books

1. Robin Nixon," Learning PHP, MySQL JavaScript, CSS & HTML5",A step by step guide to creating Dynamic Websites.3rd Edition, O'Reilly, 2014.
2. Kogent Learning Solutions Inc., "HTML5 BLACK BOOK:COVERS CSS3, JAVASCRIPT, XML, XHTML, AJAX, PHP AND JQUERY", Wiley India Pvt. Limited, July 2011, ISBN:9789350040959, 9350040956.

3. VaswaniVikram,"The Complete reference MYSQL", McGraw Hill Education India, ISBN: 9780070586840, 9780070586840.

Suggested Readings

1. VikramVaswani, How to do everything with PHP and MySQL, 1st Edition, Tata McGraw Hill, 2005.

2. VikramVaswani, A beginner's guide PHP, 1st Edition, McGraw Hill Education, 2017.

3. Luke Welling, PHP and MySQL web development, 5th Edition, Pearson Education, 2017.

4. Steven Holzner,The Complete Reference, PHP, McGrawHill Education, 2017.

Web Resources

1. https://www.w3schools.com/php/default.asp
2. https://www.udemy.com/course/php_mysql_tutorial/
3. https://www.php.net/docs.php
4. https://www.guvi.in/courses/tamil/web-development/php/

Course Outcomes (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO 1	To observe and understand the structure of PHP, Control Flow, functions, arrays, object oriented programming concepts in PHP and database creation using MYSQL.	K1, K2
CO 2	To implement programming techniques in PHP and queries in MYSQL and Database connectivity and accessibility	K3, K4
CO 3	To analyze file handling, cookies, sessions and database management and develop dynamic web pages and applications	K5, K6

Course Code	UCA5MC02
Course Title	PHP AND MYSQL LAB
Credits	4
Hours/Week	4
Category	Major Core - Practical
Semester	V
Regulation	2024

Course Overview

1. PHP is a widely-used free, open source and server side scripting language for web development.
2. MYSQL is a free and open source popular RDBMS to store and access data.
3. This course helps in understanding the PHP and MYSQL connectivity and Database accessibility
4. This also gives in-depth knowledge of developing dynamic web page and real time web application using PHP and MYSQL.

Course Objectives

1. To understand the overview of web development.
2. To learn the basics of PHP and MYSQL.
3. To understand the concept of database management and accessibility.
4. To enable the students to develop dynamic web pages and real time applications.

Prerequisites	Basic Knowledge of HTML, CSS, Database functionality.

SYLLABUS				
Unit	Content	Hrs	COs	Cognitive Level
I	1. To implement conditional statements. 2. Looping statements 3. User defined functions	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
II	4. Implementing class and object 5. Constructor and destructor 6. Class and Object 7. Implementing Inheritance 8. Implementing the Array concepts	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

III	9. Built in functions 10. File handling 11. Working with simple HTML5 programs 12. Designing page using HTML5	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
IV	13. Working with DDL commands using constraints in MYSQL. 14. Working with DML commands in MYSQL. 15. Implementing encryption functions. 16. Working with joins and subqueries. 17. Database connectivity between PHP and MYSQL and executing simple queries.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
V	18. Designing forms 19. Working with Sessions 20. Implementing Cookies	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6

Text Books
1. Robin Nixon," Learning PHP, MySQL JavaScript, CSS & HTML5",A step by step guide to creating Dynamic Websites.3rd Edition, O'Reilly, 2014.
2. Kogent Learning Solutions Inc., "HTML5 BLACK BOOK:COVERS CSS3,JAVASCRIPT,XML,XHTML,AJAX,PHP AND JQUERY", Wiley India Pvt. Limited, July 2011, ISBN:9789350040959, 9350040956.
3. VaswaniVikram,"The Complete reference MYSQL", McGraw Hill Education India, ISBN: 9780070586840, 9780070586840.

Suggested Readings

1. VikramVaswani, How to do everything with PHP and MySQL, 1st Edition, Tata McGraw Hill, 2005.

2. VikramVaswani, A beginner's guide PHP, 1st Edition, McGraw Hill Education, 2017.

3. Luke Welling, PHP and MySQL web development, 5th Edition, Pearson Education, 2017.

4.StevenHolzner,The Complete Reference, PHP,McGrawHill Education..2017

Web Resources

1. https://www.w3schools.com/php/default.asp
2. https://www.udemy.com/course/php_mysql_tutorial/
3. https://www.php.net/docs.php
4. https://www.guvi.in/courses/tamil/web-development/php/

Course Outcomes (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO 1	To observe and understand the structure of PHP, Control Flow, functions, arrays, object oriented programming concepts in PHP and database creation using MYSQL.	K1, K2
CO 2	To implement programming techniques in PHP and queries in MYSQL and Database connectivity and accessibility.	K3, K4
CO 3	To analyze file handling, cookies, sessions and database management and develop dynamic web pages and applications.	K5, K6

Course Code	UCA5MC03
Course Title	**FULL STACK WEB DEVELOPMENT LAB**
Credits	6
Hours/Week	6
Category	Major Core - Practical
Semester	V
Regulation	2024

Course Overview

1. Full Stack Web Development is a foundational course designed to provide students with a basic understanding of web development.
2. The course covers essential front-end technologies like HTML, CSS, and JavaScript, and introduces students to basic back-end development using Node.js and Express.
3. Students will also learn how to work with databases using MongoDB and will gain experience in building simple, functional web applications.
4. The different elements of the course explore the various web designing techniques.

Course Objectives

1. To understand the basics of front-end web development, including HTML, CSS, and JavaScript.
2. To learn the fundamental concepts of back-end development using Node.js.
3. To get introduced to database management using MongoDB.
4. To build basic web applications combining front-end and back-end technologies.

Prerequisites	Basic programming skills.

SYLLABUS				
Unit	Content	Hrs	COs	Cognitive Level
I	Introduction to HTML & CSS: HTML: Structure of an HTML document, Basic tags (headings, paragraphs, links, images, forms) - CSS: Basic styling, Selectors, Colors, Fonts, Margins, Padding, and Borders - Introduction to CSS Flexbox for simple layouts. 1. Create a basic webpage using HTML and style it with CSS. 2. Build a simple contact form with HTML and CSS. 3. Use CSS Flexbox to create a responsive layout.	18	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

II	Introduction to JavaScript: Variables, Data Types, Operators, Functions, Loops, Events - Basic DOM Manipulation: Selecting elements, changing content, handling events - Simple form validation using JavaScript. 1. Create a simple JavaScript programs. 2. Implement form validation using JavaScript. 3. Build a application with basic DOM manipulation.	18	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
III	Introduction to Node.js: Setting up Node.js environment - Basic server creation using Node.js - Introduction to the Express framework: Handling requests and responses - Serving static files with Express. 1. Set up a Node.js server that serves a simple page. 2. Create an Express-based server to handle basic GET and POST requests. 3. Serve static HTML and CSS files using Express.	18	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
IV	Introduction to MongoDB: Setting up basic CRUD operations - Connecting a Node.js application to a MongoDB database - Basic schema design and validation. 1. Set up MongoDB and perform basic CRUD operations through the MongoDB shell. 2. Connect a Node.js application to MongoDB and perform CRUD operations. 3. Design a simple schema for a user registration system.	18	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
V	Building a Simple Web Application: Simple authentication: Register and login functionality - Basic error handling and form validation - Deploying the application locally. 1. Create a simple Web application using Node.js, Express, and MongoDB. 2. Implement form validation and error handling in the web application. 3. Deploy the application on a local server and test its functionality.	18	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

Text Books

1. Laura Lemay, Rafe Colburn, Jennifer Kyrnin, Mastering HTML, CSS & JavaScript Web Publishing, BPB Publications, First Edition, 2016.
2. ShamaHoque, Full-Stack React Projects, Packt, Second Edition, 2020.

Suggested Readings

1. Chris Northwood, The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer, Apress Publications, First Edition, 2018.
2. John Duckett, HTML and CSS: Design and Build Webs, Wiley, First Edition, 2011.
3. Kristina Chodorow, MongoDB: The Definitive Guide, O'Reilly Media, Third Edition, 2019.

Web Resources

1. https://www.w3schools.com/whatis/whatis_fullstack.asp
2. https://www.freecodecamp.org/news/tag/full-stack/
3. https://developer.mozilla.org/en-US/
4. https://nodejs.org/en/docs/
5. https://docs.mongodb.com/

Course Outcomes (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO 1	To describe and understand the basic concepts in HTML, CSS, and JavaScript.	K1, K2
CO 2	To apply and analyze HTML, CSS, and JavaScript effectively to create interactive and dynamic websites.	K3, K4
CO 3	To create and evaluate a full-stack web application.	K5, K6

Course Code	UCA5MC04
Course Title	**OPERATING SYSTEM**
Credits	4
Hours/Week	4
Category	Major Core - theory
Semester	V
Regulation	2024

Course Overview

1. This course describes the major services, structures, and components of Operating Systems.
2. This course explains Process management, Memory management, Input Output Devices and file management, Resource Management and Communication.
3. It illustrates various memory management techniques and algorithms.
4. It covers essential concepts such as semaphores and cooperating sequential processes.

Course Objectives

1. To gain knowledge about the operating system and various services provided by it.
2. To acquire basic knowledge of process management with scheduling, and deadlock concepts.
3. To explore various memory allocation methods and free space management.
4. To focus on Input and Output device structures.

Prerequisites	Basics of computer organizations.

SYLLABUS				
Unit	Content	Hrs	COs	Cognitive Level
I	Introduction: OS Structure - Components – Services – system calls -Virtual Machines. Process Management: Introduction - Process - Process Scheduling – Operations on processes -Cooperating Process-Inter process communication.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
II	CPU Scheduling: CPU Schedulers - Scheduling Criteria - Scheduling Algorithms. Process Synchronization: Critical Section Problem – Semaphores. Deadlocks: Characterization - Methods for Handling Deadlocks – Deadlock Prevention - Avoidance - Detection - Recovery. Case study: Linux- Scheduling Algorithms.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
	Memory Management: Introduction - Dynamic Loading and Linking – Overlays - Logical and Physical Address	12	CO1	K1, K2, K3,

III	Space – swapping - Contiguous Allocation - Internal and External Fragmentation. Non-Contiguous Allocation: Paging and Segmentation Schemes.		CO2 CO3	K4, K5, K6
IV	Virtual Memory: Demand Paging - Page Replacement - Page Replacement Algorithms. File System: Introduction - File Concepts - Access Methods - Directory Structures – Protection. Case Study: Windows- Memory Management.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
V	File System Structures - Allocation Methods - Free Space Management. Disk Structure – Disk Scheduling. Multicore Operating Systems- Virtualization.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6

Text Books

1. Silberschatz Abraham, Galvin Baer Peter and Gagne Greg, "Operating System Concepts", 9th edition.2013.
2. Tanenbaum S. Andrew, "Modern Operating Systems", Third Edition, Prentice-Hall Inc, 2008.

Suggested Readings

1. Shayan Roy, 'Operating System for Beginners',Kindle edition, 2016.
2. Stallings William, "Operating Systems", Ninth Edition, Pearson Education, 2019.

Web Resources

1. https://codex.cs.yale.edu/avi/courses/CS-423/slides/index.html
2. https://www.cs.ccu.edu.tw/~pahsiung/courses/os/notes/slides.html
3. http://fivedots.coe.psu.ac.th/~cj/os/slides/slide-ppt.html
4. https://www.tutorialspoint.com/operating_system/index.htm

Course Outcomes (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO 1	To identify and understand the main components and services of Operating Systems.	K1, K2
CO 2	To explain the process, memory, file management and various scheduling algorithms and analyze various issues in Inter Process Communication (IPC) and their solutions.	K3, K4
CO 3	To evaluate the Memory management algorithms, allocation methods and to justify various algorithms used in different Operating Systems.	K5, K6

Course Code	UCA5MC05
Course Title	**SOFTWARE ENGINEERING**
Credits	4
Hours/Week	4
Category	Major Core - Theory
Semester	V
Regulation	2024

Course Overview

1. Analyze and model customer's requirements and with suitable model its software design.
2. Estimate cost and efforts required in building software.
3. Analyze and compute impact of various risks involved in software development.
4. Design and build test cases, and to perform software testing.

Course Objectives

1. To understand the significance of various process models.
2. To familiarize on Software Requirement specification, data modeling concepts, and design process..
3. To understand the importance of software quality aspects and software risks.
4. To analyze testing fundamentals, test cases and testing strategies.

Prerequisites	Basic knowledge in software development process

SYLLABUS				
Unit	Content	Hrs	COs	Cognitive Level
I	Software Engineering - A Layered Approach; Software Process – Framework, Umbrella Activities-Process Models – Waterfall Model, Incremental Model-Evolutionary Prototyping model-Spiral Model. Introduction to Agile – Agility Principles, Agile Model – Scrum.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
II	Human aspects of software engineering: The Software team-Core principles- Requirment engineering: Eliciting requirements- Requirment analysis-Creating use case-Writing formal use case.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
III	Design Concepts: The Design Process-Architectural design-software Architecture-Componentlevel design-Cohesion -Coupling-User Interface design-Design issues-Pattern based design-Mobileapp design.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6

IV	Quality Concepts-Software Quality-MCcall'sQualityFactors-Risks-ReviewTechniques-AnalyzingMetrics-Formal Technical review-Software Quality Assurance-SQA tasks-Software safety- ISO 9000 Qualtiy standard-SQA Plan,	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
V	Software Testing Strategies: Testing Fundamentals Black-Box and White Box Testing-Testing object oriented applications-web applications-mobile applications-security engineering- Software Configuration management. **Case study**: Ticket Reservation System.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6

Text Books

1. Roger Pressman, Bruce Maxim,Software Engineering: A Practitioner's Approach, 9th edition. Tata McGrawHill, 2023.
2. K.K Aggarwal, Yogesh Singh Software Engineering, 4th Edition, New Age International Publishers, 2023.

Suggested Readings

1. Richard Fairley, "Software Engineering Concepts", McGraw-Hill, 2014.

2. Rajib Mall." Fundamentals of Software Engineering", PHI, 2018.

3. Sommerville, Software Engineering. 10th edition. Addison Wesley, 2019.

Web Resources

1.http://www.javapoint.com

2.http://www.tuorialpoints.com

3.http://www.guru99.com

Course Outcomes (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO1	To identify and understand various software processing models and requirement engineering.	K1, K2
CO2	To determine the requirements and design the process.	K3, K4
CO3	To analyze project estimation, software quality and software testing	K5, K6

Course Code	UCA5ME01
Course Title	**ROBOTIC PROCESS AUTOMATION LAB**
Credits	4
Hours/Week	4
Category	Major Elective (ME) - Practical
Semester	V
Regulation	2024

Course Overview

1. This course provides the basic concepts of Robotic Process Automation.
2. It helps to familiarize the RPA tools and domains that are most relevant in the industry.
3. It explores the various options/tools available in UiPath Studio.
4. It facilitates the creation of Assistant Bots.

Course Objectives

1. To understand the fundamentals of Robotic Process Automation.
2. To offer comprehensive knowledge on developing software robots.
3. To explore the challenges and risks when implementing RPA.
4. To familiarize the creation of bots and implement simple bots.

Prerequisites	Basic Knowledge in Programming.

SYLLABUS				
Unit	**Content**	**Hrs**	**COs**	**Cognitive Level**
I	Scope and techniques of automation – Robotic Process Automation – Components of RPA – RPA platforms – About UIPath – Learning UIPath Studio- Sequence. 1.Using sequence 2.Accepting the input and display in a messagebox	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
II	Activities – Using activities with workflows – Control flow – Assign, Delay, Break, while, do while, for each, if, switch activity – Data manipulation – Variables and scope, Data table usage with examples.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

	3.Implementing activities with workflows (Assign, delay, break) 4. Implementing activities with workflows (while, do while, if ,switch)			
III	Data collection – Variables and scope -collections – Arguments – Data table usage. 5.Building a data table 6.Reading an excel file and creating a data table by using data from Excel.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
IV	Taking control of the controls – Finding and attaching windows – Finding the control – Act on controls – mouse and keyboard activities – Working with UIExplorer – Handling events – Screen scraping. 7.Implementing the attach window activity 8.Mouse and keyboard activities 9.Screen scraping	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
V	Handling user events and assistant bots – monitoring system event triggers – launching an assistant bot on a keyboard event – Exception handling – common exceptions and ways to handle them – Debugging techniques – Error reporting. 10. Creating assistant bots. 11. Monitoring image and element triggers.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6

Text Book
Alok Mani Tripathi, 2018. Learning Robotic Process Automation, 1st Edition, Packt Publishers.

Suggested Readings

1. Tom Taulli, 2020. The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems,O'Reilly.

2. GerardusBlokdyk, 2020. Robotic Process Automation RPA – A complete guide, Kindle edition.

3. NandanMullakara, Arun Kumar Asokan , 2020. Robotic Process Automation Projects, Packt Publishing.

Web Resources

1. https://www.automationanywhere.com/rpa/robotic-process-automation
2. https://enterprisersproject.com/article/2019/5/rpa-robotic-process-automation-how-explain
3. https://www.cio.com/article/227908/what-is-rpa-robotic-process-automation-explained.html

Course Outcomes (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO 1	To understand the fundamentals of automation.	K1, K2
CO 2	To analyze and interpret an RPA implementation plan.	K3, K4
CO 3	To develop the competence to design a software robot.	K5, K6

Course Code	UCA5ME02
Course Title	INTRODUCTION TO BIG DATA
Credits	4
Hours/Week	4
Category	Major Elective - Practical
Semester	V
Regulation	2024

Course Overview

1. Understand the fundamental concepts of Big Data analytics
2. Provide concepts and interfacing with HDFS and Map Reduce
3. Explores SPARK programming and its ecosystem
4. Apply SPARK analytics on structured and unstructured data
5. Explore data analytics with machine learning algorithm using SPARK

Course Objectives

1. To understand forecasting methods used in business applications
2. To develop dynamic RDD spark programming using different datasets
3. To effectively build Model using Machine Learning Algorithms to analysis in Big data

Prerequisites	Basic programming language

SYLLABUS				
Unit	**Content**	**Hrs**	**COs**	**Cognitive Level**
I	**Introduction to Big Data and Hadoop** Introduction- Big Data and its importance- Sources of Big Data – Characteristics of Big Data – Big Data Analytics – Understanding Big Data storage- Big Data Applications, Hadoop Distributed File System – Map Reduce Paradigm-Hadoop Ecosystem **Exercise:** 1. Hadoop word count 2. Map Reduce in Hadoop	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
II	**Spark Programming with Python** Introduction to Spark Apache – Spark Eco System-Loading and Storing Data – Transformations – Actions – Key-Value -Resilient Distributed Datasets- Local Variables – Broadcast Variables – Accumulators – Partitioning – Persistence.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

	Exercise: 3.Program involving Local Variables, Broadcast Variables and Accumulators 4.Program involving Resilient Distributed Datasets 5. Program involving Transformations and Actions 6.Program involving Key-Value Resilient Distributed Datasets			
III	**Spark SQL** Overview of Spark SQL – Spark Session Data Frames – Schema of a Data Frame Operations supported by Data Frames – Filter, Join, GroupBy, Aggregate operations – Nesting the Operations – Temporary Tables – Viewing and Querying Temporary Tables. **Exercise:** 7. Program involving Filter, Join, Group By, Aggregate operations 8. Viewing and Querying Temporary Tables	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
IV	**Spark Streaming** Use Cases for Real time Analytics – Transferring, Summarizing, Analyzing Real time data – Data Sources supported by Spark Streaming – Flat files, TCP/IP – Flume – Kafka – Kinesis – Streaming Context – DStreams operations. **Exercise:** 9. Transferring,Summarizing and Analysing Twitter data 10. Program involving Flume, Kafka and Kinesis 11. Program involving DStreams and Dstream RDDs	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
V	**Machine Learning with Spark** Linear Regression–Decision Tree Classification–Principal Component Analysis – Random Forest Classification– Text Pre-processing with TF-IDF – Naïve Bayes Classification – K-Means Clustering – Recommendation Engines. **Exercise:** 12.Program using Decision Tree classification 13.Program using Random Forest classification 14.Program for Naïve Bayes classification 15.Program for K means clustering	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6

Text Books

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007. 2. Tom

2. White " Hadoop: The Definitive Guide" Third Edition, O"reilly Media, 2011
3. Tomasz Drabos, "Learning PySpark", PACKT, 2017.

Suggested Readings

1. Padma Priya Chitturi, "Apache Spark for Data Science", PACKT, 2017.
2. Holden Karau, " Learning Spark". PACKT, 2016.
3. Sandy Riza, "Advanced Analytics with Spark", O' Reilly, 2016.
4. Romeo Kienzler, "Mastering Apache Spark", PACKT, 2017.

Web Resources

1. https://spark.apache.org/
2. https://databricks.com/

Course Outcomes (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO 1	To remember and understand the SPARK Programming concepts	K1, K2
CO 2	To apply Algorithm constructs to implement RDD and SQL concepts.	K3, K4
CO 3	To construct solutions to resolve various real-world problems.	K5, K6

Course Code	UCA5RC01
Course Title	RESEARCH METHODOLOGY
Credits	4
Hours/Week	4
Category	RC – Theory
Semester	V
Regulation	2024

Course Overview

1. This course introduces the basic concepts of research.

2. It deals with research design and various types of research.

3. This course provides the systematic approach to the design and formulation of research proposal.

4. It also focuses on the ethical issues in research.

Course Objectives

1. To familiarize the fundamentals of research.

2. To understand the concepts of research design.

3. To explore the methodologies for writing a research report and thesis.

4. To describe the ethical issues in educational research.

Prerequisites	Basic Knowledge in research.

SYLLABUS				
Unit	**Content**	**Hrs**	**COs**	**Cognitive Level**
I	Research Methodology Introduction- Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Research Process, Criteria of Good Research.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

II	Defining the Research Problem - selecting the problem - necessity of defining the problem- technique involved in defining a problem – Research design, meaning of research design – Features of a good design- important concepts relating to research design – Different research designs-basic principles of experimental design.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
III	Writing a Paper – The scope of a paper – Organization – the first draft – From draft to Submission – Co-authoring – A "writing Up" Check list – Other Professional Writing – Scoping the task – Understanding the task- Documentation – Technical Reports – Grant Applications – Non Technical Writing – Structuring a Report – Style – Other Problem area –A "Professional Writing" Checklist.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
IV	Presentations – Research talks – Contents – Organization – The Introduction – The Conclusion – Preparation – Delivery – Question Time – slides – Text on Slides – posters – A "Presentations and Posters" Checklist - Writing a research proposal – contents of a research proposal- preamble/introduction – the research problem – objectives of the study – hypothesis to be tested – study design measurement procedures – sampling analysis of data – structure of the report – problems and limitations-work schedule.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
V	Ethics – Intellectual creations – plagiarism – self-plagiarism – misrepresentation – authorship – confidentiality and conflict of interest – an ethics checklist-case study- Quantitative Research on social problems- preparation of white paper.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6

Text Books
1. Kothari, C.R., Gaurav Garg, Research Methodology: Methods and Techniques. New Age International. Publishers, Fourth edition 2019.- unit 1 & 2.

2. Ranjith Kumar, Research Methodology a step-by-step guide for beginners-SAGE publications - Vth edition – 2019- Unit 4
3. Justin Zobel, Writing For Computer Science, Springer -Third Edition 2014.- Unit3, Unit 4, Unit-5.

Suggested Readings

1. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International Publishers (Second revised edition)
2. R. PaneerSelvam (2014), Research Methodology, 4/e. Prentice Hall India Learning Private Limited.
3. C. George Thomas, Research Methodology and scientific writing – AneBooks , Second International Edition- 2015.

Web Resources

1. https://www.ugc.ac.in/e-book/ UGC_ GARP_ 2020_ Good%20 Academic%20Research%20 Practices.
2. https://www.ccmb.res.in/newsfiles/year-2020/csir_ethics_2020.pdf

Course Outcomes (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO 1	To recognize and understand the significance of research.	K1, K2
CO 2	To employ and analyze the concepts in research design	K3, K4
CO 3	To adapt ethics and appropriate methodologies in research	K5, K6

Course Code	UCA6MS01
Course Title	**Mobile App Development**
Credits	4
Hours/Week	5
Category	Major Skill - Theory
Semester	VI
Regulation	2024

Course Overview

1. This course introduces programming techniques, design and development related to mobile applications.
2. It familiarizes various concepts of mobile programming across platforms.
3. It also utilizes rapid prototyping techniques to design and develop sophisticated mobile interfaces.
4. This course gives practical knowledge to develop and deploy Android applications.

Course Objectives

1. To understand the basics of the Android platform.

2. To acquire knowledge on user interface design to develop frameworks.

3. To develop skills in creating drawables and animation.

4. To implement the Android platform with a database.

Prerequisites	Knowledge on JAVA Programming.

SYLLABUS				
Unit	Content	Hrs	COs	Cognitive Level
I	Getting started with Android programming – Android versions – Features – Architecture of Android – Android devices in the market – Android studio – Android SDK – Creating Android Virtual Devices (AVD's) – Using Android studio for Development – Exploring the IDE - Using code completion – Debugging application – Setting break points – Navigating Paused Code – Publishing application. ACTIVITIES – Understanding Activities – Applying Styles and themes to an Activity – Hiding the Activity Title – Displaying a Dialog Window – Displaying a Progress Dialog – Linking Activities using Intents.	15	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

II	FRAGMENTS – Adding fragments Dynamically – Life cycle of a fragment – Interactions between fragments – Understanding the Intent object – Using Intent Filters – ANDROID USER INTERFACE – Components of a screen – Views and View groups – FrameLayout – Linear Layout Horizontal and Vertical TableLayout – RelativeLayout – FrameLayout – ScrollView – Managing changes to screen orientation- Utilizing the action bar – DESIGNING YOUR INTERFACE WITH VIEWS – Using basic Views – TextView – Button, ImageButton, EditText, Checkbox, ToggleButton, RadioButton and RadioGroup Views, ProgressBar View, AutoComplete TextView – Using Picker Views – Using List Views.	15	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
III	DISPLAYING PICTURES AND MENUS WITH VIEWS – ImageView – ImageSwitcher – GridView – Using Menus – Options Menu, Context Menu – WebView – DATA PERSISTENCE – Persisting Data to Files- Saving to Internal Storage- Saving to External Storage (SD Card) – Choosing the Best Storage Option – Creating and Using Databases – Creating the DBAdapter helper class – Using the data Programmatically.	15	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
IV	CONTENT PROVIDERS – Sharing data in Android – Using a Content Provider – Predefined Query String Constants – Projections – Filtering – Sorting – Creating your own content providers – Using the content provider – MESSAGING – Sending SMS messages programmatically - – Sending SMS messages using Intent – Receiving SMS Messages – Caveats and Warnings – Sending Email.	15	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
V	LOCATION BASED SERVICES – Displaying Maps – Creating the project – Obtaining the Maps API Key – Displaying the Map – Displaying the Zoom Control – Changing Views – Navigating to a specific Location – Getting the Location that was Touched – Geocoding and Reverse Geocoding – Getting Location Data – Monitoring a Location- NETWORKING – Consuming Web services using HTTP – Downloading Binary Data – Downloading Text Content – Accessing Web Services using the GET method – Consuming JSON Services.	15	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6

Text Book
 J. F. DiMarzio, Beginning Android Programming with Android Studio, John Wiley & Sons, Inc., Fourth Edition, 2017.

Suggested Readings

1. Chris Stewart, Brian Hardy and Kristin Marsicano, Android Programming: The Big Nerd Ranch Guide by Bill Phillips, Big Nerd Ranch, LLC., First Edition, 2015.
2. J. F. DiMarzio, Android A Programmer's Guide, The McGraw-Hill Companies, 2008.
3. Neil Smyth , Android Studio 2.3 Development Essentials – Android 7, Payload Media, Inc.,2017

Web Resources

1. http://developer.android.com/guide/index.html
2. https://www.javatpoint.com/android-tutorial
3. https://www.tutorialspoint.com/android

Course Outcomes (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO 1	To enumerate and understand the concepts of JAVA and DVM platform.	K1, K2
CO 2	To apply and analyze the various mobile application development frameworks.	K3, K4
CO 3	To recommend the role of the database for the android platform.	K5, K6

Course Code	UCA6MS03
Course Title	**Mobile App Development Lab**
Credits	4
Hours/Week	5
Category	Major Skill – Practical
Semester	VI
Regulation	2024

Course Overview

1. This course facilitates to understand android SDK.

2. It helps to acquire basic knowledge on Android application development.

3. It also utilizes rapid prototyping techniques to design and develop mobile interfaces.

4. This course gives practical knowledge to develop and deploy android applications.

Course Objectives

1. To analyze the features of Android.

2. To configure Android environment and development tools.

3. To understand persistence data storage mechanism in Android.

4. To embed graphics and animation in developing android applications.

Prerequisites	Programming skills in JAVA.

SYLLABUS				
Unit	**Content**	**Hrs**	**COs**	**Cognitive Level**
I	1. Develop an app to display Hello World on screen. 2. Develop an application that uses GUI components, fonts and colors. 3. Implement linear layout and absolute layout.	15	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
II	4. Implement frame layout, table layout and relative layout. 5. Develop an application that draws basic graphical primitives on the screen. 6. Implement Text view and Edit Text	15	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

	7. Implement Auto Complete Text View. 8. Develop an application to create an activity.			
III	9. Implement a login window using UI controls. 10. Implement Checkbox, Radio Button and Radio Group. 11. Implement Progress Bar. 12. Implement List View, Grid View, Image View and Scroll View. 13. Implement Custom Toast Alert.	15	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
IV	14. Implement Date and Time Picker. 15. Implement a content provider. 16. Create a simple app for registration form.	15	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
V	17. Create a database for your application. 18. Implement an application that creates an alert upon receiving a message. 19. Create an android application to navigate to a web page, send SMS and email using filters.	15	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6

Text Book

   J. F. DiMarzio, Beginning Android Programming with Android Studio, John Wiley & Sons, Inc., Fourth Edition, 2017.

Suggested Readings
1. Chris Stewart, Brian Hardy and Kristin Marsicano, Android Programming: The Big Nerd Ranch Guide by Bill Phillips, Big Nerd Ranch, LLC., First Edition, 2015.
2. J. F. DiMarzio, Android A Programmer's Guide, The McGraw-Hill Companies, 2008.
3. Neil Smyth , Android Studio 2.3 Development Essentials – Android 7, Payload Media, Inc.,2017.

Web Resources

1. http://developer.android.com/guide/index.html.
2. https://www.javatpoint.com/android-tutorial.
3. https://www.tutorialspoint.com/android.

Course Outcomes (Cos) and Cognitive Level Mapping

Cos	CO Description	Cognitive Level
CO 1	To enumerate and understand the concepts of JAVA and DVM platform	K1, K2
CO 2	To apply and analyze the various mobile application development frameworks.	K3, K4
CO 3	To recommend the role of the database for the android platform	K5, K6

Course Code	UCA6MS02
Course Title	**MACHINE LEARNING USING PYTHON**
Credits	4
Hours/Week	5
Category	Major Skill – Theroy
Semester	VI
Regulation	2024

Course Overview

1. Machine learning deals with huge volume of data, discover unseen patterns, derive meaningful information, and make business decisions.
2. This course introduces the fundamental concepts of Machine learning and its applications.
3. It also covers complex machine learning algorithms to build predictive models using Python.
4. It enables better decision making, predictive analysis, visualization and pattern discovery.

Course Objectives

1. To understand the various techniques and concepts of Machine learning.
2. To employ the Python libraries for model building.
3. To apply principles of Machine learning to solve predictive tasks.
4. To explore the Machine Learning algorithms in Python to solve real-world problems.

Prerequisites	Basic knowledge in Programming language.

SYLLABUS				
Unit	**Content**	**Hrs**	**COs**	**Cognitive Level**
I	Introduction to Machine Learning: Different Forms - Machine Learning Categories - Frameworks for Building Machine Learning Systems - Machine Learning Python Packages. Fundamentals of Machine Learning: Scales of Measurement - Feature Engineering - Exploratory Data Analysis (EDA).	15	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
II	Supervised Learning: Regression – Classification: Logistic Regression - Decision Trees - Support Vector Machine (SVM) – k Nearest Neighbors (kNN) – Naïve Bayes Classification.	15	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
III	Evaluating a Classification Model Performance - ROC Curve - Model Diagnosis and Tuning: Optimal Probability Cutoff Point - Rare Event or Imbalanced Dataset - Bias and Variance - K-Fold	15	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6

	Cross-Validation.			
IV	Ensemble Methods – Bagging – Boosting - Ensemble Voting – Stacking - Hyper Parameter Tuning. - Random Forest.	15	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
V	Unsupervised Learning: Types – Challenges –pre processing and scaling. Clustering: K- Means Clustering – Agglomerative Clustering – DBSCAN – Comparing and Evaluating Clustering Algorithms. Case study: Reducing Air Pollution in Urban Areas Using Machine Learning	15	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6

Text Books

1. Manohar Swamynathan, Mastering Machine Learning with Python in six steps, Apress, First edition, 2017
2. Jake VanderPlas, Python Data Science Handbook - Essential Tools for Working with Data, O'reilly, First edition, 2016.

Suggested Readings

1. Dipanjan Sarkar, Raghav Bali, Tushar Sharma, {ractical Machine Learning with Python, First Edition, Aprèss, 2018.
2. 1. Samir Madhavan, Mastering Python for Data Science, PACKT Publishing, First edition, 2015
3. Joel Gurus, Data science from Scratch, O'relly, First edition, 2015

Web Resources

1. https://www.tutorialspoint.com/python_data_science/index.htm

2. https://realpython.com/tutorials/data-science/

3. https://cognitiveclass.ai/learn/data-science-with-python

Course Outcomes (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO 1	To describe and understand the concepts of Machine Learning.	K1, K2
CO 2	To apply and analyze the various Data Science techniques, supervised and unsupervised learning algorithms.	K3, K4
CO 3	To propose solutions for real world problems with huge volume of data.	K5, K6

Course Code	UCA6MS04
Course Title	**MACHINE LEARNING USING PYTHON LAB**
Credits	4
Hours/Week	5
Category	Major Skill - Practical
Semester	VI
Regulation	2024

Course Overview

1. Machine learning deals with huge volume of data, discover unseen patterns, derive meaningful information, and make business decisions.
2. This course introduces the fundamental concepts of Machine learning and its applications.
3. It also covers complex machine learning algorithms to build predictive models using Python.
4. It enables better decision making, predictive analysis, visualization and pattern discovery.

Course Objectives

1. To understand the various techniques and concepts of Machine learning.
2. To employ the Python libraries for model building.
3. To apply principles of Machine learning to solve predictive tasks.
4. To explore the Machine Learning algorithms in Python to solve real-world problems.

Prerequisites	Basic knowledge in Programming language.

SYLLABUS				
Unit	Content	Hrs	COs	Cognitive Level
I	1. Data manipulation with Numpy and pandas 2. Dealing with Missing Data and Handling Categorical Data. 3. Implement Feature selection Techniques. 4. Implement Exploratory Data Analytics Techniques.	15	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
II	5. Build the Linear Regression model. 6. Build and validate the logistic regression model. 7. Build a model with Decision Tree. 8. Build a model with Support Vector Machine (SVM) 9. Build a Model with K Nearest Neighbors (KNN) 10. Build Naïve Bayes Classification.	15	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

III	11. Evaluate a Classification Model Performance. 12. Implement ROC sure Techniques. 13. Implement the Optimal Probability Cutoff Point. 14. Perform K-Fold Cross-Validation.	15	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
IV	15. Implement Bagging method. 16. Implement Boosting method. 17. Implement Stacking method.	15	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
V	18. Implement K Means clustering 19. Implement Agglomerative clustering. 20. Implement DBSCAN clustering.	15	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6

Text Books

1. ManoharSwamynathan, Mastering Machine Learning with Python in six steps, Apress, First edition, 2017
2. Jake VanderPlas, Python Data Science Handbook - Essential Tools for Working with Data, O'reilly, First edition, 2016.

Suggested Readings

1. Dipanjan Sarkar, Raghav Bali, Tushar Sharma, {ractical Machine Learning with Python, First Edition, Aprèss, 2018.
2. 1. Samir Madhavan, Mastering Python for Data Science, PACKT Publishing, First edition, 2015
3. Joel Gurus, Data science from Scratch, O'relly, First edition, 2015

Web Resources

1. https://www.tutorialspoint.com/python_data_science/index.htm

2. https://realpython.com/tutorials/data-science/

3. https://cognitiveclass.ai/learn/data-science-with-python

Course Outcomes (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO 1	To describe and understand the concepts of Machine Learning.	K1, K2
CO 2	To apply and analyze the various Data Science techniques, supervised and unsupervised learning algorithms.	K3, K4
CO 3	To propose solutions for real world problems with huge volume of data.	K5, K6

Course Code	**UCA6MC01**
Course Title	**ARTIFICIAL INTELLIGENCE**
Credits	4
Hours/Week	4
Category	Major Core - Theory
Semester	VI
Regulation	2024

Course Overview

1. Understand basic Artificial Intelligence (AI) concepts and terminology.
2. Learn the techniques, functions and strategies for problem solving.
3. Apply logical agent methods to gain the knowledge and prove the theorems.
4. Use the Computer Vision techniques, Robotic perception and Ethics of AI to learn the classifying the images.

Course Objectives

1. To introduce basic concepts of AI.
2. To provide problem solving techniques to develop the problem solving method and strategies for AI.
3. Learn techniques for logic agents to summarize the theorem and checking agent models.
4. Analyze and interpret the image classification by apply Computer vision techniques for AI and learn robotics, ethics of AI.

Prerequisites	Basic Knowledge of problem solving techniques.

SYLLABUS				
Unit	**Content**	**Hrs**	**COs**	**Cognitive Level**
I	**Introduction:** What is AI? – The foundation of AI – The History of AI – The State of the Art – Risk and Benefits of AI. **Intelligent Agent:** Agents and Environment –Good Behavior: The Concept of Rationality – The Nature of Environments.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
II	**Solving Problems by Searching:** Problem-Solving Agents – Example Problems – Search Algorithms – Uniformed Search Strategies – Informed (Heuristic) Search Strategies - Heuristic Functions.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
	Logical Agents: Knowledge-Based Agents – The Wumpus World – Logic – Propositional Logic: A Very Simple Logic – Propositional Theorem Proving – Effective Propositional Model Checking – Agents	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6

III	Based on Propositional Logic.			
IV	**Computer Vision:** Introduction – Image Formation – Simple Image Features – Classifying Images – Detecting Objects – The 3D World – Using Computer Vision.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
V	**Robotics:** Robots – Robot Hardware – Robotic Perception – Planning and Control – Planning Uncertain Movements. **Ethics of AI:** The Ethics of AI. **Case study:** Classification and Chat bot for customer service.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6

Text Book

Stuart Russel and Peter Norvig, "Artificial Intelligence – A Modern Approach", 4th Edition, Pearson Education, 2010.

Suggested Readings
1. Kevin Knight and Elaine Rich, Nair B, "Artificial Intelligence (SIE)", Tata Mcgraw Hill, 2008.
2. Dan W. Patterson, "Introduction to AI and ES", Pearson Education, 2007.
3. Deepak Khemain, "Artificial Intelligence", Tata McGraw Hill Education, 2013.

Web Resources
1. https://builtin.com/artificial-intelligence
2. https://www.geeksforgeeks.org/artificial-intelligence-an-introduction/
3. https://www.mckinsey.com/featured-insights/mckinsey-explainers/what-is-ai
4. https://www.javatpoint.com/artificial-intelligence-ai

Course Outcomes (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO 1	Understand the importance and scope of Artificial Intelligence and methods in intelligent agents.	K1, K2
CO 2	Identify the problems by applying the problem solving algorithms, strategies and functions. Compare the logical agent's technique to gain knowledge in logic.	K3, K4
CO 3	Choose a variety of Computer Vision techniques to classify and develop the learning system. Design the control of Robotics with ethics of AI.	K5, K6

Course Code	**UCA6MC02**
Course Title	**Natural Language Processing**
Credits	6
Hours/Week	6
Category	Major Core - Practical
Semester	VI
Regulation	2024

Course Overview
1. Sensitise to linguistic phenomena and an ability to model with formal grammars. 2. Explores to experiment methodology to train and evaluate empirical NLP systems. 3. Discover to design, implement, and analyse NLP algorithms. 4. Highlights to different language modelling translation and conversion techniques.

Course Objectives	
1. To understand Natural Language Processing concepts. 2. To get familiars with its techniques in terms of syntax and semantics. 3. To implementation of various language transformation models and techniques in NLP. 4. To addressing the challenges faced on changing and conversion of the form of language.	
Prerequisites	Basic structure of language and content translation techniques.

SYLLABUS				
Unit	**Content**	**Hrs**	**COs**	**Cognitive Level**
I	Introduction to NLP– Models and Algorithms of Language processing- -Regular Expressions Basic Regular Expression Patterns – words-Corpora-tokenization – sentence segmentation and edit distance. 1. Write a python program to perform tokenization by word and sentence using nltk. 2. Write a python program to eliminate stopwords using nltk. 3. Write a python program to perform stemming using nltk.	18	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
II	N-grams Models of Syntax – Evaluating language models – sampling and generalization – interpolation - Perplexity relation on entropy. Naïve Bayes classifier – example – language model – evaluation: precision, recall, F-measure. Logistic regression: learning multinomial Logistic regression.	18	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

	4. Write a python program to perform Parts of Speech tagging using nltk. 5. Write a python program to perform lemmatization using nltk. 6. Write a python program to perform Parts of Speech tagging using nltk.			
III	Transformer: attention – transformer blocks – parallelization - language modelling head. Large language model: sampling- pre-training – evaluating – dealing with scale - language modelling scale - Masked language models – Model alignment prompting and in-context learning. 7. Write a python program to perform lemmatization using nltk. 8. Write a python program for chunking using nltk. 9. Write a python program to perform Named Entity Recognition using nltk.	18	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
IV	Annotating Linguistic Structure: Sequence labelling for parts of speech and Named-Context-free grammar and constituency parsing - Dependency parsing. Information extraction: algorithms – extraction - representation. Lexicons: defining emotions – available sentiments – human labels – using supervised and unsupervised learning. 10. Write a python program to find Term Frequency and Inverse Document Frequency (TF-IDF). 11. Write a python program for CYK parsing (Cocke- Younger-Kasami Parsing) or Chart Parsing. 12. Write a python program to find the probability of the given statement "This is my cat" by taking the example corpus into consideration. 13. Write the python code to develop Spam Filter using NLP	18	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
V	NLP applications: Machine translation-language divergence and typology- Encoder-Decoder- MT search and evaluation – Bias and ethical issues. Question answering – information retrieval. Chatbots& Dialogue systems – Automatic speech recognition and text-to-speech conversion. (**Case study:** Google Translator - applications of Speech-to- Text converter – OpenAI's Generative Pre-trained Transformers GPTs) 14. Use the Stanford named Entity recognizer to extract entities from the documents. Use it programmatically and output for each	18	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

		document, which named entities it contains and of which type.			
		15. Choose any corpus available and for the corpus, for each document, count how many times each stop word occurs and find out which are the most frequently occurring stop words. Further, calculate the term frequency and inverse document frequency as The motivation behind this is basically to find out how important a document is to a given query. For e.g.: If the query is say: "The brown crow". "The" is less important. "Brown" and "crow" are relatively more important. Since "the" is a more common word, its tf will be high. Hence we multiply it by idf, by knowing how common it is to reduce its weight.			
		16. Write the python code to perform sentiment analysis using NLP.			
		17. Write the python code to detect Fake News using NLP.			

Text Book

Daniel Jurafsky and James H Martin, "Speech and Language Processing: An introduction to

Natural Language Processing, Computational Linguistics and Speech Recognition",

Prentice Hall, 3rd Edition, 2024.

Suggested Readings

1. Daniel M. Bikel and ImedZitouni "Multilingual natural Language Processing Applications: From Theory to Practice", Pearson Publication, 2012.
2. Tanvier Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, First edition, 2008.
3. C. Manning and H. Schutze, "Foundations of Statistical Natural Language Processing", MIT Press. Cambridge, MA, 1999.

Web Resources

1. https://nlp.stanford.edu/fsnlp/
2. https://onlinecourses.nptel.ac.in/noc19_cs56/preview
3. https://www.cs.utexas.edu/~gdurrett/courses/online-course/materials.html
4. https://web.stanford.edu/~jurafsky/slp3/ed3book.pdf

Course Outcomes (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO 1	To outline and understand the basics of language processing.	K1, K2
CO 2	To apply the language parsing and lexical techniques with ethics.	K3, K4
CO 3	To implement and utilize the aspects of NLP in various platforms.	K5, K6

Course Code	UCA6MC03
Course Title	**CYBER SECURITY**
Credits	4
Hours/Week	4
Category	Major Core - Theory
Semester	VI
Regulation	2024

COURSE OVERVIEW

1. To study various encryption and decryption algorithms and their applications in cryptography.
2. To gain knowledge in key management and hashing techniques.
3. The course will detail into specifics of cyber security with cyber laws in global and Indian Legal environments.
4. Learn computer forensics techniques for investigating digital crimes and preserve digital evidence.

COURSE OBJECTIVES

1. To explain various protection methods to safeguard from cyber-attacks using cryptography.
2. Describe the basic information and network security fundamentals.
3. Describe various cyber security vulnerabilities and threats such as virus, worms, online attacks, DoS and others.
4. To comprehend the computer forensics tools and techniques.

Prerequisites	Basic knowledge on information security.

SYLLABUS				
UNIT	CONTENT	Hrs.	COs	COGNITIVE LEVEL
I	Security goals –threats and attacks. – Services and mechanisms – A model for Network Security– symmetric key cryptography- substitution cipher – transposition cipher - Stream ciphers and block ciphers – Data Encryption Standard.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
II	Public Key cryptography and RSA-Key Management-Diffie Hellman key exchange- Applications of Cryptographic Hash functions– Secure Hash algorithm (SHA)- Digital signatures and message authentication	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6

	protocols–Digital signature standard.			
III	Cybercrime and Information Security-Classifications of Cybercrimes-Cyber offenses - How criminals plan the attacks, Cyber stalking – Botnets - Security challenges posed by mobile - Attacks on Mobile phones.Case study: Cyber Pornography & the IT Act.	12	CO1 CO2 CO3	K1,K2,K3, K4,K5,K6
IV	Tools and methods used in Cybercrime-Password cracking - Keyloggers and Spywares-Virus and Worms - Trojan Horses and Backdoors - DoS and DDoS attacks- SQL Injection- Phishing and Identity Theft - The Indian IT Act - Amendments to the Indian IT Act. Case study 1: keylogger to capture login credentials, Case study 2: Digital Signatures in Indian IT Act.	12	CO1 CO2 CO3	K1, K2, K3, K4, K5, K6
V	Understanding Computer Forensics- Cyber forensics and Digital Evidence - Digital Forensics Life Cycle - Computer Forensics and Steganography - Challenges in Computer Forensics - Tools and Techniques - Hand-Held Devices and Digital forensics. Case study: Real life example of Forensics.	12	CO1 CO2 CO3	K1, K2, K3, K4,K5,K6

Text Books

1. William Stallings, "Cryptography and Network Security Principles and Practices", Eighth Edition, 2023. (Unit I and II).

2. Nina Godbole, SunitBelapure, "Cyber Security", Wiley India Pvt. Limited, Second Edition, 2013. (Unit III, IV and V).

Suggested readings

1. Godbole,"Information Systems Security", Willey **ISBN** 10: 8126516925

2. Merkov, Breithaupt," Information Security", Pearson Education ISBN-**10**: **0-7897-5325.**

3. BehrouzA.Forouzan and DebdeepMukhopadhyay, "Cryptography and Network Security",

Tata McGraw Hill, 2011.

4. Jennifer L. Bayuk and Jason Healey and Paul Rohmeyer and Marcus Sachs, "Cyber Security Policy

Guidebook", Wiley; 1ˢᵗ edition, 2012.

Web Resources

1. https://www.javatpoint.com/encryption-algorithms-in-cryptography
2. https://www.w3schools.com/cybersecurity
3. https://training.apnic.net/wp-content/uploads/sites/2/2016/12/TSEC01.pdf
4. Digital Forensics Tools:www.guidancesoftware.com ,www.accessdata.com,www.netwitness.com

Course Outcomes (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO 1	Identify cryptography algorithms for authentication purposes in the organizational network	K1, K2
CO 2	Illustrate different cyber-attacks with relevant examples	K3,K4
CO 3	Summarize the security challenges on cyberspace and usage of cyber forensic tools.	K5,K6

Course Code	UCA6MC04
Course Title	**PROJECT**
Credits	6
Hours/Week	6
Category	Major Core
Semester	VI
Regulation	2024

Course Overview

1. This course implements major software engineering techniques and position them to lead and develop applications.
2. It also aims to implement programming skills for solving real-time problems.
3. It enables resource utilization, scheduling, and evaluation.
4. It focuses on documentation and presentation of the project progress on par with Industry standards.

Course Objectives

1. To build a new software system based on theory and practical skills.
2. To gain knowledge about various domains, platforms, and software developing environments.
3. To gain confidence in conceptualization, design, and implementation of a working software project.
4. To be accustomed to the various methods and techniques used for effective project management.

Prerequisites	Good programming skills.

Course Outcomes (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO 1	To identify and understand the real-world problem for application development.	K1, K2
CO 2	To apply and analyze a standard model in a necessary environment.	K3, K4
CO 3	To appraise and measure the developed implementation process and validate the developed software.	K5, K6

SCHEME OF EXAMINATIONS

PART- I

GENERAL LANGUAGE (GL) -(TAMIL/HINDI/SANSCRIT/FRENCH)

Language departments shall evolve a common template for Continuous Internal Assessment (CIA) and Semester Examinations of General Language (GL) courses following the guidelines below.

• GL shall focus on learning levels K1, K2, K3, and K4.

• Each Course descriptor (Syllabus) shall have a total number of 3 Course Outcomes (COs).

•Course Outcomes	Learning level (s)
CO1	K1, K2
CO2	K3
CO3	K4

CIA and semester Question papers shall have only 3 sections (A, B, and C).

Section	COs	Learning level(s)	Weightage
A	CO1	K1, K2	20%
B	CO2	K3	40%
C	CO3	K4	40%

CIA (INTERNAL): Theory / Practical CIA will be conducted for 100 marks.

ERP Configuration:

TEST	CONDUCTED	CONVERTED	COMPONENTS (3a& 3b)	TOTAL MARKS
CIA I	50	30	20	50
CIA II	50	30	20	50
			TOTAL	100

END SEMESTER (EXTERNAL):

❖ Theory / Practical semester Examination will be conducted for 3 Hours for 100 marks.

❖ The maximum number of questions in CIA and semester question papers shall be 11 and 22 respectively.

❖ Questions under Sections B and C shall have a maximum of 2 sub-divisions only.

Section	COs	Learning level(s)	CIA	Semester	Weightage
A	CO1	K1, K2	5 x 2 =10 Answer ALL	10 x 2 =20 Answer ALL	20%
B	CO2	K3	2 x 10 =20 (2 out of 4)	4 x 10 =40 (4 out of 8)	40%
C	CO3	K4	1 x 20 =20 (1 out of 2)	2 x 20 =40 (2 out of 4)	40%

The minimum pass mark for undergraduate courses is 40 out of 100.

PART- II

GENERAL ENGLISH (GE)

English department shall evolve a common template for Continuous Internal Assessment (CIA) and Semester Examinations of General English (GE) courses following the guidelines below.

- ❖ GE shall focus on learning levels K1, K2, K3, K4, K5 and K6.
- ❖ Each Course descriptor (Syllabus) shall have a total number of 3 Course Outcomes (COs).
- ❖ CO-Learning mapping shall be as follows and each course outcome statement shall be written using corresponding Bloom's action verbs.

Course Outcomes	Learning level (s)
CO1	K1, K2
CO2	K3, K4
CO3	K5, K6

CIA and semester Question papers shall have only 3 sections (A, B, and C).

Section	COs	Learning level(s)	Weightage
A	CO1	K1, K2	20%
B	CO2	K3, K4	40%
C	CO3	K5, K6	40%

CIA (INTERNAL): Theory / Practical CIA will be conducted for 100 marks.

ERP Configuration:

TEST	CONDUCTED	CONVERTED	COMPONENTS (3A& 3B)	TOTAL MARKS
CIA I	50	30	20	50
CIA II	50	30	20	50
			TOTAL	**100**

END SEMESTER (EXTERNAL):

- ❖ Theory / Practical semester Examination will be conducted for 3 Hours for 100 marks.
- ❖ The maximum number of questions in CIA and semester question papers shall be 11 and 22 respectively.
- ❖ Questions under Sections B and C shall have a maximum of 2 sub-divisions only.

Section	COs	Learning level(s)	CIA	Semester	Weightage
A	CO1	K1, K2	5 x 2 =10 Answer ALL	10 x 2 =20 Answer ALL	20%
B	CO2	K3, K4	2 x 10 =20 (2 out of 4)	4 x 10 =40 (4 out of 8)	40%
C	CO3	K5, K6	1 x 20 =20 (1 out of 2)	2 x 20 =40 (2 out of 4)	40%

PART- III

(Major Core (MC), Allied Required (AR), Allied Optional (AO), Major Elective (ME) and Major Skill)

- ❖ MC, AR, AO, ME, and MS shall focus on all learning levels (K1-K6).
- ❖ Each Course descriptor (Syllabus) shall have a total number of 3 Course Outcomes (COs).
- ❖ CO-Learning mapping shall be as follows and each course outcome statement shall be written using corresponding Bloom's action verbs.

Course Outcomes	Learning level (s)
CO1	K1, K2
CO2	K3, K4
CO3	K5, K6

CIA and semester Question papers shall have only 3 sections (A, B, and C).

Section	Cos	Learning level(s)	Weightage
A	CO1	K1, K2	20%
B	CO2	K3, K4	40%
C	CO3	K5, K6	40%

CIA (INTERNAL): Theory / Practical CIA will be conducted for 100 marks.

ERP Configuration:

TEST	CONDUCTED	CONVERTED	COMPONENTS (3A& 3B)	TOTAL MARKS
CIA I	50	30	20	50
CIA II	50	30	20	50
			TOTAL	**100**

END SEMESTER (EXTERNAL):

❖ Theory / Practical semester Examination will be conducted for 3 Hours for 100 marks.

❖ The maximum number of questions in CIA and semester question papers shall be 11 and 22 respectively.

❖ Questions under Sections B and C shall have a maximum of 2 sub-divisions only.

Section	COs	Learning level(s)	CIA	Semester	Weightage
A	CO1	K1, K2	5 x 2 =10 Answer ALL	10 x 2 =20 Answer ALL	20%
B	CO2	K3, K4	2 x 10 =20 (2 out of 4)	4 x 10 =40 (4 out of 8)	40%
C	CO3	K5, K6	1 x 20 =20 (1 out of 2)	2 x 20 =40 (2 out of 4)	40%

PART-IV

(Purely Internal Papers)

❖ NME shall focus on learning levels K1, K2, K3 and K4.

❖ Each Course descriptor shall have a total number of 3 Course Outcomes (COs).

❖ CO-Learning mapping shall be as follows and each course outcome statement shall be written using corresponding Bloom's action verbs.

Course Outcomes	Learning level (s)
CO1	K1, K2
CO2	K3
CO3	K4

CIA and semester Question papers shall have only 3 sections (A, B, and C).

Section	COs	Learning level(s)	Weightage
A	CO1	K1, K2	20%
B	CO2	K3	40%
C	CO3	K4	40%

CIA (INTERNAL): Theory / Practical CIA will be conducted for 100 marks.

ERP Configuration:

TEST	CONDUCTED	CONVERTED	COMPONENTS (3A& 3B)	TOTAL MARKS
CIA I	50	30	20	50
CIA II	50	30	20	50
			TOTAL	**100**

• Questions under Sections B and C shall have a maximum of 2 sub-divisions only.

Section	COs	Learning level(s)	CIA	Weightage
A	CO1	K1, K2	5 x 2 =10 Answer ALL	20%
B	CO2	K3	2 x 10 =20 (2 out of 4)	40%
C	CO3	K4	1 x 20 =20 (1 out of 2)	40%

• There is no semester examination for CD (NME) courses.

INSTRUCTIONS RELATED TO THE SKILL ENHANCEMENT COURSE TO BE OFFERED IN 5TH SEMESTER

❖ Skill Enhancement course (SE) shall be offered for 4 hours (4 credits) in the 5th semester.

❖ It is a purely internal paper and it contains 2 components/courses,

❖ Research Methodology (RM) is to be offered for 2 hours (2 credits). This course will have only formative assessments (FA1, FA2, C3A and C3B) and no semester examinations. It will be evaluated for 100 marks and converted to 50 marks.

❖ Seminar & Presentation (SP) is to be offered for 2 hours (2 credits). This course will be evaluated for 50 marks.

❖ The total marks to be evaluated for the course will be 50 +50 = 100 marks

❖ Instructions related to the Major Skill course to be offered in the 6th Semester

❖ Major Skill course (MS) shall be offered for 10 hours (10 credits) in the 6th semester.

❖ This course will have 2 components: inside and outside the class hours (Evaluated for 50 marks each).

❖ Inside class hours: It will have 2 courses (with 8 credits each) to be offered under this category (Two theory courses or one theory and one laboratory course).

❖ Outside class hours:

❖ Project (PJ) shall be offered under the MS course for 2 credits outside the class hours which shall be a case study/survey/fieldwork / special internship based on skills acquired / group or mini project with a maximum of 5 students/start-up or innovative ideas/model presentation / immersive learning etc.

❖ It will be evaluated for 50 marks with a minimum of 5 fortnight reports.

(INTERNSHIP)
SEMESTER VI

SUB.CODE	SUBJECT	MAX. MARKS				TOTAL
	INTERNSHIP	Participation / Attendance	Performance & Skills acquired	Internship Report	Viva-Voce Examination	100
		25	25	25	25	

SCHEME OF EXAMINATIONS –NON CGBA COURSES

Value-Added Courses

SUB.CODE	SUBJECT	Max. Marks		
		CIA	CIA	Total Marks
	Value-Added Courses	50	50	100

(Foundation Course - SEMESTER I, II, III & IV)

SUB.CODE	SUBJECT	Max. Marks		
		CA I	CA II	Total Marks
	Foundation Courses (Fc)	50	50	100

(Self-Study Paper)

SUB.CODE	SUBJECT	Max. Marks		
		CIA I	CIA II	Total Marks
	Self-Study Paper	50	50	100

(Club Activity - CC- SEMESTER I & II))

SUB.CODE	SUBJECT	Max. Marks		
		Sem I	Sem II	Total Hours
	Club Activity (CC)	30	30	60

(Outreach - OR - SEMESTER II & III)

SUB.CODE	SUBJECT	Max. Marks		
		SemIII	Sem IV	Total Hours
	Outreach (OR)	**45**	45	**90**

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DEPARTMENT OF …………………………………
CONTINUOUS INTERNAL ASSESSMENT (MONTH & YEAR)
COURSE CODE & TITLE

Class: **Date:**
Time: **Max. Marks:** 50

SECTION A	
Answer ALL the questions (K1 & K2, CO1)	**(6 x 2 = 12)**
1.	
2.	
3.	
4.	
5.	
6.	

SECTION B	
Answer any ONE of the following (K3, CO2)	**(1 x 7 = 7)**
7.	
8.	

SECTION C	
Answer any ONE of the following (K4, CO3)	**(1 x 7 = 7)**
9.	
10.	
SECTION D	

	Answer any ONE of the following (K5, CO4)	(1 x 12 = 12)
11.		
12.		

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SECTION E

</div>

	Answer any ONE of the following (K6, CO5)	(1 x 12 = 12)
13.		
14.		

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U.G.DEGREE EXAMINATION

		SECTION A - K1& K2 (CO1)
Q.No	Levels	**Answer ALL the Questions** **(10 x 2 = 20)**
1		
2		
3	K1	
4		
5		
6		
7		
8	K2	
9		
10		
		SECTION B– K3& K4 (CO2)
		Answer ALL the Questions **(4 x 10 = 40)**
11		
		[OR]
12		
13	K3	
		[OR]
14		
15		
		[OR]
16		

17	K4	
		[OR]
18		

Answer ALL the Questions(2 x 20 = 40)

19		
	K5	**[OR]**
20		
21		
	K6	**[OR]**
22		

APRIL 2025