AUXILIUM COLLEGE (AUTONOMOUS)

VELLORE – 632 006

Department of Computer Applications (B.C.A.)

B.C.A.

SYLLABUS AND REGULATIONS

(Based on TANSCHE Model Syllabus)

Under

OUTCOME BASED EDUCATION PATTERN

With

CHOICE BASED CREDIT SYSTEM

For the Candidates Admitted from 2024-2025 Onwards

Department of Computer Applications (B.C.A.) - (UG)

(Effective from the academic year 2024 - 2025)

Vision of the Department:

- To provide a intellectual environment that fosters the search for new knowledge in a highly dynamic computing world
- To be a leading, contemporary, innovative programme in inculcating professional competencies in the field of Computing and related interdisciplinary technologies to achieve academic excellence and to facilitate research activities as a timely response to dynamic needs and challenges of industry and society.

Objectives:

- To provide study of quantity, structure, space and change, focusing on problem solving in Computer Application.

- To acquire skill and competency in practical.

- To expose the students to the recent trends in Computer and other related areas.

- To motivate the students learning software and architecture.

To train economically backward students and make them eligible for higher education and job opportunities.

To tap out the talents through extracurricular and co-curricular activities.

To get sensitized to social and environmental realities.

Eligibility for admission to B.C.A.:

The basic BCA eligibility is to possess an aggregate of 50% or above in Class 12 in any stream (Arts, Science, Commerce) with English as a compulsory subject.

Highlights of the Revamped Curriculum:

➢ Student-centric, meeting the demands of industry & society, incorporating industrial components, hands-on training, skill enhancement modules, industrial project, project with viva-voce, exposure to entrepreneurial skills, training for competitive examinations, sustaining the quality of the core components and incorporating application-oriented content wherever required.

➢ The Core subjects include latest developments in the education and scientific front, practical training, catering to the needs of stakeholders with research aptitude.

➢ The curriculum is designed to strengthen the industry-academia interface and provide more job opportunities for the students.

➢ The Internship during the second-year vacation will help the students gain valuable work experience, that connects classroom knowledge to real world experience and to narrow down and focus on the career path.

➢ Project with viva-voce component in the fifth semester enables the students to apply their conceptual knowledge to practical situations. Such innovative provisions of the industrial training/project/internships will give students an edge over the counterparts in the job market.

➢ State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature are incorporated as Elective and Skill Enhancement Courses, covering conventional topics to the application oriented.

Value additions in the Revamped Curriculum:

Semester	Newly introduced Components	Outcome/Benefits
I	**Foundation Course** To ease the transition of learning from higher secondary to higher education, providing an overview of the pedagogy of learning abstract Mathematics and simulating mathematical Concepts to real world.	• Instill confidence among students • Create interest for the subject
I,II,III,IV	**Skill Enhancement papers** (Discipline centric / Generic/ Entrepreneurial)	• Industry ready graduates • Skilled human resource • Students are equipped with essential skills to make them employable
		• Training on Computing / Computational skills Enable the students gain knowledge and exposure on latest computational aspects
		• Data analytical skills will enable students gain internships, apprentice ships, field work involving data collection, compilation, analysis etc.
		• Entrepreneurial skill training will provide an opportunity for independent livelihood • Generates self–employment • Create small scale entrepreneurs • Training to girls leads to women empowerment
		• Discipline centric skill will improve the Technical knowledge of solving real life problems using ICT tools

III,IV,V &VI	Elective papers- An open choice of topics categorized under Generic and Discipline Centric	• Strengthening the domain knowledge • Introducing the stake holders to the State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature • Students are exposed to Latest topics on Computer Science / IT, that require strong mathematical background • Emerging topics in higher education /industry/ communication network / health sector etc. are introduced with hands-on-training, facilitates designing of mathematical models in the respective sectors
IV	Industrial Statistics	• Exposure to industry moulds students into solution providers • Generates Industry ready graduates • Employment opportunities enhanced
II year Vacation activity	Internship/ Industrial Training	• Practical training at the Industry/ Banking Sector / Private / Public sector organizations / Educational institutions, enable the students gain professional experience and also become responsible citizens.
V Semester	Project with Viva–voce	• Self-learning is enhanced • Application of the concept to real situation is conceived resulting in tangible outcome
VI Semester	Introduction of Professional Competency component	• Curriculum design accommodates all category of learners; Mathematics for Advanced Explain component will comprise of advanced topics in Mathematics and allied fields, for those in the peer group / aspiring researchers • Training for Competitive Examinations' caters to the needs of the aspirants towards most sought-after services of the nation viz, UPSC, CDS, NDA, Banking Services, CAT, TNPSC group services, etc.
Extra Credits: **For Advanced Learners / Honors degree**		• To cater to the needs of peer learners / research aspirants
Skills acquired from the Courses		Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

TANSCHE BASED PROGRAMME STRUCTURE FOR B.C.A.
(For the candidates admitted from the academic year 2024-2025)

Sem	Part	Category	Paper Code	Title	Hours/ Week	Exam Th	Exam Pr	Credits	Marks
I	I	Tamil/ Language	ULTAA24	Language I: Tamil - I	6	3	-	3	40+60
	II	English	UENGA24	Language II: English - I	6	3	-	3	40+60
	III	Core Course 1	UCCAA24	Python Programming	5	3	-	5	40+60
		Core Course 2	UCCAB24	Practical I: Python Programming	3	-	3	3	40+60
		Generic Elective 1	UGECOA24	Generic Elective I: Financial Accounting	5	3	-	5	40+60
	IV	Skill Enhancement Course SEC 1	USCA124	SEC: Structured Programming Language in C	2	3	-	2	40+60
		Foundation Course FC	UFCA24	FC: Fundamentals of Information Technology	2	3	-	2	40+60
		Value Education	UVEDA22*	Value Education	1	-	-	-	-
Total					**30**			**23**	**700**
II	I	Tamil/ Language	ULTAB24	Language I: Tamil - II	6	3	-	3	40+60
	II	English	UENGB24	Language II: English - II	5	3	-	3	40+60
	III	Core Course 3	UCCAC24	Data Structure and Algorithms	6	3	-	5	40+60
		Core Course 4	UCCAD24	Practical II: Data Structure and Algorithm using C++	3	-	3	3	40+60
		Generic Elective 2	UGECOB24	Generic Elective II: Cost Accounting	5	3	-	5	40+60
	IV	Skill Enhancement Course SEC 2	USCA224	SEC: Introduction to HTML	2	3	-	2	40+60
		Skill Enhancement Course SEC 3	USCA324	SEC: Understanding Internet	2	3	-	2	40+60
		Value Education	UVEDA22**	Value Education	1	-	-	-	-
Total					**30**			**23**	**700**
III	I	Tamil/ Language	ULTAC24	Language I: Tamil–III	5	3	-	3	40+60
	II	English	UENGC24	Language II: English - III	6	3	-	3	40+60
	III	Core Course 5	UCCAE24	Programming in Java	5	3	-	5	40+60
		Core Course 6	UCCAF24	Practical III: Programming in Java	3	-	3	3	40+60
		Generic Elective 3	UGECAA24	Generic Elective III: Mathematical Foundations	5	3	-	5	40+60
	IV	Skill Enhancement Course SEC 4	USCA424	SEC: PHP programming	2	3	-	1	40+60
		Skill Enhancement Course SEC 5	USCA524	SEC: Enterprise Resource Planning	2	3	-	2	40+60
		Environmental Science	UNEVS24*	Environmental Studies	1		-	-	40+60
		Value Education	UVEDA22***	Value Education	1	-	-	-	-
Total					**30**			**22**	**800**

Sem	Part	Category	Paper Code	Title	Hours/Week	Exam Th	Exam Pr	Credits	Marks
	I	Tamil/ Language	ULTAD24	Language I: Tamil - IV	6	3	-	3	40+60
	II	English	UENGD24	Language II: English - IV	5	3	-	3	40+60
IV	III	Core Course 7	UCCAG24	Asp.net Programming	5	3	-	5	40+60
		Core Course 8	UCCAH24	Practical IV: Asp.net Programming Lab	3	-	3	3	40+60
		Generic Elective 4	UGEMAB24	Generic Elective IV: Statistical Methods	5	3	-	5	40+60
	IV	Skill Enhancement Course SEC 6	USCA624	SEC: Multimedia System	2	3	-	2	40+60
		Skill Enhancement Course SEC 7	USCA724	SEC: Software Testing	2	3	-	2	40+60
		Environmental Science	UNEVS24	Environmental Studies	1		-	2	40+60
		Value Education	UVEDA22****	Value Education	1	-	-	-	-
				Total	**30**			**25**	**800**
V	III	Core Course 9	UCCAI24	Computer networks	5	3	-	4	40 + 60
		Core Course 10	UCCAJ24	RDBMS	5	3	-	4	40 + 60
		Core Course 11	UCCAK24	Practical V: PL/SQL	5	3	-	4	40 + 60
		Core Course 12	UCCAL24	Project	5	-	-	4	40+60
		Discipline Specific Elective 1	UECAA24	Elective: Cloud Computing	5	3	-	3	40 + 60
			UECAB24	Elective: Artificial Intelligence					
		Discipline Specific Elective 2	UECAC24	Elective: Software Metrics	4	3	-	3	40 + 60
			UECAD24	Elective: Human Computer Interaction					
	IV	Value Education	UVEDA22*****	Value Education	1	-	-	-	-
		Summer Internship/ Industrial Training	UICA24	Internship	-	-	-	2	40 + 60
Total					**30**			**24**	**700**
VI	III	Core Course 13	UCCAM24	Operating System	6	3	-	4	40 + 60
		Core Course 14	UCCAN24	Data analytics using R Programming	6	3		4	40 + 60
		Core Course 15	UCCAO24	Practical VI: R Programming	3	3	-	2	40 + 60
		Core Course 16	UCCAP24	Practical - VII: Linux	3	3	-	2	40 + 60
		Discipline Specific Elective 3	UECAE24	Elective: IOT and its Applications	4	3	-	3	40 + 60
			UECAF24	Elective: Cyber Security					
		Discipline Specific Elective 4	UECAG24	Elective: Big Data Analytics	5	3	3	3	40 + 60
			UECAH24	Natural Language Processing					
	IV	Professional Competency SEC 8	UCCAPC24	Generative AI	2	2	-	2	40 + 60
		Value Education	UVEDA22	Value Education	1	2	-	2	40 + 60
	V	Extension Activity	-	Extension Activity (90 hours)	-	-	-	1	-
				Total	**30**			**23**	**800**
				Grand Total	**180**			**140**	**4500**

- Any one course of the following to be completed during III semester (15 hours teaching and 15 hours activities):
  - i) Fundamentals of Computer and MS Office (Computer Science & B.C.A)
  - ii) Gender Studies (History)
  - iii) Health and Wholeness (Physical Education)

S. No.	Category	Assessment Tool	Maximum Marks	Exam Theory	Weightage	
	Methods of Evaluation					
1	Core Courses/ Generic & Discipline Specific Electives	I Continuous Assessment (ICA)	50	1 ½ h	35	40
		II Continuous Assessment (IICA)	50	1 ½ h		
		Innovative Component (IC)	5	-	5	
		End Semester Examination	100	3 h		60
2	Foundation Course/ Professional Competency	I Continuous Assessment (ICA)	30	1 h	35	40
		II Continuous Assessment (IICA)	30	1 h		
		Innovative Component (IC)	5	-	5	
		End Semester Examination	60	2 h		60
3	EVS	Continuous Assessment (IICA)	25	1 h		40
		Innovative Component (IC)	25	-		
		End Semester Examination	60	2 h		60

Activity-based Assessment for Skill Enhancement Courses:

Activity 1 for Unit I: (Nature of Activity)   – 20 marks
Activity 2 for Unit II: (Nature of Activity)   – 20 marks
Activity 3 for Unit III: (Nature of Activity)   – 20 marks
Activity 4 for Unit IV: (Nature of Activity)   – 20 marks
Activity 5 for Unit V: (Nature of Activity)   – 20 marks

Nature of Activity – Field visit/ Industrial visit/ Project (individual or group)/ Exhibits/ Model making/ Hands on training/ Lab practice/ Product making/ Extempore/ Block and Tackle/ Debate/ Report writing/ Case study/ Interpretation of data or results/ Transcription/ Quiz (LMS)/ Problem solving/ Designing/ Role play/ Start-up proposal/ Research proposal/ Poster presentation/ Oral presentation (live or video recorded)/ Survey (Field or Online)/ Group discussion/ Problem solving/ Problem formulation/ Interviews/ Concept mapping/

Mind mapping / Promoting public awareness etc.

Record of Assessment will be maintained by the course instructors and verified by the Head of the department.

Cognitive Levels of Assessment	
Recall (K1)	Simple definitions, MCQ, Recall steps, Concept definitions
Understand/ Comprehend (K2)	MCQ, True/False, Short essays, Concept explanations, short summary or Overview
Application (K3)	Suggest idea/ concept with examples, suggest formulae, Solve problems, Observe, Explain
Analyze (K4)	Problem-solving questions, finish a procedure in many steps, Differentiate Between various ideas, Map knowledge
Evaluate (K5)	Longer essay/ Evaluation essay, Critique or justify with pros and cons
Create (K6)	Check knowledge in specific or off beat situations, Discussion, Debating or Presentations

PROGRAMME OUTCOMES (PO)

On completion of the UG Programme, the students will be able to:

PO1: Attain knowledge and understand the principles and concepts in the respective discipline.

PO2: Acquire and apply analytical, critical and creative thinking, and problem-solving skills.

PO3: Effectively communicate general and discipline-specific information, ideas and opinions.

PO4: Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.

PO5: Emulate positive social values and exercise leadership qualities and team work.

PO6: Pursue higher knowledge, qualify professionally, enhance entrepreneurial skills and contribute towards the needs of the society.

PROGRAMME SPECIFIC OUTCOMES (PSO)

On completion of the UG Programme in Computer Applications (B.C.A.), the students will be able to:

PSO1: Equip the students with requisite knowledge, skills and right attitude necessary to provide effective software development skills in a global environment and also focus on preparing students for roles pertaining to computer applications and IT industry.

PSO2: Acquire skills in computer and information technology and also be competent in the field of Commerce, Mathematics and Management.

PSO3: Introduce and update knowledge relevant to IT like networking, computer graphics, web development, trouble shooting, and hardware and software skills. Also to develop software

solutions to problems across a broad range of application domains through analysis and design.

PSO4: Become proficient and ensure job in the key areas of computer science like Web designing and development, Mobile applications, Network and communication technologies, undertaking government organizations, faculty for computer science and applications in educating institutions.

PSO5: Ability to analyze social and environmental aspects with professional values, ethics and equity to transform the knowledge, skills and expertise to the community.

PSO6: Ability to work as a member or leader in diverse teams in multidisciplinary environment. An identify opportunities, entrepreneurship vision and use of innovative ideas to create value and wealth for the betterment of the individual and society.

PO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
PO1	H	H	H	H	H	H
PO2	H	H	H	H	H	M
PO3	H	H	H	M	M	M
PO4	H	H	H	M	M	M
PO5	H	H	M	M	M	M
PO6	M	M	M	M	M	M

(HIGH - 3, MODERATE - 2, LOW - 1)
Consolidated Semester wise and Component wise Credit distribution

Parts	Sem I	Sem II	Sem III	Sem IV	Sem V	Sem VI	Total Credits
Part I	3	3	3	3	-	-	12
Part II	3	3	3	3	-	-	12
Part III	13	13	13	13	21	17	90
Part IV	4	4	3	6	2	4	23
Part V	-	-	-	-	-	1	1
Other	-	-	2	-	-	-	2
Total	23	23	24	25	23	22	**140**

*Part I, II and Part III components will be separately considered for CGPA calculation and classification for the under graduate programme and the other components. IV, V must be completed during the duration of the programme as per the norms, to be eligible for obtaining the UG degree.

Title of the Course	**Python Programming**						
Paper No.	Core 1						
Category	Core	**Year**	I	**Credits**	5	**Course Code**	UCCAA24
		Semester	I				
Instructional hours per week	Lecture	Tutorial	Lab Practice			Total	
	5		-			5	
Pre requisites	Higher Secondary						
Objectives of the course	The course aims at giving an overall view of the ● To make students understand the concepts of Python programming.. ● To apply the OOPs concept in PYTHON programming. ● To impart knowledge on demand and supply concepts. ● To make the students learn best practices in PYTHON programming. ● To know the costs and profit maximization.						
Course Outline	**UNIT- I: (12 hours) (K1, K2, K3 & K4)** 1.1 Basics of Python Programming: History of Python 1.2 Features of Python-Literal-Constants-Variables 1.3 Identifiers–Keywords-Built-in Data Types 1.4 Output Statements-Input Statements-Comments -Indentation 1.5 Operators-Expressions-Type conversions. 1.6 Python Arrays: Defining and Processing Arrays – Array methods.						
	UNIT- II: (12 hours) (K1, K2, K3 & K4) 2.1 Control Statements: Selection 2.2 Conditional Branching statements 2.3 If, if-else, nested if and if-elif-else statements. 2.4 Iterative Statements: while loop, for loop, else suite in loop and nested loops. 2.5 Jump Statements, break, continue and pass statements.						
	UNIT-III: (12 hours) (K1, K2, K3 & K4) 3.1 Functions: Function Definition – Function Call Variable Scope and its Lifetime. 3.2 Return Statement. Function Arguments: Required Arguments,						

	Keyword Arguments, Default Arguments and Variable Length Arguments.
	3.3 Recursion Python Strings: String operations - Immutable Strings - Built-in String Methods and Functions - String Comparison.
	3.4 Modules: import statement - The Python module – dir() function.
	3.5 Modules and Namespace
	3.6 Defining our own modules.
	UNIT-IV: (12 hours) (K1, K2, K3 & K4)
	4.1 Lists: Creating a list- Access values in List-Updating values in Lists- Nested lists- Basic list operations- List Methods.
	4.2 Tuples: Creating, Accessing, Updating and Deleting Elements in a tuple.
	4.3 Nested tuples–Difference between lists and tuples.
	4.4 Dictionaries: Creating, Accessing, Updating and Deleting Elements in a Dictionary.
	4.5 Dictionary Functions and Methods
	4.6 Difference between Lists and Dictionaries.
	UNIT-V: (12 hours) (K1, K2, K3 & K4)
	5.1 Python File Handling: Types of files in Python - Opening and Closing files.
	5.2 Reading and Writing files: write() and write lines() methods
	5.3 Append() method– read() and read lines() methods–with keyword– Splitting words
	5.4 File methods- File Positions
	5.5 Renaming and deleting files
Extended Professional Component (is a part of internal component only, not to be included in the	Questions related to the above topics,from various competitive examinations UPSC/ JAM/ TNPSC and others to be solved (To be discussed during the Tutorial hours)

external examination Question paper)	
Recommended Text	1. Reema Thareja, ‒Python Programming using problem solving approach‖,First Edition, 2017,Oxford University Press 2. Dr.R.Nageswara Rao,‒Core Python Programming‖,First Edition,2017,Dreamtech Publishers.
Reference Books	**1.** Vamsi Kurama,‒Python Programming: A modern Approach‖, Pearson Education. Mark Lutz,‖Learning Python‖, Orielly. **2.** Adam Stewarts,‒Python Programming‖,Online. Fabio Nelli,‒Python Data Analytics‖, A Press. **3.** Kenneth A.Lambert,‒Fundamentals of Python-First Programs‖ , CENGAGE Publication.
Website and e-learning source	1. https://www.programiz.com/python-programming 2. https://www.guru99.com/python-tutorials.html 3. https://www.w3schools.com/python/python_intro.asp 4. https://www.geeksforgeeks.org/python-programming-language/ 5. https://en.wikipedia.org/wiki/Python_(programming_language

Course Outcomes:
On completion of the course, the students should be able to **CO1:** Learn the basics of python, Do simple programs on python, Learn how to use an array.(K1, K2, K3, K4) **CO2:** Develop program using selection statement,Work with Looping and jump statements, Do programs on Loops and jump statements. (K1, K2, K3, K4) **CO3:**Concept of function, function arguments, Implementing the concept strings in various application, Significance of Modules, Work with functions, Strings and modules. (K1, K2, K3, K4) **CO4:**Work with List, tuples and dictionary, Write program using list, tuples and dictionary. (K1, K2, K3, K4) **CO5:**Usage of File handlings in python, Concept of reading and writing files, Do programs using files.(K1, K2, K3, K4)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	M	H	H	H
CO2	H	M	M	H	M	H
CO3	H	M	L	H	M	M
CO4	H	L	L	M	L	H
CO5	H	L	H	M	H	H

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	M	H
CO2	H	H	M	M	H	H
CO3	M	H	H	L	H	M
CO4	H	L	H	H	L	H
CO5	H	H	L	H	M	H

Title of the Course	PRACTICAL I: PYTHON PROGRAMMING					
Paper No.	Core 2					
Category	Practical	Year	I	Credits	3	Course Code	UCCAB24
		Semester	I				
Instructional Hours per week	Lecture	Tutorial	Lab Practice		Total	
	-	-	3		3	
Pre requisites	Higher Secondary level					
Objectives of the course	1. Be able to design and program Python applications. 2. Be able to create loops and decision statements in Python. 3. Be able to work with functions and pass arguments in Python. 4. Be able to build and package Python modules for reusability. 5. Be able to read and write file in Python.					
Course Outline	**Practical Program: (30 hours)** 1. Program using variables, constants, I/O statements in Python. 2. Program using Operators in Python. 3. Program using Conditional Statements. 4. Program using Loops. 5. Program using Jump Statements. 6. Program using Functions. 7. Program using Recursion. 8. Program using Arrays. 9. Program using Strings. 10. Program using Modules. 11. Program using Lists. 12. Program using Tuples. 13. Program using Dictionaries. 14. Program for File Handling.					

Course Outcomes:

On completion of the course the students should be able to

CO1: Demonstrate the understanding of syntax and semantics.

CO2: Identify the problem and solve using PYTHON programming techniques.

CO3: Identify suitable programming constructs for problem solving.

CO4: Analyze various concepts of PYTHON language to solve the problem in an efficient way.

CO5: Develop a PYTHON program for a given problem and test for its correctness.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	M	M	L	H
CO2	H	L	L	L	H	M
CO3	M	H	M	L	M	M
CO4	H	M	L	M	L	L
CO5	H	M	L	M	L	M

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	M	L
CO2	L	L	L	M	L	H
CO3	H	M	M	H	H	M
CO4	L	H	L	M	M	H
CO5	M	H	H	H	M	L

Title of the Course	**SEC: STRUCTURED PROGRAMMING LANGUAGE IN C**						
Paper No.	SEC-I						
Category	Practical	Year	I	Credits	2	Course Code	USCA124
		Semester	I				
Instructional Hours per week	Lecture	Tutorial	Lab Practice		Total		
	2	-	-		2		
Pre requisites	Higher Secondary level						
Objectives of the course	● To familiarize the students with the Programming basics and the fundamentals of C, Data types in C, Mathematical and logical operations. ● To understand the concept using if statements and loops ● This unit covers the concept of Arrays ● This unit covers the concept of Functions ● To understand the concept of implementing pointers.						
Course Outline	**UNIT- I: (12 hours)** Overview of C: Importance of C, sample C program, C program structure, executing C program - Constants, Variables, and Data Types: Character set, C tokens, keywords and identifiers, constants, Variables, data types, declaration of variables, assigning values to variables - Assignment statement, declaring a variable as constant, as volatile. - Operators and Expression. - Managing Input Operations, Managing Output Operations						
	UNIT - II: (12 hours) Decision Making and Branching : Decision making with If, - Simple IF, IFELSE, nested IFELSE, ELSEIF ladder, - Switch, GOTO statement. -Decision Making and Looping: While, Do-While, - For, Jumps in loops.						
	UNIT-III : (12 hours) Arrays: Declaration and accessing of one & two-dimensional arrays,- Initializing two-dimensional arrays,-Multidimensional arrays. -Dynamic Array - Predefined Streams						
	UNIT-IV: (12 hours) Functions: The form of C functions, Return values and types, calling a function, categories of functions, Nested functions,Recursion, functions with arrays, call by value, Call by reference, storage classes Character arrays. String functions						
	UNIT-V: (12 hours) Pointers: definition, declaring and initializing pointers, Accessing a variable through address and through pointer, Pointer expressions, pointer increments and						

	scale factor, Pointers and arrays, Pointers and functions. Pointers and structures.
Recommended Text	1. Balagurusamy, Programming in ANSI C, Fifth Edition, TataMcGraw-Hill, 2010.
Reference Books	**1.** Byron Gottfried, Schaum's Outline Programming with C, Fourth Edition, Tata McGraw-Hill, 2018. 2. Kernighan and Ritchie, The C Programming Language, Second Edition, Prentice Hall, 1998. 3. Yashavant Kanetkar, Let Us C, Eighteenth Edition, BPB Publications, 2021
Website and e-learning source	1. https://codeforwin.org/ 2. https://www.geeksforgeeks.org/c-programming-language/ 3. http://en.cppreference.com/w/c 4. http://learn-c.org/ 5. https://www.cprogramming.com/

Course Outcomes:

On completion of the course the students should be able to

CO1: Remember the program structure of C with its syntax and semantics

CO2: Understand the programming principles in C (datatypes, operators, branching and looping, arrays, functions, structures, pointers and files).

CO3: Apply the programming principles learnt in real-time problems.

CO4: Analyze the various methods of solving a problem and choose the best method.

CO5: Code, debug and test the programs with appropriate test cases.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	L	M	L	L	H
CO2	H	M	L	H	L	H
CO3	H	L	L	M	M	M
CO4	M	L	M	M	L	M
CO5	M	M	L	M	M	H

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	L	H	H	L	L
CO2	H	H	L	H	M	L
CO3	M	H	M	L	H	M
CO4	H	L	H	H	H	H
CO5	H	H	L	H	M	H

Title of the Course	FC: FUNDAMENTALS OF INFORMATION TECHNOLOGY						
Paper No.	**Foundation Course**						
Category	Practical	Year	I	**Credits**	2	**Course Code**	**UFCA24**
		Semester	I				
Instructional Hours per week	Lecture	Tutorial	Lab Practice			Total	
	2	-	-			2	
Pre requisites	Higher Secondary level						
Objectives of the course	1. Understand basic concepts and terminology of information technology. 2. Have a basic understanding of personal computers and their operation. 3. Be able to identify data storage and it susage. 4. Get great knowledge of software and its functionalities. 5. Understand about operating system and their uses.						
Course Outline	**UNIT-I :(12 hours)** 1.1 Introduction to Computers- Generations of Computer. 1.2 Data and Information. 1.3 Components of Computer. 1.4 Software – Hardware 1.5 Input Devices- Output Devices 1.6 Types of Operating System.						
	UNIT-II :(12 hours) 2.1 MsWord: Introduction– Elements of Window– Files, Folders and Directories. 2.2 Text Manipulating: Cut, Copy, Paste, Drag and Drop. 2.3 Text Formatting: Font – Style, Size, Face and Colors (Both foreground and background). 2.4 Alignment-Bullets and Numbering- Header and footer- watermark. 2.5 Inserting objects (images, other application document) 2.6 Table creation – Mail merge.						
	UNIT-III: (12 hours) 3.1 MsExcel: Introduction–Inserting rows and columns. 3.2 Sizing rows and columns–Implementing formulas.						

	3.3 Generating series-Functions in excel
	3.4 Creation of Chart– Inserting objects.
	3.5 Filter–Sorting
	3.6 Inserting work sheet.
	UNIT-IV: (12 hours) 4.1 MSPower Point: Introduction– Slides Manipulation (Inserting new Copy, paste, delete and duplicate slides). 4.2 Slide show– Types of Views. 4.3 Types of Animations–Inserting Objects. 4.4 Implementing multimedia (Video and Audio). 4.5 Templates (Built-in and User-Defined).
	UNIT-V:(12 hours) 5.1 Internet: Introduction to Internet and Intranet. 5.2 Services of Internet-Domain Name – URL. 5.3 Browser – Types of Browsers – Search Engine. 5.4 E-Mail – Basic Components of E-Mail –.How to send group mail 5.5 E-Commerce: Digital Signature–Digital Currency 5.6 Online shopping and transaction.
Recommended Text	1. Anoop Mathew, S. Kavitha Murugeshan (2009),―Fundamental of Information Technology, Majestic Books. 2. Alexis Leon, Mathews Leon, Fundamental of Information Technology‖, 2nd Edition. 3. S. K Bansal,―Fundamental of Information Technology.
Reference Books	4. Bhardwaj Sushil Puneet Kumar,―Fundamental of Information Technology 5. GGWILKINSON,―Fundamentals of Information Technology, Wiley-Blackwell 6. A Ravichandran―Fundamentals of Information Technology, Khanna Book Publishing
Website and e-learning source	1. https://testbook.com/learn/computer-fundamentals 2. https://www.tutorialsmate.com/2020/04/computer-fundamentals-tutorial.html 3. https://www.javatpoint.com/computer-fundamentals-tutorial 4. https://www.tutorialspoint.com/computer_fundamentals/index.htm 5. https://www.nios.ac.in/media/documents/sec229new/Lesson1.pdf

Course Outcomes:

On completion of the course the students should be able to

CO1: Learn the basics of computer, Construct the structure of the required things in computer learn how to use it.

CO2: Develop organizational structure using for the devices present currently under input or outputunit.

CO3: Concept of storing data in computer using two header namely RAM and ROM with different types of ROM with advancement in storage basis.

CO4: Work with different software, Write program in the software and applications of software.

CO5: Usage of Operating system in information technology which really acts as a interpreter between software and hardware.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	L	L	M	M
CO2	H	L	M	H	L	M
CO3	L	H	L	M	M	L
CO4	H	M	M	L	H	M
CO5	H	L	M	L	H	M

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	L	H	H	M	H
CO2	H	H	L	H	M	L
CO3	M	H	M	L	H	M
CO4	H	L	H	H	L	M
CO5	H	H	L	H	M	H

Title of the Course	DATA STRUCTURES AND ALGORITHMS						
Paper No.	**Core 3**						
Category	**Core**	**Year**	I	**Credits**	5	**Course Code**	UCCAC24
		Semester	II				
Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**		**Total**		
	6	-	-		6		
Pre requisites	Higher Secondary level						
Objectives of the course	1. To understand the concepts of ADTs. 2. To learn linear data structures Lists, Stacks, Queues. 3. To learn Tree Structures and Application of Trees. 4. To learn Graph Structures and Application of graphs. 5. To understand various Sorting and Searching.						
Course Outline	**UNIT-I (15 hours)** 1.1 Abstract Data Types (ADTs) - List ADT- Array-based implementation. 1.2 Linked list implementation singly linked lists. 1.3 Circular linked lists - Doubly-linked lists. 1.4 Applications of lists – Polynomial Manipulation. 1.5 All operations – Insertion – Deletion. 1.6 Merge – Traversal.						
	UNIT-II (15 hours) 2.1 Stack ADT – Operations – Applications. 2.2 Evaluating arithmetic expressions. 2.3 Conversion of infix to postfix expression. 2.4 Queue ADT – Operations. 2.5 Circular Queue – Priority Queue. 2.6 De-Queue applications of queues.						
	UNIT-III (15 hours) 3.1 Tree ADT – Tree traversals – Binary Tree ADT. 3.2 Expression Trees - Applications of trees. 3.3 Binary search tree ADT - Threaded Binary Trees. 3.4 AVL Trees - B-Tree - B+ Tree. 3.5 Heap – Applications of heap.						

	UNIT-IV (15 hours) 4.1 Definition – Representation of Graph. 4.2 Types of graph – Breadth first traversal. 4.3 Depth first traversal. 4.4 Topological sort - Bi-connectivity. 4.5 Cut vertex – Euler circuits. 4.6 Applications of graphs.
	UNIT-V (15 hours) 5.1 Searching – Linear search – Binary search. 5.2 Sorting – Bubble sort – Selection sort. 5.3 Insertion sort – Shell sort – Radix sort. 5.4 Hashing: Hash functions – Separate chaining. 5.5 Open Addressing – Rehashing Extendible Hashing.
Recommended Text	1. Mark Allen Weiss, ‖Data Structures and Algorithm Analysis in C++‖, Pearson Education 2014, 4th Edition. 2. Reema Thareja, ‖Data Structures Using C‖, Oxford Universities Press 2014, 2nd Edition.
Reference Books	1. Thomas H.Cormen, ChalesE.Leiserson, Ronald L.Rivest, Clifford Stein,‖Introduction to Algorithms‖, McGraw Hill 2009, 3rd Edit 2. Aho, Hopcroftand Ullman, ‖Data Structures and Algorithms‖, Pearson Education 2003.
Website and e-learning source	1. NPTEL & MOOC courses titled DataStructures. 2. https://nptel.ac.in/courses/106106127/

Course Outcomes:

On completion of the course the students should be able to

CO1: Understand the concept of Dynamic Memory Management, Data Types, Algorithms, Big O Notation.

CO2: Understand basic data structures such as arrays, linked lists, stacks and queues.

CO3: Describe the hash function and concepts of collision and its resolution methods.

CO4: Solve problem involving graphs, trees and heaps.

CO5: Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	L	M	L	H	M	M
CO2	H	L	H	H	L	M
CO3	L	H	L	M	M	L
CO4	M	H	M	M	L	M
CO5	M	L	H	L	H	M

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	L	H
CO2	L	M	L	M	H	H
CO3	H	L	M	L	M	M
CO4	M	M	L	H	H	L
CO5	H	L	L	L	H	L

Title of the Course	PRACTICAL II: DATA STRUCTURES AND ALGORITHMS LAB USING C++						
Paper No.	Core 4						
Category	Practical	Year	I	Credits	3	Course Code	UCCAD24
		Semester	II				
Instructional Hours per week	Lecture	Tutorial	Lab Practice		Total		
	-	-	3		3		
Pre requisites	Higher Secondary level						
Objectives of the course	1. To understand the concepts of ADTs. 2. To learn linear data structures Lists, Stacks, Queues. 3. To learn Tree Structures and Application of Trees. 4. To learn Graph Structures and Application of graphs. 5. To understand various Sorting and Searching.						

Course Outline	**Practical Program: (30 hours)**
	
	1. Write a program to implement the List ADT using arrays and linked lists.
	
	2. Write a programs to implement the following using a singly linked list.
	   • Stack ADT
	   • Queue ADT
	
	3. Write a program that reads an infix expression, converts the expression to postfix form and then evaluates the postfix expression (use stack ADT).
	4. Write a program to implement priority queue ADT.
	
	5. Write a program to perform the following operations:
	   • Insert an element into a binary search tree.
	   • Delete an element from a binary search tree.
	   • Search for a key element in a binary search tree.
	
	6. Write a program to perform the following operations
	   • Insertion into an AVL-tree
	   • Deletion from an AVL-tree
	
	7. Write a programs for the implementation of BFS and DFS for a given graph.
	
	8. Write a programs for implementing the following searching methods:						

	• Linear search • Binary search. 9. Write a programs for implementing the following sorting methods: • Bubble sort • Selection sort • Insertion sort • Radix sort.

Course Outcomes:

On completion of the course the students should be able to

CO1: Understand the concept of Dynamic Memory Management, Data Types, Algorithms, Big O Notation.

CO2: Understand basic data structures such as arrays, linked lists, stacks and queues.

CO3: Describe the hash function and concepts of collision and its resolution methods.

CO4: Solve problem involving graphs, trees and heaps.

CO5: Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	H	L	M	L	H
CO2	M	H	L	M	H	M
CO3	M	H	L	H	M	L
CO4	L	M	L	H	L	M
CO5	H	L	M	H	L	M

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	M	L	H
CO2	L	M	L	H	H	M
CO3	H	L	M	L	M	H
CO4	M	M	L	M	H	L
CO5	H	M	L	H	L	M

Title of the Course	SEC: INTRODUCTION TO HTML						
Paper No.	SEC-2						
Category	Practical	Year	I	Credits	2	Course Code	USCA224
		Semester	II				
Instructional Hours per week	Lecture	Tutorial	Lab Practice		Total		
	2	-	-		2		
Pre requisites	Higher Secondary level						
Objectives of the course	1. Insert a graphic within a web page. 2. Create a link within a web page. 3. Create a table within a web page. 4. Insert the adding levels within a web page. 5. Insert ordered and unordered lists within a web page. Create a web page.						
Course Outline	**UNIT-I : (6 hours)** Introduction: Web Basics - What is Internet? - Web browsers - What is Web page - HTML Basics: Understanding tags. **UNIT-II (6 hours)** Tags for Document structure (HTML,Head,Body Tag) - Block level text elements - Headings paragraph(<p>tag) - Font style elements:(bold,italic, font,small,strong,strike,) - Big tags. **UNIT-III (6 hours)** Lists - Types of lists: Ordered, Unordered - Nesting Lists - Other tags: Marquee, HR, BR - Using Images - Creating Hyper links. **UNIT-IV :(6 hours)** Tables: Creating basic Table - Table elements - Caption–Table - Cell alignment– Row span - Cols pan – Cell padding. **UNIT-V: (6 hours)** Frames - Frameset - Targeted Links – Noframe - Forms:Input,Textarea, Select,Option.						

Recommended Text	1. Mastering HTML5 and CSS3 Made Easy ‖,Teach U Comp Inc., 2014. 2. Thomas Michaud, "Foundations of Web Design: Introduction to HTML&CSS"
Reference Books	1. https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf 2. https://www.w3schools.com/html/default.asp

Course Outcomes:

On completion of the course the students should be able to

CO1: Knows the basic concept in HTML Concept of resources in HTML.

CO2: Knows Design concept. Concepts of Meta Data Understand the concept of save the files.

CO3: Understand the page formatting, Concept of list, Creating Links.

CO4: Know the concept of creating link to email address.

CO5: Concept of adding images understand the table creation.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	L	M	M	H	L	H
CO2	L	M	L	M	H	M
CO3	M	H	M	L	M	M
CO4	L	M	L	H	L	L
CO5	H	M	H	L	M	M

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	H	H
CO2	H	H	M	H	H	H
CO3	M	H	H	H	H	H
CO4	H	H	H	H	H	H
CO5	H	H	H	M	H	H

Title of the Course	SEC: UNDERSTANDING INTERNET						
Paper No.	SEC-3						
Category	Core	Year	I	Credits	2	Course Code	USCA324
		Semester	II				
Instructional Hours per week	Practical	Tutorial	Lab Practice			Total	
	2	-	-			2	
Pre requisites	Higher Secondary level						
Objectives of the course	1. Knowledge of Internet medium 2. Internet as a mass medium 3. Features of Internet Technology 4. Internet as source of infotainment 5. Study of internet audiences and about cyber crime						
Course Outline	**UNIT-I :(6 hours)** The emergence of internet as a mass medium- The world of World Wide Web. **UNIT-II: (6 hours)** Features of internet as a technology. **UNIT-III: (6 hours)** Internet as a source of infotainment - Classification based on content and style. **UNIT-IV :(6 hours)** Demographic and psychographic descriptions of internet- Audiences– effect of internet on the values and life-styles. **UNIT-V :(6 hours)** Present issue such as cyber crime and future possibilities.						
Recommended Text	**1.** Barnouw E and Krishna swamy S [1990] Indian Film. New York, OUP. 2. Kumar, Keval [1999] Mass Communication in India. Mumbai, Jaico. 3. Srivastava, KM [1992] Media Issues. Sterling Publishers Pvt Ltd.						
Reference Books	1. Acharya, RN [1987] Television in India. Manas Publications, New Delhi.						

Website and e-learning source	1. https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf 2. https://www.w3schools.com/html/default.asp

Course Outcomes:

On completion of the course the students should be able to

CO1: The emergence of internet as a mass medium–the world of world wide web

CO2: Features of internet as a technology

CO3: Internet as a source of infotainment–classification based on content and style.

CO4: Demographic and psycho graphic descriptions of internet audiences effect of internet on the values and life-styles.

CO5: Present issues such as cyber crime and future possibilities.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	M	L	M	H
CO2	M	L	M	L	H	M
CO3	M	H	M	L	H	M
CO4	L	M	L	M	L	L
CO5	H	H	L	M	L	M

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	H	H
CO2	H	H	M	H	H	H
CO3	M	H	H	H	H	H
CO4	H	H	H	H	H	H
CO5	H	H	H	M	H	H

Title of the Course	PROGRAMMING IN JAVA						
Paper No.	Core 5						
Category	Core	Year	II	Credits	5	Course Code	UCCAE24
		Semester	III				
Instructional Hours per week	Lecture	Tutorial	Lab Practice			Total	
	5	-	-			5	
Pre requisites	Higher Secondary level						
Objectives of the course	1. To provide fundamental knowledge of object-oriented programming. 2. To equip the student with programming knowledge in Core Java from the basics up. 3. To enable the students to use AWT controls, Event Handling and Swing for GUI. 4. To provide fundamental knowledge of object-oriented programming. 5. To equip the student with programming knowledge in Core Java from the basics up						
Course Outline	**UNIT-I :(12 hours)** 1.1 Introduction: Review of Object Oriented concepts- History of Java- Java buzz words. 1.2 JVM architecture-Data types-Variables-Scope and life time of variables 1.3 Arrays-operators-control statements 1.4 type conversion and casting- simple java program- 1.5 Constructors-methods-Static block-Static Data-Static Method. 1.6 String and String Buffer Classes.						
	UNIT-II: (12 hours) 2.1 Inheritance: Basic concepts - Types of inheritance -Member access rules- Usage of this and Super keyword. 2.2 Method Overloading-Method overriding-Abstract classes. 2.3 Dynamic method dispatch - Usage of final keyword. 2.4 Packages: Definition-Access Protection-Importing Packages. 2.5 Interfaces: Definition–Implementation–Extending Interfaces. 2.6 Exception Handling: try–catch- throw - throws–finally–Built-in						

	exceptions- Creating own Exception classes
	UNIT-III : (12 hours) 3.1 Multithreaded Programming: Thread Class-Runnable interface–Synchronization. 3.2 Using synchronized methods– Using synchronized statement. 3.3 Inter thread Communication –Deadlock. 3.4 I/O Streams: Concepts of streams- Stream classes- Byte and Character stream. 3.5 Reading console Input and Writing Console output –File Handling.
	UNIT-IV :(12 hours) 4.1 AWT Controls: The AWT class hierarchy - user interface components -Labels-Button. 4.2 Text Components - Check Box - Check Box Group - Choice -List Box – 4.3 Panels – Scroll Pane - Menu - Scroll Bar. 4.4 Working with Frame class - Colour - Fonts and layout managers. 4.5 Event Handling: Events- Event sources- Event Listeners - Event Delegation Model (EDM). 4.6 Handling Mouse and Keyboard Events - Adapter classes – Inner classes.
	UNIT-V :(12 hours) 5.1 Swing: Introduction to Swing- Hierarchy of swing components. 5.2 Containers-Top level containers. 5.3 JFrame- JWindow - JDialog - JPanel - JButton - JToggle Button. 5. 4 JCheck Box- JRadio Button -JLabel, JTextField. 5.5 JTextArea- JList- JCombo Box- JScrollPane.
Recommended Text	1. Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010 2. Gary Cornell, Core Java2 VolumeI–Fundamentals, Addison Wesley, 1999 Edition.
Reference Books	1. Head First Java, O'Rielly Publications. 2. Y. Daniel Liang, Introduction to Java Programming,7thEdition, Pearson EducationIndia,2010.

Website and e-learning source	1. https://javabeginnerstutorial.com/core-java-tutorial 2. http://docs.oracle.com/javase/tutorial/ 3. https://www.coursera.org/

Course Outcomes:

On completion of the course the students should be able to

CO1: Understand the basic Object-oriented concepts. Implement the basic constructs of Core Java.

CO2: Implement inheritance, packages, interfaces and exception handling of Core Java.

CO3: Implement multi-threading and I/O Streams of Core Java

CO4: Implement AWT and Event handling.

CO5: Use Swing to create GUI.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	L	L	M	M	M
CO2	M	M	M	M	H	H
CO3	M	M	M	L	L	M
CO4	H	M	L	M	H	H
CO5	M	L	M	H	M	H

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	L	H	L	M	H
CO2	H	M	L	H	M	L
CO3	M	H	M	L	H	M
CO4	H	L	H	M	L	H
CO5	L	M	L	H	M	H

Title of the Course	PRACTICAL III: PROGRAMMING IN JAVA LAB						
Paper No.	Core 6						
Category	Practical	Year	II	Credits	3	Course Code	UCCAF24
		Semester	III				
Instructional Hours per week	Lecture	Tutorial	Lab Practice		Total		
	-	-	3		3		
Pre requisites	Higher Secondary level						
Objectives of the course	1. To provide fundamental knowledge of object-oriented programming. 2. To equip the student with programming knowledge in Core Java from the basics up. 3. To enable the students to know about Event Handling. 4. To enable the students to use String Concepts. 5. To equip the student with programming knowledge in to create GUI using AWT controls.						

Course Outline	**Practical Programs:(30 hours)**
	1. Write a Java program that prompts the user for an integer and then prints Out
	    all the prime numbers up to that Integer.
	2. Write a Java program to multiply two given matrices.
	3. Write a Java program that displays the number of characters, lines and words
	   in a text
	4. Generate random numbers between two given limits using Random class and
	   print messages according to the range of the value generated.
	5. Write a program to do String Manipulation using Character Array and perform
	   the following string operations:
	   a. String length.
	   b. Finding a character at a particular position.
	   c. Concatenating two strings.						

6. Write a program to perform the following string operations using String class:

  a. StringConcatenation.

  b. Searchasubstring.

  c. Toextractsubstringfromgivenstring.

7. Write a program to perform string operations using String Buffer class:

  a. Length of a string.

  b. Reverse a string.

  c. Delete a sub string from the given string

8. Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.

9. Write a threading program which uses the same method asynchronously to print the numbers1to10 using Thread 1 and to print 90 to 100 using Thread2.

10. Write a program to demonstrate the use of following exceptions.

  a. Arithmetic Exception

  b. Number Format Exception

  c. Array Index Out of Bound Exception

  d. Negative Array Size Exception

11. Write a Java program that reads on file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes

12. Write a program to accep ta text and change its size and font. Include bold italic options. Use frames and controls.

13. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. (Use adapter classes).

14. Write a Java program that works as a simple calculator. Use a grid layout

	to arrange buttons forth edigits and forth e+,-,*,% operations. Add a text field to display the result. Handle any possible exceptions like divide by zero.
	15. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with—stop‖or—ready‖or—go‖ should appear above the buttons in a selected color. Initially there is no message shown.

Course Outcomes:

On completion of the course the students should be able to

CO1: Understand the basic Object-oriented concepts. Implement the basic constructs of Core Java.

CO2: Implement inheritance, packages, interfaces and Exception handling of Core Java.

CO3: Implement multi-threading and I/O Streams of Core Java

CO4: Implement AWT and Event handling.

CO5: Use Swing to create GUI.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	L	M	L	M	H
CO2	H	M	M	M	H	H
CO3	M	H	M	L	M	H
CO4	H	M	L	M	H	H
CO5	H	L	M	H	M	L

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	L	H	M	L	H	M
CO2	H	M	L	L	M	L
CO3	M	L	M	L	H	M
CO4	L	L	M	M	L	M
CO5	H	H	L	L	H	L

Title of the Course	**SEC: PHP PROGRAMMING**						
Paper No.	**SEC-4**						
Category	**Practical**	**Year**	II	**Credits**	1	**Course Code**	USCA424
		Semester	III				
Instructional Hours per week	**Lecture**	**Tutorial**		**Lab Practice**		**Total**	
		-		2		2	
Pre requisites	Higher Secondary level						
Objectives of the course	1. To provide the necessary knowledge on basics of PHP. 2. To design and develop dynamic, database -driven web applications using PHP version. 3. To get an experience on various web application development techniques. 4. To learn the necessary concepts for working with the files using PHP. 5. To get a knowledge on OOPS with PHP.						
Course Outline	**UNIT-I :(13 hours)** Introduction to PHP -Basic Knowledge of websites - Introduction of Dynamic Website - Introduction to PHP -Scope of PHP - XAMPP and WAMP Installation. **UNIT-II: (11 hours)** PHP Programming Basics - Syntax of PHP - Embedding PHP in HTML - Embedding HTML in PHP - Introduction to PHP Variable - Understanding Data Types -Using Operators -Using Conditional Statements -If(), else if() and else if condition Statement. **UNIT-III: (12 hours)** Switch() Statements -Using the while() Loop- Using the for ()Loop PHP Functions -PHP Function -Creating an Array - Modifying Array Elements.- Processing Arrays with Loops - Creating forms to Display, Add, Edit and Delete files- Grouping Form Selections with Arrays- Using Array Functions. **UNIT-IV: (12 hours)** PHP Advanced Concepts -Reading and Writing Files- Reading Data from a File. **UNIT-V: (12 hours)** Managing Sessions. -Using Session Variables - Destroying a Session -Storing Data in Cookies - Setting Cookies.						

Recommended Text	1. Head First PHP & MySQL: A Brain- Friendly Guide – 2009 – LynnmighleyandMichael.Morrison. 2. The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL- Alan Forbes
Reference Books	1. PHP: The Complete Reference Steven Holzner. DT Editorial Services (Author),—HTML5 Black Book (Covers CSS3, Java Script, XML, XHTML, AJAX, PHP, jQuery), Paper back 2016, 2nd Edition.
Website and e-learning source	1. https://www.w3schools.com/php/default.asp

Course Outcomes:

On completion of the course the students should be able to

CO1: Write PHP script to handle HTML forms

CO2: Write regular expressions including modifiers, operators and meta characters.

CO3: Create PHP Programusing the concept of array.

CO4: Create PHP programs that use various PHP.

CO5: Library functions

CO6: Manipulate files and directories.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	L	L	L	L
CO2	H	M	L	M	M	M
CO3	M	H	H	L	L	H
CO4	H	L	M	H	L	M
CO5	M	L	M	L	M	L

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	H	M	L
CO2	M	M	L	H	M	L
CO3	H	H	M	L	L	M
CO4	H	H	H	L	L	M
CO5	H	M	L	L	L	L

Title of the Course	SEC: ENTERPRISE RESOURCE PLANNING						
Paper No.	SEC-5						
Practical	Core	Year	II	Credits	2	Course Code	USCA524
		Semester	III				
Instructional Hours per week	Lecture	Tutorial	Lab Practice			Total	
		-	2			2	
Pre requisites	Higher Secondary level						
Objectives of the course	1. To understand the basic concepts, Evolution and Benefits of ERP. 2. To know the need and Role of ERP in logical and Physical Integration. 3. Identify the important business functions provided by typical business of ware such As enterprise resource planning and customer relationship management 4. To train the students to develop the basic understanding of how ERP enriches the Business organizations in achieving a multidimensional growth. 5. To aim at preparing the students technological competitive and make them ready to self-upgrade with the higher technical skills.						
Course Outline	**UNIT-I :(12 hours)** 1.1 ERP Introduction, Benefits, Origin. 1.2 Evolution and Structure: Conceptual Model of ERP. 1.3 The Evolution of ERP 1.4 The Structure of ERP, 1.5 Components and needs of ERP, 1.6 ERP Vendors; Benefits & Limitations of ERP Packages.						
	UNIT-II: (12 hours) 2.1 Need to focus on Enterprise Integration/ ERP; Information mapping - Role of common shared Enterprise database. 2.2 System Integration, Logical vs. Physical System Integration 2.3 Benefits & limitations of System Integration. 2.4 ERP's Role in Logical and Physical Integration. 2.5 Business Process Reengineering, Dataware Housing, Data Mining, Online Analytic Processing (OLAP), 2.6 Product Life Cycle Management (PLM), LAP-Supply chain Management.						

	UNIT-III: (12 hours) 3.1 ERP Market place and Market place Dynamics: Market Overview, Market place Dynamics, the Changing ERP Market. 3.2 ERP- Functional Modules: Introduction, Functional Modules of ERP Software, 3.3 Integration of ERP, Supply chain and Customer Relationship Applications. 3.4 Cloud and Open Source, Quality Management, Material Management, 3.5 Financial Module, CRM and Case Study.
	UNIT-IV :(12 hours) 4.1 ERP Implementation Basics. ERP implementation Strategy. 4.2 ERP Implementation Life Cycle, Pre-Implementation task. 4.3 Role of SDLC/SSAD. 4.4 Object Oriented Architecture. 4.5 Consultants, Vendors and Employees.
	UNIT-V (12 hours) 5.1 ERP & E-Commerce, Future Directives -in ERP. 5.2 ERP and Internet. 5.3 Critical success and failure factors. 5.4 Integrating ERP into organizational culture. 5.5 Using ERP tool: either SAP or ORACLE format to case study.
Recommended Text	1. Enterprise Resource Planning–Alexis Leon, Tata McGraw Hill.
Reference Books	1. Enterprise Resource Planning–Diversified by Alexis Leon, TMH. 2. Enterprise Resource Planning–Ravi Shankar &S.Jaiswal, Galgotia
Website and e-learning source	1.https://www.tutorialspoint.com/management_concepts/enterprise_resource_planning.htm 2.https://www.saponlinetutorials.com/what-is-erp-systems-enterprise-resource-planning/ 3.https://www.guru99.com/erp-full-form.html 4.https://www.oracle.com/in/erp/what-is-erp/

Course Outcomes:

On completion of the course the students should be able to

CO1: Understand the basic concepts of ERP.

CO2: Identify different technologies used in ERP.

CO3: Understand and apply the concepts of ERP Manufacturing Perspective and

     ERP Modules.

CO4: Discuss the benefits of ERP.

CO5: Apply different tools used in ERP.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	L	M	L	L	H
CO2	H	M	L	H	L	H
CO3	H	L	L	M	M	M
CO4	M	L	M	M	L	M
CO5	M	M	L	M	M	H

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	L	H	H	L	L
CO2	H	H	L	H	M	L
CO3	M	H	M	L	H	M
CO4	H	L	H	H	H	H
CO5	H	H	L	H	M	H

Title of the Course	**ASP.NET PROGRAMMING**						
Paper No.	**Core 7**						
Category	**Core**	**Year**	II	**Credits**	5	**Course Code**	UCCAG24
		Semester	IV				
Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**		**Total**		
	5	-	-		5		
Pre requisites	Higher Secondary level						
Objectives of the course	1. To identify and understand the goals and objectives of the .NET frame work and ASP.NET with C# language. 2. To develop ASP.NET Web application using standard controls. 3. To implement file handling operations. 4. To handles SQLServer Database using ADO.NET. 5. Understand the Grid view control and XML classes.						
Course Outline	**UNIT-I :(12 hours)** 1.1 Overview of .NET frame work: Common Language Runtime (CLR), 1.2 Framework Class Library 1.3 C# Fundamentals: Primitive types and Variables 1.4 Operators –Conditional statements-Looping statements 1.5 Creating and Using Objects–Arrays 1.6 String operations.						
	UNIT-II: (12 hours) 2.1 Introduction to ASP.NET 2.2 IDE languages supported Components 2.3 Working with Web Forms 2.4 Web form standard controls: Properties and its events 2.5 HTML Controls 2.6 List Controls: Properties and its events.						
	UNIT-III: (12 hours) 3.1 Rich Controls: Properties and its events 3.2 validation controls: Properties and its events 3.3 File Stream classes -File Modes – File Share 3.4 Reading and Writing to files 3.5 Creating, Moving, Copying and Deleting files –File uploading.						

	UNIT-IV: (12 hours) 4.1 ADO.NET Overview 4.2 Data base Connections 4.3 Commands 4.4 Data Reader –Data Adapter –Data Sets . 4.5 Data Controls and its Properties–Data Binding. 4.6 Data Binding.
	UNIT-V: (12 hours) 5.1 Grid View control: Deleting, editing, Sorting and Paging. 5.2 XML's Hidden role in .NET - Improving the List with XML 5.3 XML classes– Web form to manipulate XML files 5.4 Web site Security-Authentication-Authorization 5.5 Creating a Web application.
Recommended Text	1. SvetlinNakov, VeselinKolev& Co, Fundamentals of Computer Programming with C#, Faber publication, 2019. 2. Mathew, MacDonald, TheCompleteReferenceASP.NET, Tata McGraw-Hill, 2017.
Reference Books	1. Herbert Scheldt, The Complete ReferenceC#.NET, Tata McGraw-Hill,2017. 2. KogentLearningSolutions,C#2012ProgrammingCovers .NET4.5BlackBook,Dreamtechpres,2013. 3. Anne Boehm, Joel Murach, Murach's C#2015,MikeMurach& AssociatesInc.2016. 4. Danielle Otey, MichaelOtey,ADO.NET: The Complete reference, McGraw Hill,2008. 5. Matthew Mac Donald, Beginning ASP.NET4 in C# 2010, APRESS, 2010.
Website and e-learning source	1. https://www.geeksforgeeks.org/introduction-to-net-framework/ 2. https://www.javatpoint.com/net-framework

Course Outcomes:

On completion of the course the students should be able to

CO1: Develop working knowledge of C# programming constructs and the .NET Frame work

CO2: To develop a software to solve real-world problems using ASP.NET

CO3: To Work On Various Controls Files

CO4: To create web application using Microsoft ADO.NET.

CO5: To develop web applications using XML

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	H	L	L	M	M
CO2	M	L	M	H	L	M
CO3	L	H	L	M	M	L
CO4	M	M	M	L	H	M
CO5	M	L	M	L	L	M

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	L	H	H	M	H
CO2	L	H	L	H	M	L
CO3	M	H	M	L	H	M
CO4	H	L	H	H	L	M
CO5	H	H	L	H	M	H

Title of the Course	**PRACTICAL IV: ASP.NET PROGRAMMING LAB**						
Paper No.	**Core 8**						
Category	**Core**	**Year**	II	**Credits**	3	**Course Code**	UCCAH24
		Semester	IV				
Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	.	-	3			3	
Pre requisites	Higher Secondary level						
Objectives of the course	1. To develop ASP.NET Web application using standard controls. 2. To create rich database applications using ADO.NET. 3. To implement file handling operations. 4. To implement XML classes. 5. To utilize ASP.NET security features for authenticating the website						
Course Outline	**Practical Program: (Hours: 30)** 1. Create an exposure of Web applications and tools 2. Implement the HTML Controls 3. Implement the Server Controls 4. Web application using Web controls. 5. Web application using List controls. 6. Web Page design using Rich control. Validate user input using Validation controls. Working with File concepts. 7. Web application using Data Controls. 8. Data binding with Web controls 9. Data binding with Data Controls. 10. Data base application toper form insert, update and delete operations. 11. Database application using Data Controls to Perform insert, delete, edit, paging and sorting operation. 12. Implement the Xml classes. 13. Implement Authentication –Authorization. 14. Ticket reservation using ASP.NET controls. 15. Online examination using ASP.NET controls						

Course Outcomes:

On completion of the course the students should be able to

CO1: To create web applications and implement various controls

CO2: Create web pages in Rich control.

CO3: Develop knowledge about file handling operations

CO4: An ability to design XML classes

CO5: To develop as software to solve real-world problems using ASP.NET

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	L	H	M	M	L	H
CO2	M	L	L	L	H	M
CO3	M	H	M	L	M	M
CO4	L	M	L	M	L	L
CO5	H	M	L	M	L	M

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	M	L
CO2	L	L	M	L	L	H
CO3	H	M	M	H	H	M
CO4	L	H	L	M	M	H
CO5	M	H	H	H	M	L

Title of the Course	SEC: MULTIMEDIA SYSTEMS						
Paper No.	SEC-6						
Category	Practical	Year	II	Credits	2	Course Code	USCA624
		Semester	IV				
Instructional Hours per week	Lecture	Tutorial	Lab Practice		Total		
		-	2		2		
Pre requisites	Higher Secondary level						
Objectives of the course	1. Understand the definition of Multimedia 2. To study about the Image File Formats, Sounds Audio File Formats 3. Understand the concepts of Animation and Digital Video Containers 4. To study about the Stage of Multimedia Project **5.** Understand the concept of ownership of Content Created for Project Acquiring Talent						
Course Outline	**UNIT-I :(6 hours)** 1.1 Multimedia Definition-Use Of Multimedia 1.2 Delivering Multimedia 1.3 Text: About Fonts and Faces 1.4 Using Text in Multimedia-Computers and Text Font Editing and Design Tools 1.5 Hypermedia and Hypertext.						
	UNIT-II: (6 hours) 2.1 Images: Plan Approach 2.2 Organize Tools-Configure Computer Workspace 2.3 Making Still Images-Color –Image File Formats. 2.4 Sound: The Power of Sound-Digital Audio- Midi Audio - Midwives. 2.5 Digital Audio-Multimedia System Sounds Audio File Formats- Vaughan's Law of Multimedia Minimums - Adding Sound to Multimedia Project						

	UNIT-III: (6 hours) 3.1 Animation: The Power of Motion 3.2 Principles of Animation- Animation by Computer 3.3 Making Animations that Work. 3.4 Video: Using Video –Working with Video and Displays 3.5 Digital Video Containers-Obtaining Video Clips- Shooting and Editing Video.
	UNIT-IV: (6 hours) 4.1 Making Multimedia: The Stage of Multimedia Project. 4.2 The Intangible Needs -The Hardware Needs. 4.3 The Software Needs. Multimedia production team
	UNIT-V : (6 hours) 5.1 Planning and Costing: The Process of Making Multimedia- 5.2 Scheduling- Estimating-RFPs and Bid Proposals. 5.3 Designing and Producing 5.4 Content and Talent: Acquiring Content 5.5 Ownership of Content Created for Project 5.6 Acquiring Talent
Recommended Text	1. Tay Vaughan, "Multimedia: Making It Work", 9th Edition, Osborne/ McGraw- Hill, 2014.
Reference Books	1. Ralf Steinmetz & Klara Nahrstedt" Multimedia Computing, Communication & Applications",Pearson Education,2012.
Website and e-learning source	https://www.geeksforgeeks.org/multimedia-systems-with-features-or-characteristics/

Course Outcomes:

On completion of the course the students should be able to

CO1: Understand the concepts, importance, application and the process of developing multimedia

CO2: To have basic knowledge and understanding about image related processing's

CO3: To understand the frame work of frames and bit images to animations

CO4: Speaks about the multimedia projects and stages of requirement in phases of project.

CO5: Understanding the concept of cost involved in multimedia planning, designing, and producing

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	H	M	M	M	L
CO2	H	M	M	M	H	L
CO3	M	H	H	M	L	H
CO4	H	L	M	M	L	M
CO5	M	L	M	L	M	L

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	L	M	H	M	L
CO2	L	M	L	H	M	L
CO3	M	L	M	L	M	M
CO4	H	L	H	L	L	M
CO5	H	M	L	M	M	H

Title of the Course	SEC: SOFTWARE TESTING						
Paper No.	**SEC-7**						
Category	Elective	Year	II	**Credits**	2	**Course Code**	USCA724
		Semester	IV				
Instructional Hours per week	Lecture	Tutorial	Lab Practice		Total		
		-	2		2		
Pre requisites	Higher Secondary level						
Objectives of the course	1. To study fundamental concepts in software testing 2. To discuss various software testing issues and solutions in software unit test, integration and system testing. 3. To study the basic concept of Data flow testing and Domain testing. 4. To Acquire knowledge on path products and path expressions. To learn about Logic based testing and decision tables.						
Course Outline	**UNIT-I :(6 hours)** Introduction: Purpose–Productivity and Quality in Software -Testing Vs Debugging - Model for Testing – Bugs - Types of Bugs - Testing and Design Style.						
	UNIT-II: (6 hours) Flow / Graphs -Path Testing- Achievable paths -Path instrumentation Application - Transaction Flow Testing Techniques.						
	UNIT-III: (6 hours) Data Flow Testing Strategies -Domain Testing: Domains and Paths - Domains and Interface Testing.						
	UNIT-IV :(6 hours) Linguistic -Metrics–Structural Metric-Path Products and Path Expressions - Syntax Testing – Formats -Test Cases						
	UNIT-V :(6 hours) Logic Based Testing - Decision Tables-Transition Testing -States, State Graph -State Testing.						

Recommended Text	1. B.Beizer,‒Software Testing Techniques‖, IIEdn., DreamTech India, NewDelhi,2003.
	2. K.V.K.Prasad,‒ Software Testing Tools‖,Dream Tech. India, New Delhi,2005
Reference Books	1. I.Burnstein,2003,‒PracticalSoftwareTesting‖,SpringerInternationalEdn.
	2. E.Kit,1995,―SoftwareTestingintheRealWorld:ImprovingtheProcess‖, PearsonEducation,Delhi.
	3. R.Rajani,andP.P.Oak,2004,‒SoftwareTesting‖,TataMcgrawHill, NewDelhi.
Website and e-learning source	1. https://www.javatpoint.com/software-testing-tutorial
	2. https://www.guru99.com/software-testing.html

Course Outcomes:

On completion of the course the students should be able to

CO1: Students learn to apply software testing knowledge and engineering methods.

CO2: Have an ability to identify the needs of Software Test automation, and define and develop a Test tool to support test automation.

CO3: Have an ability understand and identify various software testing problems, and solve these problems by designing and selecting software test models,criteria,strategies,and methods.

CO4: Have basic understanding and knowledge of contemporary issues in software testing, such as component –based software testing problems.

CO5: Have an ability to use software testing methods and modern software testing tools for their testing projects.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	L	M	H	M	L
CO2	H	M	H	M	H	L
CO3	L	H	H	M	L	H
CO4	H	M	M	H	L	M
CO5	M	H	M	L	H	L

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	M	H	M	M	M	-
CO2	H	M	M	H	H	M
CO3	M	H	H	M	M	H
CO4	M	L	M	M	M	L
CO5	M	M	H	M	M	M

Title of the Course	**COMPUTER NETWORKS**						
Paper No.	**Core 9**						
Category	**Core**	**Year**	III	**Credits**	4	**Course Code**	UCCAI24
		Semester	V				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	5		-			5	
Prerequisites	Operating System						
Objectives of the course	1. To learn the basic concepts of Data communication and Computer network. 2. To learn about wireless Transmission. 3. To learn about networking and data link layer. 4. To study about Network communication. 5. To learn the concept of Transport layer.						
Course Outline	**Unit I (15 Hours) (K1, K2)** 1.1 Introduction – Network Hardware – Software – Reference Models. 1.2 OSI and TCP/IP Models. 1.3 Example Networks: Internet, ATM. 1.4 Understanding Ethernet and Wireless LANs - Physical Layer. 1.5 Theoretical Basis for Data Communication 1.6 Guided Transmission Media.						
	Unit II (15 Hours) (K1, K2, K3) 2.1 Wireless Transmission. 2.2 Communication Satellites. 2.3 Telephone System: Structure, Local Loop. 2.4 Trunks and Multiplexing and Switching. 2.5 Data Link Layer: Design Issues. 2.6 Error Detection and Correction.						
	Unit III (15 Hours) (K1, K2, K3, K4) 3.1 Elementary Data Link Protocols - Sliding Window Protocols. 3.2 Data Link Layer in the Internet. 3.3 Medium Access Layer. 3.4 Channel Allocation Problem. 3.5 Multiple Access Protocols. 3.6 Bluetooth.						

	Unit IV (15 Hours) (K1, K2)
	4.1 Network Layer - Design Issues.
	4.2 Routing Algorithms.
	4.3 Congestion Control Algorithms.
	4.4 IP Protocol.
	4.5 IP Addresses.
	4.6 Internet Control Protocols.
	Unit V (15 Hours) (K1, K2, K3, K4)
	5.1 Object Transport Layer – Services.
	5.2 Connection Management.
	5.3 Addressing - Establishing and Releasing a Connection.
	5.4 Simple Transport Protocol.
	5.5 Internet Transport Protocols (ITP).
	5.6 Network Security: Cryptography.
Recommended Text	1. A. S. Tanenbaum, "Computer Networks", 4th Edition, Prentice-Hall of India, 2008.
ReferenceBooks	1. B. A. Forouzan, "Data Communications and Networking", Tata McGraw Hill, 4th Edition, 2017. 2. F. Halsall, "Data Communications, Computer Networks and Open Systems", Pearson Education, 2008. 3. D. Bertsekas and R. Gallagher, "Data Networks", 2nd Edition, PHI, 2008. 4. Lamarca, "Communication Networks", Tata McGraw- Hill, 2002.
Website and e-learningsource	1. https://en.wikipedia.org/wiki/Computer_network 2. https://citationsy.com/styles/computer-networks

Course Outcomes:

CO1: To understand the basics of Computer Network architecture, OSI and TCP/IP reference models
CO2: To gain knowledge on Telephone systems using wireless network
CO3: To understand the concept of MAC
CO4: To analyze the characteristics of Routing and Congestion control algorithms
CO5: To understand network security and define various protocols such as FTP, HTTP, Telnet, DNS

CO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	L	H	H	H	L	M
CO2	M	L	M	L	H	M
CO3	H	M	M	M	H	L
CO4	M	H	L	M	L	L
CO5	H	L	H	L	M	H

CO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	L	H	M	M	H
CO2	H	L	L	H	M	H
CO3	M	M	M	H	L	M
CO4	L	L	H	M	H	M
CO5	M	M	H	H	L	L

Title of the Course	**RELATIONAL DATABASE MANAGEMENT SYSTEMS**						
Paper No.	**Core 10**						
Category	**Core**	**Year**	III	**Credits**	4	**Course Code**	UCCAJ24
		Semester	V				
Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**		**Total**		
	5	-	-		5		
Pre requisites	Higher Secondary level						
Objectives of the course	1. Describe basic concepts of database system. 2. Design a Data model and Schemas in RDBMS. 3. Competent in use of SQL. 4. Analyze functional dependencies for designing robust Database. 5. Describe basic concepts of database system						
Course Outline	**UNIT-I :(15 hours)** 1.1 Introduction to DBMS– Data and Information - Database – Database Management System. 1.2 Objectives-Advantages–Components-Architecture. 1.3 ER Model: Building blocks of ER Diagram 1.4 Relationship Degree. 1.5 Classification–ER diagram to Tables–ISA relationship. 1.6 Constraints–Aggregation and Composition–Advantages. **UNIT-II: (15 hours)** 2.1 Relational Model: CODD's Rule. 2.2 Relational Data Model-Key. 2.3 Integrity– Relational Algebra Operations. 2.4 Advantages and limitations– Relational 2.5 Calculus– Domain Relational Calculus - QBE. **UNIT-III: (15 hours)** 3.1 Structure of Relational Database. Introduction to Relational Database Design. 3.2 Objectives–Tools–Redundancy and Data Anomaly. 3.3 Functional Dependency- 3.4 Normalization–1NF–2NF–3NF–BCNF. 3.5 Transaction Processing						

	3.6 Database Security.
	UNIT-IV: (15 hours) 4.1 SQL: Commands– Datatypes– DDL- Selection, 4.2 Projection, Join Operations 4.3 Set Operations. 4.4 Aggregate Functions. 4.5 DML–Modification. 4.6 Truncation-Constraints– Subquery.
	UNIT-V: (15 hours) 5.1 PL/SQL: Structure- Elements–Operators Precedence. 5.2 Control Structure 5.3 Iterative Control. 5.4 Cursors-Procedure-Function. 5.5 Packages. 5.6 Exceptional Handling-Triggers.
Recommended Text	1. S. Sumathi, S. Esakkirajan,‒Fundamentals of Relational Database Management System, Springe rInternational Edition 2007.
Reference Books	1. AbrahamSilberchatz, Henry F. Korth, S.Sudarshan,―Database System Concepts, McGraw Hill 2019, 7th Edition. 2. Alexis Leon & Mathews Leon, ― Fundamentals of DBMS, Vijay Nicole Publications 2014, 2nd Edition.
Website and e-learning source	1. NPTEL&MOOCcoursestitledRelationalDatabaseManagementSystems 2. https://nptel.ac.in/courses/106106093/ 3. https://nptel.ac.in/courses/106106095/

Course Outcomes:

On completion of the course the students should be able to

CO1: Understand basic concepts of database system.

CO2: Design a Data model and Schemas in RDBMS.

CO3: Understand Competent in use of SQL.

CO4: Analyze functional dependencies for designing robust Database.

CO5: Understand basic concepts of database system.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	L	M	L	M	M
CO2	H	H	L	M	L	M
CO3	L	M	M	H	H	M
CO4	H	H	L	M	H	M
CO5	M	L	H	H	M	H

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	M	L	H	H	L
CO2	L	M	L	H	M	M
CO3	M	H	L	H	M	L
CO4	H	M	H	H	M	M
CO5	H	M	L	H	M	M

Title of the Course	**Practical - V: PL/SQL**						
Paper No.	**Core 11**						
Category	**Practical**	**Year**	III	**Credits**	4	**Course Code**	UCCAK24
		Semester	V				
Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**		**Total**		
	-	-	3		3		
Pre requisites	HigherSecondary level						
Objectives of the course	1. To enable the students to learn the designing of database systems, foundation on the Relational model of data and normal forms. 2. To understood the concepts of database management system, design simple Database models. 3. To learn and understand to write queries using SQL,PL/SQL. 4. To enable the students to learn the designing of database systems, foundation on the Relational model of data and normal forms. 5. To understood the concepts of database management system, design simple Database Models.						
Course Outline	**Practical Program (Hours: 40)** **I. SQL** 1. DDL COMMANDS 2. DML COMMANDS 3. TCL COMMANDS **II. PL/SQL** 4. FIBONACCI SERIES 5. FACTORIAL 6. STRING REVERSE 7. SUM OF SERIES 8. TRIGGER **III. CURSOR** 9. STUDENT MARK ANALYSIS USING CURSOR **IV. APPLICATION** LIBRARY MANAGEMENT SYSTEM STUDENT MARK ANALYSIS						

Course Outcomes:

On completion of the course the students should be able to

CO1: Understand the various basic concepts of Data Base System. Difference between file system and DBMS and compare various datamodels.

CO2: Define the integrity constraints. Understand the basic concepts of Relational Data Model, Entity Relationship Model.

CO3: Design database schema considering normalization and relationships within database. Understand and construct database using Structured Query Language. Attain a good practical skill of managing and retrieving of data using Data Manipulation Language (DML).

CO4: Classify the different functions and various join operations and enhance the knowledge of handling multiple tables.

CO5: Learn to design Database operations and implement using PL/SQL programs.

CO6: Learn basics of PL/SQL and develop programs using Cursors, Exceptions.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	L	M	M	M
CO2	L	H	M	M	L	L
CO3	H	L	M	L	M	M
CO4	M	H	H	M	H	L
CO5	M	L	M	H	M	M

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	L	M
CO2	M	H	H	H	L	M
CO3	M	H	H	H	L	H
CO4	M	H	H	H	L	M
CO5	M	H	L	H	L	M

Title of the Course	ELECTIVE I A: CLOUD COMPUTING						
Paper No.	Discipline Specific Elective-IA						
Category	Elective	Year	III	Credits	3	Course Code	UECAA24
		Semester	VI				
Instructional Hours per week	Lecture	Tutorial		Lab Practice		Total	
	5	-		-		5	
Pre requisites	Higher Secondary level						
Objectives of the course	1. Learning fundamental concepts and Technologies of Cloud Computing. 2. Learning various cloud service types and the viruses and pitfalls. 3. To learn about Cloud Architecture and Application design. 4. To know the various aspects of application design, bench marking and security on the Cloud. 5. To learn the various Case Studies in Cloud Computing.						
Course Outline	**UNIT-I :(15 hours)** 1.1 Introduction to Cloud Computing: Definition of Cloud Computing – Characteristics of Cloud Computing. 1.2 Cloud Models – Cloud Service Examples – Cloud-based Services and Applications. 1.3 Cloud Concepts and Technologies: Virtualization – Load balancing. 1.4 Scalability and Elasticity – Deployment – Replication – Monitoring. 1.5 Software Defined Networking – Network Function Virtualization. 1.6 Map Reduce – Identity and Access Management – Service Level Agreements – Billing. **UNIT-II: (15 hours)** 2.1 Cloud Services: Compute Services: Amazon Elastic Computer Cloud - Google Compute Engine - Windows Azure Virtual Machines. 2.2 Storage Services: Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage. 2.3 Database Services: Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database – Windows Azure Table Service. 2.4 Application Services: Application Runtimes and Frameworks – Queuing Services – Email Services –Notification Services – Media Services. 2.5 Content Delivery Services: Amazon Cloud Front – Windows Azure						

Content Delivery Network Analytics Services: Amazon Elastic Map Reduce - Google Map Reduce Service – Google Big Query –Windows Azure HD Insight.

2.6 Deployment and Management Services: Amazon Elastic Beanstack – Amazon Cloud Formation - Identity and Access Management Services: Amazon Identiy and Access Management –Windows Azure Active DirectoryOpen Source Private Cloud Software: Cloud Stack – Eucalyptus – Open Stack.

UNIT-III: (15 hours)

3.1 Cloud Application Design:Introduction – Design Consideration for Cloud Applications.

3.2 Scalability–Reliability and Availability– Security – Maintenance and Upgradation.

3.3 Performance – Reference Architectures for Cloud Applications.

3.4 Cloud Application Design Methodologies: Service Oriented Architecture(SOA).

3.5 Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller (MVC), REST ful Web Services.

3.6 Data Storage Approaches: Relational Approach (SQL), Non-Relational Approach (NoSQL).

UNIT-IV: (15 hours)

4.1 Cloud Application Bench marking and Tuning:Introduction to Benchmarking – Steps in Benchmarking.

4.2 Workload Characteristics – Application Performance Metrics.

4.3 Design Consideration for Benchmarking Methodology–Benchmarking Tools and Types of Tests- Deployment Prototyping.

4.4 Cloud Security**:** Introduction – CSA Cloud Security Architecture – Authentication (SSO).

4.5 Authorization–Identity and Access Management.

4.6 Data Security : Securing data at rest, securing data in motion –Key Management–Auditing.

UNIT-V :(15 hours)

5.1 Case Studies:Cloud Computing for Healthcare

	5.2 Cloud Computing for Energy Systems
	5.3 Cloud Computing for Transportation Systems
	5.4 Cloud Computing for Manufacturing Industry
	5.5 Cloud Computing for Education.
Recommended Text	ArshdeepBahga, Vijay Madisetti, *Cloud Computing– A Hands On Approach* Universities Press (India) Pvt. Ltd., 2018
Reference Books	1. Anthony T Velte, Toby J Velte, Robert Elsenpeter, *Cloud Computing: A PracticalApproach*, TataMcGraw-Hill,2013. 2. Barrie Sosinsky, *Cloud Computing Bible*, Wiley India Pvt. Ltd., 2013. 3. David Crookes, *Cloud Computing in Easy Steps*, Tata McGraw Hill, 2015. 4. Dr.KumarSaurabh, *Cloud Computing*,WileyIndia,Second Edition 2012.
Website and e-learning source	1. https://en.wikipedia.org/wiki/Cloud_computing 2. https://link.springer.com/chapter/10.1007/978-3-030-34957-8_7 3. https://webobjects.cdw.com/webobjects/media/pdf/solutions/cloud-computing/121838-CDW-Cloud-Computing-Reference-Guide.pdf

Course Outcomes:

 On completion of the course the students should be able to

CO1: Understand the fundamental concepts and Technologies in Cloud Computing.

CO2: Able to understand various cloud service types and the viruses and pitfalls.

CO3: Able to understand Cloud Architecture and Application design.

CO4: Understand the various aspects of application design, benchmarking and security on the Cloud.

CO5: Understand various Case Studies in Cloud Computing.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	L	L	L	H	H	M
CO2	M	L	M	H	L	M
CO3	L	H	L	H	M	L
CO4	M	H	L	M	L	M
CO5	H	H	M	L	H	M

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	M	M	M	H	H	L
CO2	H	L	H	H	H	M
CO3	H	M	L	M	L	H
CO4	H	H	M	H	M	M
CO5	M	M	L	H	H	H

Title of the Course	**ELECTIVE I B: ARTIFICIAL INTELLIGENCE**						
Paper No.	**Discipline Specific Elective-IB**						
Category	Elective	Year	III	**Credits**	3	**Course Code**	UECAB24
		Semester	V				
Instructional Hours per week	Lecture	Tutorial	Lab Practice		Total		
	5	-	-		5		
Pre requisites	Higher Secondary level						
Objectives of the course	1. To learn various concepts of AI Techniques. 2. To learn various Search Algorithm in AI. 3. To learn probabilistic reasoning and models in AI. 4. To learn about Markov Decision Process. 5. To learn various type of Reinforcement learning.						
Course Outline	**UNIT-I :(15 hours)** 1.1 1.1 Introduction: Concept of AI. 1.2 1.2 History, current status, scope. 1.3 1.3 Agents, environments. 1.4 1.4 Problem Formulations, Review of tree and graph structures. 1.5 1.5 State space representation 1.6 1.6 Search graph and Search tree						
	UNIT-II: (15 hours) 2.1 Search Algorithms: Random search, Search with closed and open list. 2.2 Depth first search 2.3 Breadth first search. 2.4 Heuristic search Best first search. 2.5 A*algorithm. 2.6 Game Search.						
	UNIT-III: (15 hours) 3.1 Probabilistic Reasoning: Probability, conditional probability. 3.2 Bayes Rule. 3.3 Bayesian Networks- representation. 3.4 Construction and inference 3.5 Temporal model. 3.6 Hidden Markov model.						
	UNIT-IV :(15 hours) 4.1 Markov Decision process: MDP formulation. 4.2 utility theory. 4.3 utility Functions. 4.4 value iteration.						

	4.5 Policy iteration and partially observable MDPs.
	UNIT-V: (15 hours) 5.1 Reinforcement Learning: Passive reinforcement learning. 5.2 direct utility estimation. 5.3 Adaptive dynamic programming. 5.4 Temporal difference. 5.5 Learning, active reinforcement learning -Q learning.
Recommended Text	1. Stuart Russel Peter Norvig, "Artificial Intelligence- A Modern Approach" Second Edition Pearson Education/ Prentice Hall of India 2010. 2. Elaine Richand Kevin Knight,—Artificial Intelligence‖, Tata McGraw Hill.
Reference Books	1. Trivedi, M. C.,— A Classical Approach to Artifical Intelligence, Khanna Publishing House, Delhi. 2. SarojKaushik, — Artificial Intelligence, Cengage Learning India, 2011. 3. David Poole and Alan Mackworth, — Artificial Intelligence: Foundations for Computational Agents, Cambridge University Press, 2010.
Website and e-learning source	1. NPTEL&MOOCcoursestitledArtificialIntelligenceandExpertSystems 2. https://nptel.ac.in/courses/106106140/ 3. https://nptel.ac.in/courses/106106126/

Course Outcomes:

On completion of the course the students should be able to

CO1: Understand the various concepts of AI Techniques.

CO2: Understand various Search Algorithm in AI.

CO3: Understand probabilistic reasoning and models in AI.

CO4: Understand Markov Decision Process.

CO5: Understand various type of Reinforcement learningTechniques.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	L	M	L	M
CO2	L	M	M	L	M	L
CO3	M	L	L	H	M	M
CO4	M	M	M	L	H	M
CO5	L	H	L	M	L	L

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	M	H	M	M	H	L
CO2	H	M	H	M	H	M
CO3	H	L	M	M	L	M
CO4	M	H	H	L	H	L
CO5	H	M	H	H	H	M

Title of the Course	**ELECTIVE II A: SOFTWARE METRICS**						
Paper No.	**Discipline Specific Elective-2A**						
Category	**Elective**	**Year**	III	**Credits**	3	**Course Code**	UECAC24
		Semester	V				
Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	4	-	-			4	
Pre requisites	Higher Secondary level						
Objectives of the course	1. Gain a solid understanding of what software metrics are and their significance. 2. Learn how to identify and select appropriate software metrics based on project goals. 3. Acquire knowledge and skills in collecting and measuring software metrics. 4. Learn how to analyze and interpret software metrics data to extract valuable insights. 5. Gain the ability to evaluate software quality using appropriate metrics.						
Course Outline	**UNIT-I :(15 hours)** 1.1 Fundamentals of Measurement: Need for Measurement: 1.2 Measurement in Software Engineering, Scope of Software Metrics. 1.3 The Basics of measurement: The representational theory of measurement. 1.4 Measurement and models. 1.5 Measurement scales and scale types, meaningfulness in measurement.						
	UNIT-II: (15 hours) 2.1 A Goal- Based Framework For Software Measurement: Classifying software measures. 2.2 Determining what to Measure, Applying the framework. 2.3 Software measurement validation, Performing Software Measurement Validation. 2.4 Empirical investigation: Principles of Empirical Studies, Planning Experiments. 2.5 Planning case studies as quasi-experiments 2.6 Relevant and Meaningful Studies.						

	UNIT-III :(15 hours) 3.1 Software Metrics Data Collection: Defining good data. 3.2 Data collection for incident reports, How to collect data, Reliability of data collection Procedures. 3.3 Analyzing software measurement data. 3.4 Statistical distributions and hypothesis testing. 3.5 Classical data analysis techniques 3.6 Examples of simple analysis techniques.
	UNIT-IV: (15 hours) 4.1 Measuring internal product attributes: Size Properties of Software Size, Code size, Design size. 4.2 Requirements analysis and Specification size, Functional size measures and estimators, Applications of size measures. 4.3 Measuring internal product attributes: Structure: Aspects of Structural Measures. 4.4 Control flow structure of program units, Design-level Attributes. 4.5 Object-oriented Structural attributes and measures.
	UNIT-V: (15 hours) 5.1 Measuring External Product Attributes: Modelling software quality. 5.2 Measuring aspects of quality, Usability Measures, Maintainability measures, Security Measures 5.3 Software Reliability. 5.4 Measurement and Prediction: Basic of reliability theory, The software reliability problem. 5.5 Parametric reliability growth models 3.6 Predictive accuracy.
Recommended Text	1. Software Metrics A Rigorous and Practical Approach, Norman Fenton, James Bieman, Third Edition,2014.
Reference Books	1. Software metrics, Norman E, Fentonand Shari Lawrence Pfleeger, International Thomson ComputerPress,1997 2. Metric and models in software quality engineering, Stephen H. Kan, Second edition, 2002, Addison Wesley Professional 3. Practical Software Metrics for Project Management and Process

	Improvement, Robert B.Grady, 1992, Prentice Hall.
Website and e-learning source	1. https://lansa.com/blog/general/what-are-software-metrics-how-can-i-measure-these-metrics/ 2. https://stackify.com/track-software-metrics/

Course Outcomes:

On completion of the course the students should be able to

CO1: Understand various fundamentals of measurement and software metrics.

CO2: Identify frame work and analysis techniques for software measurement.

CO3: Apply internal and external attributes of software product for effort estimation.

CO4: Use appropriate analytical techniques to interpret software metrics data and derive meaningful insights.

CO5: Recommend reliability models for predicting software quality.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	L	H	L	M
CO2	L	L	M	L	M	L
CO3	H	M	L	H	L	M
CO4	M	L	H	L	H	M
CO5	L	H	L	M	L	L

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	M	M	M	H	H	L
CO2	H	H	L	M	H	M
CO3	M	M	H	H	M	M
CO4	M	L	H	H	M	L
CO5	L	M	M	H	M	M

Title of the Course	**ELECTIVE II B: HUMAN COMPUTER INTERACTION**					
Paper No.	**Discipline Specific Elective 2B**					
Category	**Elective**	**Year**	III	**Credits**	3	**Course**
		Semester	V			**Code** UECAD24
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**		**Total**	
	4		-		4	
Prerequisites	Mobile Application Development					
Objectives of the course	1. 1. To learn about the foundations of Human Computer Interaction. 2. To learn the design and software process technologies. 3. To learn HCI models and theories. 4. To learn Mobile Ecosystem. 5. To learn the various types of Web Interface Design.					
Course Outline	**Unit I (Hours 12) (K1)** 1.1 The Human: I/O Channels 1.2 Memory 1.3 Reasoning and Problem solving- Processing and Networks 1.4 Interaction: Models- Frameworks 1.5 Ergonomics 1.6 Interactivity Paradigms.					
	Unit II (Hours 12) (K2) 1.1 Interactive Design 1.2 Basics- Process- Scenarios. 1.3 Navigation: Screen Design Iteration 1.4 Prototyping. 1.5 Software Life Cycle 1.6 Design Rules: Principles					
	Unit III (Hours 12) (K2) 1.1 HCI Models: Cognitive Models 1.2 Socio Organizational 1.3 Issues and Stakeholder requirements. 1.4 Communication and Collaboration Models. 1.5 Hypertext 3.6 Multimedia and WWW.					

	Unit IV (Hours:12) (K2, K3)
	4.1 Mobile Ecosystem: Platforms
	4.2 Application Frameworks
	4.3 Types of Mobile Applications: Widgets, Applications Games.
	4.4 Mobile Information Architecture
	4.5 Mobile Design: Elements of Mobile Design.
	4.6 Case Studies.
	Unit V (Hours 12) (K4)
	5.1 Designing Web Interfaces
	5.2 Drag and Drop
	5.3 Direct Selection
	5.4 Contextual Tools
	5.5 Virtual Pages.
	5.6 Process Flow.

Recommended Text	1.Alan Dix Janet Finlay, Gregory Abowd, Russel Beale, "Human Computer Interaction" III Edition Pearson Education ,2004(Unit I,II& III)
	2.Brian Fling – " Mobile Design and Development", I Edition ,O Reilly Media Inc 2009(Unit IV)
	3. Bill Scott and Theresa Neil – Designing web Interfaces First Edition O Reilly 2009(Unit V)
ReferenceBooks	1. Shneiderman Designing the User Interfaces Strategies for Effective Human Computer Interaction", V Edition, Pearson Education.
Website and e-learningsource	**Web Resources** 1. https://www.interaction-design.org/literature/topics/human computer interaction. 2. http://link.springer.com/10.1007/978-0-387-39940-9-192.

Course Outcomes:

Course Outcomes (Cos)
CO1: Understand the fundamentals of HCI
CO2: Understand the design and software process technologies.
CO3: Understand HCI Models and Theories.
CO4: Understand the mobile Ecosystem, types of Mobile Applications, Mobile Architecture and Design.
CO5: Understand the various types of web Interface Design.

CO	PO					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	M	L	L	H	M	M
CO2	H	M	H	M	H	L
CO3	H	M	L	M	L	H
CO4	L	H	H	L	M	H
CO5	M	M	H	M	M	L

CO	PSO					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	L	H	H	M	L	M
CO2	M	M	L	M	M	M
CO3	H	M	M	L	H	L
CO4	L	H	L	H	H	H
CO5	M	L	M	H	M	M

Title of the Course	**OPERATING SYSTEMS**						
Paper No.	**Core 13**						
Category	**Core**	**Year**	III	**Credits**	4	**Course Code**	UCCAM24
		Semester	VI				
Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	6	-	-			6	
Pre requisites	Higher Secondary level						
Objectives of the course	1. Understanding the design of the Operating System. 2. Imparting knowledge on CPU scheduling, Process and Memory Management. 3. To code specialized programs for managing over all resources and operations of the computer. 4. To study about the concept of Job and process or scheduling. 5. To learn about the concept of memory organization and multi programming.						
Course Outline	**UNIT-I :(15 hours)** 1.1 Introduction: operating system, history (1990sto2000and beyond). 1.2 Distributed computing, parallel computation. 1.3 Process concepts:definition of process, process states-Life cycle of a process, process management-process state transitions, process control block (PCB). 1.4 Process operations, suspend and resume. 1.5 Context switching, Interrupts-Interrupt processing, interrupt classes. 1.6 Inter process communication - signals, message passing.						
	UNIT-II: (15 hours) 2.1 Asynchronous concurrent processes:mutual exclusion- critical section, mutual exclusion primitives. 2.2 Implementing mutual exclusion primitives, Petersons, algorithm. 2.3 Software solutions to the mutual Exclusion Problem-n-thread mutual exclusion. 2.4 Lamp posts Bakery- Algorithm Semaphores – Mutual exclusion with Semaphores. 2.5 Thread synchronization with semaphores, counting semaphores. 2.6 Implementing semaphores. Concurrent programming: Monitors, message						

	passing.
	UNIT-III: (15 hours) 3.1 Deadlock and indefinite Postponement: Resource concepts. 3.2 Four necessary conditions for deadlock. 3.3 Deadlock prevention, deadlock avoidance. 3.4 Dijkstra's Banker's algorithm. 3.5 Deadlock election, deadlock recovery.
	UNIT-IV: (15 hours) 4.1 Job and processor scheduling: scheduling levels, scheduling objectives. 4.2 Scheduling criteria, preemptive vs non-preemptive scheduling. 4.3 Interval timer or interrupting clock, priorities, scheduling algorithms - FIFO scheduling. 4.4 RR scheduling, quantum size, SJF scheduling. 4.5 SRT scheduling, HRN scheduling, multilevel feedback queues - Fair share scheduling.
	UNIT-V :(15 hours) 5.1 Real Memory organization and Management: Memory organization, Memory management, Memory hierarchy, 5.2 Memory management strategies, contiguous vs non – contiguous memory allocation, single user contiguous memory allocation, fixed partition multi programming, variable partition multi programming. 5.3 Memory swapping - Virtual Memory organization: virtual memory basic concepts, multilevel storage organization. 5.4 Block mapping, paging basic concepts, segmentation. 5.5 Paging / segmentation systems. 5.6 Virtual Memory Management:Demand Paging, Pager replacement strategies.
Recommended Text	1. H.M.Deitel, Operating Systems, Third Edition, Pearson Education Asia, 2011.
Reference Books	1. William Stallings, Operating System Internals and Design Principles, Seventh Edition Prentice – Hall of India, 2012. 2. A. Silberschatz, and P.B. Galvin., Operating Systems Concepts, Ninth

	Edition, John Wiley & Sons (ASIA) PteLtd.,2012.
Website and e-learning source	1. http://www.freebookcentre.net/UnixCategory/unixCategory.html 2. http://freecomputerbooks.com/unixCategory.html

Course Outcomes:

On completion of the course the students should be able to

CO1: Define the fundamentals of OS and identify the concepts relevant to process, process lifecycle, Scheduling Algorithms, Deadlock and Memory management.

CO2: Know the critical analysis of process involving various algorithms, an exposure to threads and semaphores.

CO3: Have a complete study about Deadlock and its impact over OS. Knowledge of handling Deadlock with respective algorithms and measures to retrieve from deadlock.

CO4: Have complete knowledge of Scheduling Algorithms and its types.

CO5: Understand memory organization and management

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	L	L	L	H	M	M
CO2	H	L	M	H	L	M
CO3	L	H	L	M	M	L
CO4	M	H	L	M	L	M
CO5	M	L	M	L	H	M

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	L	L	M	M	L
CO2	M	H	L	M	H	L
CO3	H	L	H	H	L	L
CO4	L	H	L	L	H	M
CO5	H	L	L	H	M	L

Title of the Course	**DATA ANALYTICS USING R PROGRAMMING**						
Paper No.	**Core 14**						
Category	**Core**	**Year**	III	**Credits**	4	**Course Code**	UCCAN24
		Semester	VI				
Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**		**Total**		
	6	-	-		6		
Pre requisites	Higher Secondary level						
Objectives of the course	1. To understand the problem solving approaches 2. To learn the basic programming constructs in R Programming 3. To learn the basic programming constructs in R Programming 4. To use R Programming data structures-lists, tuples, and dictionaries 5. To do input/output with files in R Programming.						
Course Outline	**UNIT-I: (18 hours)** 1.1 Evolution of big data- Best Practices for Big data Analytics 1.2 Big data characteristics-Validating- The Promotion of the Value of Big Data 1.3 Big Data Use Cases- Characteristics of Big Data Applications 1.4 Perception and Quantification of Value-Understanding Big Data Storage - A General Overview of High-Performance Architecture- HDFS 1.5 Map Reduce and YARN-Map Reduce Programming Model						
	UNIT-II: (18 hours) 2.1 Control Structures And Vectors- Control Structures- functions- scoping Rules- dates and times 2.2 Introduction to Functions, preview of Some Important R Data Structures 2.3 Vectors-Character Strings- Matrices- Lists- Data Frames 2.4 Classes Vectors-Generating sequences- Vectors and subscripts- Extracting elements of a vector using subscripts 2.5 Working with logical subscripts- Scalars- Vectors- Arrays and Matrices- Adding and Deleting Vector Elements 2.6 Obtaining the Length of a Vector- Matrices and Arrays as Vectors Vector Arithmetic and Logical						

	UNIT-III: (18 hours) 3.1 LISTS- Lists: Creating Lists- General List Operations-List Indexing Adding 3.2 Deleting List Elements- Getting the Size of a List 3.3 Extended Example- Text Concordance Accessing List Components 3.4 Values Applying Functions to Lists 3.5 Data Frames, Creating Data Frames 3.6 Accessing Data Frames- Other Matrix-Like Operations
	UNIT-IV: (18 hours) 4.1 FACTORS AND TABLES-Factors and Levels- Common Functions Used with Factors 4.2 Working with Tables- Matrix/Array-Like Operations on Tables- Extracting a Sub Table 4.3 Finding the Largest Cells in a Table- Math Functions- Calculating a Probability 4.4 Cumulative Sums and Products- Minima and Maxima 4.5 Calculus, Functions for Statistical Distributions R Programming.
	UNIT-V: (18 hours) 5.1 OBJECT-ORIENTED PROGRAMMINGS Classes, S Generic Functions 5.2 Writing S Classes 5.3 Using Inheritance- S Classes 5.4 Implementing a Generic Function on an S Class- visualization 5.5 Simulation- code profiling 5.6 Statistical Analysis with R- data manipulation
Recommended Text	1. Roger D.Peng,R Programming for Data Science−,2012 2. Norman Malt off, The Art of R Programming- A Tour of Statistical Software Design,2011.
Reference Books	1. Garrett Grolemund, Hadley Wickham, Hands-On Programming with R: Write Your Own Functions and Simulations, 1st Edition, 2014. 2. Venables, W.N., and Ripley, S programming−, Springer, 2000.
Website and e-learning source	1. https://www.simplilearn.com

Course Outcomes:

On completion of the course the students should be able to

CO1: Work with big data tools and its analysis techniques.

CO2: Analyze data by utilizing clustering and classification algorithms.

CO3: Learn and apply different mining algorithms and recommendation systems for large volumes of data.

CO4: Perform analytics on data streams.

CO5: Learn No SQL data bases and management.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	L	M	L	H	H
CO2	H	H	L	M	L	M
CO3	L	M	M	H	L	M
CO4	L	H	M	M	H	M
CO5	M	L	L	H	M	H

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	M	H	L	H	L
CO2	H	H	M	M	L	M
CO3	L	M	H	L	M	L
CO4	M	M	L	H	M	L
CO5	M	M	M	L	H	L

Title of the Course	PRACTICAL VI: R PROGRAMMING						
Paper No.	Core 14						
Category	Practical	Year	III	Credits	2	Course Code	UCCAO24
		Semester	VI				
Instructional Hours per week	Lecture	Tutorial	Lab Practice		Total		
	-	-	3		3		
Pre requisites	Higher Secondary level						
Objectives of the course	1. To understand the problem solving approaches. 2. To learn the basic programming constructs in R Programming 3. To practice various computing strategies for R Programming-based solutions to real world problems. 4. To use R Programming data structures-lists, tuples, and dictionaries.						
Course Outline	**Practical Program: (Hours: 40)** 1. Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending Upon user's choice. 2. Program, to find the area of rectangle, square, circle and triangle by accepting suitable input Parameters from user. 3. Write a program to find list ofevennumbersfrom1tonusingR-Loops. 4. Create a function to print squares of numbers in sequence. 5. Write a program to join columns and rows in a data frame using c bind() and r bind()in R. 6. Implement different String Manipulation functions in R. 7. Implement different data structures in R(Vectors, Lists, Data Frames). 8. Write a program to read a csv file and analyze the data in the file in R. 9. Create pie chart and bar chart using R. 10. Create a data set and do statistical analysis on the data using R. 11. Create a data set and do statistical analysis on the data using R. 12. Write a R program to count the number of even and odd numbers from array of N numbers.						

Course Outcomes:

On completion of the course the students should be able to

CO1: Acquire programming skills in core R Programming.
CO2: Acquire Object-oriented programming skills in R Programming.
CO3: Develop the skill of designing graphical-user interfaces (GUI) in R Programming.

C04: Acquire R Programming skills to move into Specific branches.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	H	L	M	M	M
CO2	L	H	M	M	M	L
CO3	L	L	M	L	M	M
CO4	M	H	M	M	H	L
CO5	M	L	M	H	M	M

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	L	M
CO2	M	H	H	H	L	M
CO3	M	H	H	H	L	M
CO4	M	H	H	H	L	M
CO5	M	H	H	H	L	M

Title of the Course	PRACTICAL VII: LINUX						
Paper No.	**Core 16**						
Category	Practical	**Year**	III	**Credits**	2	**Course Code**	UCCAP24
		Semester	VI				
Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	-	-	3			3	
Prerequisites							
Objectives of the course	1. To provide the skills in Linux Shell Script. 2. To learn programmatically to implement simple OS mechanisms. 3. To understand shell script in files. 4. To learn about standard, I/O and system calls. 5. To learn suspending and resuming process.						

Course Outline	**Practical Programs (45 Hours) (K5,K6)**
	 1. Write a shell script that accepts a file name, starting and ending line numbers as arguments and displays all the lines between the given line numbers.
	 2. Write a shell script that displays a list of all files in the current directory to which the user has read, write and execute permissions.
	 3. Write a shell script to find the factorial of a given number.
	 4. Write a C program that makes a copy of a file using standard I/O and system calls.
	 5. Implement in C the following Linux commands using system call
	     (a) cat (b) ls (c) mv.
	 6. Write a C program to list every file in a directory, its inode number and
	   file name.
	 7. Write a C program that illustrates how to execute two commands concurrently with a command pipe. Ex: ls -l
		sort.
		 8. Write a C program that illustrates suspending and resuming processes using signals.
		 9. Write a C program that implements a producer-consumer system with two processes (using semaphores).
		 10. Write a C program that illustrates two processes communicating using shared memory.						

Course Outcomes:

The Learners will be able to
1. Get familiar with the GCC compiler and files.
2. Understand the high-level structure of the Linux kernel both in concept and source code.
3. Acquire a detailed understanding of one aspect (the scheduler) of the Linux kernel.
4. Learn to develop software for Linux systems.
5. Obtain a foundation for an advanced course in operating systems.

CO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	M	H	M	H	H
CO2	M	M	L	L	H	M
CO3	L	L	L	H	M	L
CO4	H	L	H	M	H	M
CO5	M	H	M	M	L	L

CO	PO					
	1	2	3	4	5	6
CO1	H	H	L	L	M	H
CO2	M	M	L	H	H	L
CO3	L	M	H	L	M	M
CO4	H	H	M	M	H	M
CO5	M	L	L	H	L	L

Title of the Course	ELECTIVE III A: IOT AND ITS APPLICATIONS						
Paper No.	**Discipline Specific Elective – 3A**						
Category	Elective	Year	III	**Credits**	3	**Course Code**	UECAE24
		Semester	VI				
Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	4	-	-			4	
Pre requisites	Higher Secondary level						
Objectives of the course	1. Use of Devices, Gateways and Data Management in IoT. 2. Design IoT applications in different domain and be able to analyze their performance. 3. Implement basic IoT applications on embedded platform. 4. To gain knowledge on Industry Internet of Things. 5. To Learn about the privacy and Security issues in IoT.						
Course Outline	**UNIT-I: (15 hours)** 1.1 IoT&Web Technology,The Internet of Things Today, Time for Convergence,Towards the IoT Universe. 1.2 Internet of Things Vision, IoT Strategic Research and Innovation Directions. 1.3 IoT Applications, Future Internet Technologies. 1.4 Infrastructure, Networks and Communication, Processes. 1.5 Data Management, Security, Privacy&Trust, Device Level Energy Issues. 1.6 IoT Related Standardization, Recommendations on Research Topics.						
	UNIT-II: (15 hours) 2.1 M2M to IoT – A Basic Perspective –Introduction, Some Definitions, M2M Value Chains, IoT Value Chains. 2.2 An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. 2.3 M2M to IoT-An Architectural. 2.4 Overview–Building an architecture. 2.5 Main design principles and needed capabilities. 2.6 An IoT architecture outline, standards considerations.						

	UNIT-III: (15 hours)
	3.1 IoT Architecture - State of the Art – Introduction, State of the art, Architecture.
	3.2 Reference Model- Introduction, Reference Model and architecture.
	3.3 IoT referenceModel, IoT Reference Architecture.
	3.4 Introduction, Functional View, Information View.
	3.5 Deployment and Operational View, Other Relevant architectural views.
	UNIT-IV :(15 hours)
	4.1 IoT Applications for Value Creations Introduction.
	4.2 IoTapplications for industry: Future Factory Concepts, Brown field IoT, Smart Objects.
	4.3 Smart Applications, Four Aspects in your Business to Master IoT.
	4.4 Value Creation from Big Data and Serialization, IoT for Retailing Industry.
	4.5 IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry.
	4.6 Home Management.
	UNIT-V: (15 hours)
	5.1 Internet of Things Privacy, Security and Governance Introduction, Overview of Governance.
	5.2 Privacy and Security Issues, Contribution from FP7 Projects.
	5.3 Security, Privacy and Trust in IoT.
	5.4 Data- Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach.
	5.5 Data Aggregation for the IoT in Smart Cities, Security.
Recommended Text	1. Vijay Madisettiand ArshdeepBahga,‒Internet of Things: (AHands-on Approach)‖,Universities Press(INDIA) Private Limited 2014,1ˢᵗ Edition.
Reference Books	1. Michael Miller,The Internet of Things: How Smart TVs, Smart Cars, Smart Homes,and Smart Cities Are Changing the World, kindleversion.
	2. FrancisdaCosta,Rethinking the Internet of Things: A Scalable Approach to Connecting Everything ‖, A press Publications 2013, 1stEdition.
	3. WaltenegusDargie, Christian Poellabauer, "Fundamentals of Wireless

	Sensor Networks:Theoryand Practice‖ 4. CunoPfister,Getting Started with the Internet of Things‖, O'' Reilly Media 2011.
Website and e-learning source	1. https://www.simplilearn.com 2. https://www.javatpoint.com 3. https://www.w3schools.com

Course Outcomes:

On completion of the course the students should be able to

CO1: Work with bigdata tools and its analysis techniques.

CO2: Analyze data by utilizing clustering and classification algorithms.

CO3: Learn and apply different mining algorithms and recommendation systems for large volumes of data.

CO4: Perform analytics on datastreams.

CO5: Learn No SQL databases and management.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	L	M	H	L	M
CO2	M	L	M	H	H	L
CO3	M	H	H	L	M	L
CO4	M	H	L	M	L	M
CO5	M	L	M	L	H	M

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	M	H	L	M	H	M
CO2	M	L	H	L	H	L
CO3	H	M	L	L	M	L
CO4	M	L	M	M	L	M
CO5	M	H	H	M	H	M

Title of the Course	ELECTIVE III B: CYBER SECURITY						
Paper No.	Discipline Specific Elective 3B						
Category	Elective	Year	III	Credits	3	Course Code	UECAF24
		Semester	VI				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	4		-		4		
Prerequisites	Network Security						
Objectives ofthe course	1. To introduce the basic concepts of Cyber Security. 2. To acquire knowledge on cyber threats and attacks. 3. To become aware of significant security technologies and tools. 4. Analyze the cyber security needs of an organization. 5. Examine software vulnerabilities and security solutions to reduce the risk of exploitation.						
Course Outline	**Unit I (12 Hours) (K1, K2)** Introduction to Information Security: Components of Information system – Software Development Life Cycle – Security Software Development Life Cycle- Security Professionals and the organization- Communicates of Interest.						
	Unit II (12 Hours) (K1, K2) Need for Security: Introduction – Business Need First – Threats – Attacks – Secure Software Development.						
	Unit III (12 Hours) (K1, K2) Security Technologies: Introduction – Access Control – Firewall- Protecting Remote Connections – Intrusion Detection and Prevention System – Honeypots – Scanning and Analysis Tools – Biometric Access Control.						
	Unit IV (12 Hours) (K3, K4) Cryptography: Foundation of Cryptology - Cipher Methods - Cryptographic Algorithms - Cryptographic Tools - Protocols for Communication - Attacks on Cryptosystems.						
	Unit V (12 Hours) (K3, K4) Risk Management: An overview of Risk Management – Risk Identification – Risk Assessment – Risk Control Strategy – Risk Management - Risk Control Practices.						

Recommended Text	1. Michael E. Whitman Herbert J.Mattord", Principles of Information Security", 4th Edition. 2. Principles of Information Security by Micheal E. Whitman and Herbert J. Mattord.
Reference Books	1. William Stallings "Cryptography and Network Security Principles and Practice", Pearson Education, 7th Edition. 2. Atul Kahate", Cryptography and Network Security by Richard E. Smith. 3. Fundamentals of Information Systems Security by David Kim and Micheal G.
Website and e-learning source	1.https://library.ju.edu/cybersecurity/web resources 2. https://www.cisa.gov/resources-tools/resources/free-cybersecurity-services-and-tools

Course Outcomes (Cos)
CO1: Understand the basic Concepts need, approaches, Principles and components of security.
CO2: Explain the Various cyber threats and attacks.
CO3: Describe the various Security Technologies and Tools.
CO4: Examine the various protocols for secure communication.
CO5: Explore the significant aspects of cyber security.

CO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	L	M	M	L	H
CO2	L	H	H	H	M	M
CO3	M	M	L	L	H	M
CO4	L	H	M	M	M	H
CO5	H	M	L	L	L	H

CO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	M	H	M	H	L	M
CO2	H	M	H	M	M	H
CO3	H	L	L	M	M	H
CO4	M	L	H	H	H	L
CO5	L	H	M	L	M	H

Title of the Course	ELECTIVE IV A: BIG DATA ANALYTICS						
Paper No.	Discipline Specific Elective 4A						
Category	Core	Year	III	Credits	3	Course Code	UECAG24
		Semester	VI				
Instructional Hours per week	Lecture	Tutorial	Lab Practice			Total	
	5	-	-			5	
Prerequisites	Python, Java						
Objectives of the course	This course aims at providing an overall view of the • Understand the Big Data Platform and its Use cases, Map Reduce Jobs. • To identify and understand the basics of cluster and decision tree. • To study about the Association Rules, Recommendation System. • To learn about the concept of stream. • Understa8nd the concepts of NoSQL Databases.						
Course Outline	**UNIT-I (15 hours) (K1, K2)** 1.1 Evolution of Big data - Best Practices for Big data Analytics - Big data characteristics. 1.2 Validating - The Promotion of the Value of Big Data - Big Data Use Cases. 1.3 Characteristics of Big Data Applications 1.4 Perception and Quantification of Value -Understanding Big Data Storage. 1.5 A General Overview of High-Performance Architecture - HDFS. 1.6 Map Reduce and YARN - Map Reduce Programming Model.						
	UNIT-II (15 hours) (K1, K2) 2.1 Advanced Analytical Theory and Methods: Overview of Clustering K-means. 2.2 Use Cases - Overview of the Method - Determining the Number of Clusters - Diagnostics. 2.3 Reasons to Choose and Cautions-Classification: Decision Trees 2.4 Overview of a Decision Tree -The General Algorithm. 2.5 Decision Tree Algorithms - Evaluating a Decision Tree. 2.6 Decision Trees in R -Naïve Bayes - Bayes Theorem - Naïve Bayes Classifier.						

	UNIT-III (15 hours) (K1, K2)
	3.1 Advanced Analytical Theory and Methods: Association Rules- Overview - Apriori Algorithm.
	3.2 Evaluation of Candidate Rules - Applications of Association Rules
	3.3 Finding Association& finding similarity.
	3.4 Recommendation System: Collaborative Recommendation.
	3.5 Content Based Recommendation.
	3.6 Knowledge Based Recommendation- Hybrid Recommendation Approaches.
	UNIT-IV (15 hours) (K2, K3)
	4.1 Introduction to Streams Concepts - Stream Data Model and Architecture - Stream Computing.
	4.2 Sampling Data in a Stream - Filtering Streams - Counting Distinct Elements in a Stream - Estimating moments.
	4.3 Counting oneness in a Window-Decaying Window
	4.4 Real time Analytics Platform RTAP) applications.
	4.5 Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.
	4.6 Using Graph Analytics for Big Data: Graph Analytics.
	UNIT-V (15 hours) (K2, K3)
	5.1 No SQL Databases: Schema-less Models: Increasing Flexibility for Data Manipulation.
	5.2 Key Value Stores- Document Stores — Tabular Stores — Object Data Stores.
	5.3 Graph Databases Hive — Sharding —HBase.
	5.4 Analyzing big data with twitter.
	5.5 Big data for E-Commerce Big data for blogs.
	5.6 Review of Basic Data Analytic Methods using R.

Recommended Text	1. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
Reference Books	1. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/El Sevier Publishers, 2013. 2. EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015

Website and e-learning source	1. https://www.simplilearn.com 2. https://www.sas.com/en_us/insights/analytics/big-data-analytics.html

Course Outcomes:

The Learners will be able to
1. Work with big data tools and its analysis techniques.
2. Analyse data by utilizing clustering and classification algorithms.
3. Learn and apply different mining algorithms and recommendation systems for large volumes of data.
4. Perform analytics on data streams.
5. Learn NoSQL databases and management.

CO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	L	H	M	H	M	H
CO2	M	H	L	L	H	L
CO3	M	L	L	M	H	M
CO4	H	L	M	H	M	H
CO5	M	H	L	L	M	M

CO	PO					
	1	2	3	4	5	6
CO1	H	L	H	M	M	H
CO2	H	L	L	H	M	H
CO3	M	M	M	H	L	M
CO4	L	L	H	M	H	M
CO5	M	M	H	H	L	L

(Low -L, Medium -M, High-H)

Title of the Course	**ELECTIVE IV B: NATURAL LANGUAGE PROCESSING**						
Paper No.	**Discipline Specific Elective 4B**						
Category	Core	Year	III	**Credits**	3	**Course Code**	UECAH24
		Semester	VI				
Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	5	-	-			5	
Prerequisites	Solid foundation of Mathematics, Programming and Data Structures, Machine Learning Basics.						
Objectives of the course	This course aims at providing an overall view of the • To understand approaches to syntax and semantics in NLP. • To learn natural language processing and to learn how to apply basic algorithms in this field. • To understand approaches to discourse, generation, dialogue and summarization within NLP. • To get acquainted with the algorithmic description of the main language levels: morphology, syntax, semantics, pragmatics etc. • To understand current methods for statistical approaches to machine translation.						
Course Outline	**UNIT-I (15 hours) (K1, K2)** 1.1 Introduction: Natural Language Processing tasks in syntax, semantics, and pragmatics. 1.2 Issue- Applications – The role of machine learning. 1.3 Probability Basics- Information theory. 1.4 Collocations -N-gram Language Models. 1.5 Estimating parameters and smoothing. 1.6 Evaluating language models. **UNIT-II (15 hours) (K1, K2)** 2.1 Word level and Syntactic Analysis: Word Level Analysis - Regular Expressions-Finite. 2.2 State Automata-Morphological Parsing. 2.3 Spelling Error Detection and correction. 2.4 Words and Word classes – Part of Speech Tagging. 2.5 Syntactic Analysis: Context Free Grammar. 2.6 Constituency – Parsing-Probabilistic Parsing. **UNIT-III (15 hours) (K1, K2)** 3.1 Semantic analysis and Discourse Processing**:** Semantic Analysis - Meaning Representation. 3.2 Lexical Semantics- Ambiguity.						

	3.3 Word Sense Disambiguation. 3.4 Discourse Processing: cohesion- Reference Resolution. 3.5 Discourse Coherence and Structure.
	UNIT-IV (15 hours) (K1, K2) 4.1 Natural Language Generation: Architecture of NLG Systems. 4.2 Generation Tasks and Representations. 4.3 Application of NLG. Machine Translation: Problems in Machine Translation. 4.4 Characteristics of Indian Languages- Machine Translation Approaches. 4.5 Translation involving Indian Languages.
	UNIT-V (15 hours) (K1, K2) 5.1 Information retrieval and lexical resources**:** Information Retrieval: Design features of Information Retrieval Systems. 5.2 Classical - Non-classical. 5.3 Alternative Models of Information Retrieval. 5.4 Valuation Lexical Resources: WorldNet-Frame Net Stemmers. 5.5 POS Tagger. 5.6 Research Corpora SSAS.

Recommended Text	1. Daniel Jura sky, James H. Martin, "Speech & language processing", Pearson publications. 2. Allen, James. Natural language understanding. Pearson, 1995.
Reference Books	1. Pierre M. Nugues, "An Introduction to Language Processing with Perl and Prolog", Springer.
Website and e-learning source	1. https://en.wikipedia.org/wiki/Natural_language_processing 2. https://www.techtarget.com/searchenterpriseai/definition/natural-language-

Course Outcomes:
 	
The Learners will be able to
    1. Describe the fundamental concepts and techniques of natural language processing. Explain the advantages and disadvantages of different NLP technologies and their applicability in different business situations.
    2. Distinguish among the various techniques, taking into account the assumptions, strengths, and weaknesses of each. Use NLP technologies to explore and gain a broad understanding of text data.

3. Use appropriate descriptions, visualizations, and statistics to communicate the problems and them solutions. Use NLP methods to analyse sentiment of a text document.
4. Analyse large volume text data generated from a range of real-world applications. Use NLP methods to perform topic modelling.
5. Develop robotic process automation to manage business processes and to increase and monitor their efficiency and effectiveness.

CO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	M	L	M	M	H
CO2	M	L	H	H	H	M
CO3	M	H	H	H	L	M
CO4	L	H	M	M	L	L
CO5	M	L	M	H	M	L

CO	PO					
	1	2	3	4	5	6
CO1	M	H	H	M	H	L
CO2	H	M	M	M	L	H
CO3	H	L	M	H	M	M
CO4	L	M	L	L	M	L
CO5	L	M	H	M	H	H

Title of the Course	PROFESSIONAL COMPETENCY SKILL ENHANCEMENT COURSE: GENERATIVE AI					
Paper No.	Professional competency SEC 8					
Category	Core	Year	III	Credits	2	Course Code
		Semester	VI			UPCA24
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total	
	-	-	2		2	
Prerequisites	Artificial Intelligence					
Objectives of the course	1. To provide a comprehensive understanding of the fundamental principles and theories behind artificial intelligence. 2. To equip students with the practical skills required to develop and deploy AI tools, using popular frameworks. 3. To equip students with the practical skills required to develop and deploy AI tools, using popular frameworks. 4. To foster an understanding of the ethical considerations and potential societal impacts of AI. 5. To encourage innovation and research in the field of AI, through critical thinking and creative problem-solving methods.					
Course Outline	**Unit I** **Artificial Intelligence:** Introduction- Foundation of AI - History of AI intelligent agents- Agents and Environments - structure of agents, problem solving agents, problem- formulation-Environments and its properties.					
	Unit II **Artificial Intelligence Apps:** Copy.ai- Jasper AI - Teach Easy. AI - Ask AI-Face App – Claudy. AI – Copilot – Elicit.					
	Unit III **AI Tools: Introduction –** Benefits of AI Tools - ChatGPT – Bard – Topview AI - Midjourney – Addy AI – Repurpose – Quillbot - HeyGen.					
	Unit IV 1. Edit Video using Topview AI. 2. Generate images from text using Midjourney. 3. Generate email using Addy AI.					
	Unit V 4. Create Social Media Posting using Repurpose. 5. Check Grammer and summarize the paragraph using Quillbot tool. 6. Create a talking Avatar using HeyGen.					

Recommended Text	1. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education. 2. Dr. Nilakshi Jain, Artificial Intelligence, As per AICTE: Making a System Intelligent, Wiley Publications, 1st Edition,2019.
Reference Book	1. Super Intelligence: Paths, Dangers, Strategies" by Nick Bostrom, Oxford university 2016.

Course Outcomes (Cos)
CO1: Demonstrate various AI applications, languages and Intelligent Agents.
CO2: Understand the basics of Artificial Intelligence Apps.
CO3: Understand the basics of AI Tools
CO4: Apply AI Tools to solve the real-world problems.
CO5: Identify different applications of Expert systems.

CO	PO					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	H	M	M	L	H	M
CO2	L	H	H	H	M	L
CO3	L	M	M	M	H	H
CO4	H	L	L	H	H	M
CO5	M	M	L	H	L	H

CO	PSO					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	M	H	L	H
CO2	L	L	H	M	L	H
CO3	H	M	M	L	M	M
CO4	M	M	H	H	L	L
CO5	H	H	M	L	M	H

(Low -L, Medium -M, High-H)