AUXILIUM COLLEGE (AUTONOMOUS)

VELLORE – 632 006

Department of Computer Science

B.Sc. COMPUTER SCIENCE
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

B.Sc. COMPUTER SCIENCE

(Effective from the academic year 2024 - 2025)

Vision of the Department:

- To open a channel of admission for computing courses for students, who have done the 10+2 and are interested in taking computing as a career.
- To enhance logical and reasoning capabilities of students.
- To train the students in basic knowledge in Computer Science, particularly in core areas and in developing application programs.
- To impart sufficient knowledge and skills for writing general application programs.
- To provide experience of Information Technology scenario.

Objectives:

- To provide an in-depth knowledge in Computer Science.
- To acquire skill and competency in practical.
- To expose the students to the recent trends in Computer Science and its Technologies.
- To motivate the students for life-long learning and train students towards research.
- 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.Sc. Computer Science:

A candidate who has qualified in Higher Secondary Examination conducted by the Government of Tamil Nadu or an examination accepted as equivalent thereto with Mathematics as one of the subjects, is eligible for seeking admission to the B.Sc. Computer Science Course.

Allied Subjects:

1. Mathematics
2. Statistics

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, advanced programming packages allied with the discipline topics, practical training, devising mathematical models and algorithms for providing solutions to industry / real life situations. The curriculum also facilitates peer learning with advanced mathematical topics in the final semester, catering to the needs of stakeholders with research aptitude.

➢ The General Studies and Computer Science based problem solving skills are included as mandatory components in the 'Training for Competitive Examinations' course at the final semester, a first of its kind.

➢ The curriculum is designed so as to strengthen the Industry-Academia interface and provide more job opportunities for the students.

➢ The Industrial Statistics course is newly introduced in the fourth semester, to expose the students to real life problems and train the students on designing a mathematical model to provide solutions to the industrial problems.

➢ 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 student, application of conceptual knowledge to practical situations. The state of art technologies in conducting a Explain in a scientific and systematic way and arriving at a precise solution is ensured. Such innovative provisions of the industrial training, project and 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 courses, covering conventional topics to the latest – Statistics with R Programming, Data Science, Machine learning. Internet of Things and Artificial Intelligence etc.

Value additions in the Revamped Curriculum:

Semester	Newly introduced Components	Outcome / Benefits
I	**Foundation Course in Computer Science** 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.	• Instil 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, apprenticeships, 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 knowhow of solving real life problems using ICT tools
I, II, III, IV, V & VI	Elective papers- An open choice of topics categorized under Generic and Discipline Centric	• Strengthening the domain knowledge • Introducing the stakeholders 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.

Skills acquired from the Courses	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

| | | | | TANSCHE BASED PROGRAMME STRUCTURE FOR B.Sc. COMPUTER SCIENCE | | | | | |
| | | | | (For the candidates admitted from the academic year 2024-2025) | | | | | |

Sem	Part	Category	Paper Code	Title	Hours/Week	Exam		Credits	Marks
						Th	Pr		
I	I	Tamil/Language	ULTAA24	Language I: Tamil – I	5	3	-	3	40 + 60
	II	English	UENGA24	Language II: English – I	6	3	-	3	40 + 60
		Core Course 1	UCCSA24	Python Programming	5	3	-	5	40 + 60
		Core Course 2	UCCSB24	Practical - I: Python Programming	3	-	3	3	40 + 60
	III	Generic Elective 1	UGEMAC24	Generic Elective I: Statistical Methods and their Applications - I	6	3	-	5	40 + 60
		Skill Enhancement Course SEC 1	USCS124	SEC: Introduction to HTML	2	-	2	2	40 + 60
	IV	Foundation Course FC	UFCS24	FC: Problem Solving Techniques	2	2	-	2	40 + 60
		Value Education	UVEDA22*	Value Education	1	-	-	-	-
				Total	**30**			**23**	**700/800**
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
		Core Course 3	UCCSC24	Data Structure and Algorithms	5	3	-	5	40 + 60
		Core Course 4	UCCSD24	Practical - II: Data Structure and Algorithms	3	-	3	3	40 + 60
	III	Generic Elective 2	UGEMAD24	Generic Elective II: Statistical Methods and their Applications - II	6	3	-	5	40 + 60
		Skill Enhancement Course SEC 2	USCS224	SEC: Digital Logics and Fundamentals	2	-	2	2	40 + 60
	IV	Skill Enhancement Course SEC 3	USCS324	SEC: Web Designing	2	-	2	2	40 + 60
		Value Education	UVEDA22**	Value Education	1	-	-	-	-
				Total	**30**			**23**	**700/800**
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
		Core Course 5	UCCSE24	Java Programming	5	3	-	5	40 + 60
	III	Core Course 6	UCCSF24	Practical - III: Java Programming	3	-	3	3	40 + 60
		Generic Elective 3	UGEMAE24	Generic Elective III: Numerical Methods -I	6	3	-	5	40+ 60
		Skill Enhancement Course SEC 4	USCS424	SEC: Multimedia System	2	-	2	2	40+ 60
		Skill Enhancement Course SEC 5	USCS524	SEC: Microprocessor	1	-	2	1	40+ 60
	IV	EVS	UNEVS24*	Environmental Studies	1	-	-	-	-
		Value Education	UVEDA24***	Value Education	1	-	-	-	-
				Total	**30**			**22**	**700/800**

IV	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
	III	Core Course 7	UCCSG24	Operating System	**5**	3	-	**5**	40 + 60
		Core Course 8	UCCSH24	Practical - IV: Linux	**3**	-	3	**3**	40 + 60
		Generic Elective 4	UGEMAF24	Generic Elective IV: Numerical Methods -II	**6**	3	-	**6**	40 + 60
	IV	Skill Enhancement Course SEC 6	USCS624	SEC: PHP Programming	**2**	-	2	**2**	40 + 60
		Skill Enhancement Course SEC 7	USCS724	SEC: Understanding Internet	**1**	-	2	**1**	40 + 60
		EVS	UNEVS24	Environmental Studies	**1**	2	-	**2**	40 + 60
		Value Education	UVEDA22****	Value Education	**1**	-	-	-	-
				Total	**30**			**25**	**800/800**
V	III	Core Course 9	UCCSI24	Computer Networks	**5**	3	-	**4**	40 + 60
		Core Course 10	UCCSJ24	Database Management System	**5**	3	-	**4**	40 + 60
		Core Course 11	UCCSK24	Practical V: Database Management System	**5**	3	-	**4**	40 + 60
		Core Course 12	UCCSL24	Project	**5**	-	-	**4**	40 + 60
		Discipline Specific Elective 1	UECSA24	Elective: Cloud Computing	**5**	3	-	**3**	40 + 60
			UECSB24	Elective: Artificial Intelligence					
		Discipline Specific Elective 2	UECSC24	Elective: Introduction to Data Science	**4**	3	-	**3**	40 + 60
			UECSD24	Elective: Human Computer Interaction					
	IV	Value Education	UVEDA22*****	Value Education	**1**	-	-	-	-
		Summer Internship/Industrial Training	UICS24	Internship	-	-	-	**2**	40 + 60
				Total	**30**			**24**	**700/800**
VI	III	Core Course 13	UCCSM24	Data Analytics Using R	**6**	3	-	4	40 + 60
		Core Course 14	UCCSN24	Practical - VI: Data Analytics Using R	**3**	-	3	2	40 + 60
		Core Course 15	UCCSO24	.NET Programming	**6**	3	-	4	40 + 60
		Core Course 16	UCCSP24	Practical - VII: .NET Programming	**3**	-	3	2	40 + 60
		Discipline Specific Elective 3	UECSE24	Elective: Big Data Analytics	**5**	3	-	3	40 + 60
			UECSF24	Elective: Natural Language Processing					
		Discipline Specific Elective 4	UECSG24	Elective: IOT and its Applications	**4**	3	-	3	40 + 60
			UECSH24	Elective: Cyber Security					
	IV	Professional Competency SEC 8	UPCS24	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**	**800/800**
				Grand Total	**180**			**140**	**4400**

- 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)
    - Advanced Excel
    - Multimedia Using Flash
    - Photoshop
  - ii) Health and Fitness (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 SEC/	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

Taxonomy 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)	Examine the logics, Suggest idea/concept with example programs, 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 offbeat 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 Science, the students will be able to:

PSO 1: Ability to attain knowledge and understand the mathematical and logical concepts, algorithmic principles and computer fundamentals.

PSO 2: Understand the basic concepts of system software, hardware and evolution of computer graphics.

PSO 3: Demonstrate the knowledge on appropriate theory, practices and tools for the specification, design and implementation.

PSO 4: Utilize the practical skill to examine, plan and engineer the applications of technology using computing tools and techniques.

PSO 5: Apply the recent technology in multidisciplinary domains and evaluate the methods of implementing it, to create high level design and implement robust software applications using latest technological skills.

PSO 6: Be ethically and professionally responsible with the ability to relate IT applications to broader social context for the growth of the nation.

PO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
PO1	H	H	H	H	H	H
PO2	H	H	H	H	H	M
PO3	M	H	H	H	H	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	14	22	18	93
Part IV	4	4	3	5	2	4	22
Part V	-	-	-	-	-	1	1
Total	23	23	22	25	24	23	**140**

*Part I, II, and Part III components will be separately considered for CGPA calculation and classification for the undergraduate 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	UCCSA24
		Semester	I				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	5	-	-		5		
Prerequisites	C++						
Objectives of the course	1. To make students understand the concepts of Python programming. 2. To apply the OOPs concept in Python programming. 3. To Learn how to write loops and decision statements in python. 4. To make the students learn best practices in Python programming. 5. To define the structure and Components of a python program.						
Course Outline	**Unit I (15 Hours) (K1, K2)** 1.1 Basics of Python Programming: History of Python-Features of Python. 1.2 Literal-Constants-Variables - Identifiers–Keywords. 1.3 Built-in Data Types- Output Statements. 1.4 Input Statements-Comments- Indentation. 1.5 Operators-Expressions-Type conversions. 1.6 Python Arrays: Defining and Processing Arrays – Array methods.						
	Unit II (15 Hours) (K1, K2) 2.1 ControlStatements: Selection/Conditional Branching statements: if- if-else 2.2 Nested if and if- elif -else statements. 2.3 Iterative Statements: while loop- for loop. 2.4 Else suite in loop and Nested loops. 2.5 Jump Statements: break, continue Statements 2.6 Pass statements.						
	Unit III (15 Hours) (K1, K2) 3.1 Functions: Function Definition – Function Call. 3.2 Variable Scope and its Lifetime-Return Statement. 3.3 Function Arguments: Required Arguments- Keyword Arguments 3.4 Default Arguments and Variable Length Arguments- Recursion. 3.5 Python Strings: String operations- Immutable Strings. 3.6 Built-in String Methods -Functions - String Comparison.						

	Unit IV (15 Hours) (K3, K4) 4.1 Lists: Creating a list -Access values in List-Updating values in Lists 4.2 Nested lists -Basic list operations-List Methods. 4.3 Tuples: Creating, Accessing, Updating and Deleting Elements in a tuple. 4.4 Nested tuples– Difference between lists and tuples. 4.5 Dictionaries: Creating, Accessing, Updating and Deleting Elements in a Dictionary. 4.6 Dictionary Functions and Methods - Difference between Lists and Dictionaries.
	Unit V (15 Hours) (K3, K4) 5.1 Python File Handling: Types of files in Python 5.2 Opening and Closing files-Reading and Writing. 5.3 Files: write() and write lines() methods- append() method. 5.4 Read() and read lines() methods – with keyword. 5.5 Splitting words – File methods. 5.6 File Positions- Renaming and deleting files.
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, Dream tech Publishers.
Reference Books	1. Vamsi Kurama, "Python Programming: A Modern Approach", Pearson Education. **2.** Mark Lutz," Learning Python", Orielly. 3. Adam Stewarts, "Python Programming", Online. 4. Fabio Nelli, "Python Data Analytics", A Press. 5. Kenneth A. Lambert, "Fundamentals of Python – First Programs", CENGAGE Publication
	Course Outcomes: On completion of the course the students should be able to **CO1:** Demonstrate the understanding of syntax and semantics of Python language **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/PSO	PSO1	PSO2	PSO3	PSO 4	PSO 5	PSO6
CO1	H	L	M	H	L	L
CO2	H	M	M	H	M	L
CO3	M	L	H	M	L	H
CO4	H	M	M	L	H	L
CO5	L	H	L	M	M	H

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

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

Title of the Course	**PRACTICAL I: PYTHON PROGRAMMING**						
Paper No.	Core 2						
Category	Core	Year	I	Credits	3	Course Code	UCCSB24
		Semester	I				
Instructional hours perweek	Lecture	Tutorial	Lab Practice			Total	
	-	-	3			3	
Prerequisites	C++						
Objectives of the course	1. Design and program Python applications. 2. Create loops and decision statements in Python. 3. Work with functions and pass arguments in Python. 4. Build and package Python modules for reusability. 5. Read and write files in Python.						
Course Outline	**Practical Programs (45 Hours) (K2, K3,K4)** 1. Program using Conditional Statements. 2. Program using Loops. 3. Program using Functions. 4. Program using Recursion. 5. Program using Arrays. 6. Program using Strings. 7. Program using Modules. 8. Program using Lists. 9. Program using Tuples. 10. Program using Dictionaries						
Recommendedd Text	1. ReemaThareja, "Python Programming using problem solving approach", First Edition, 2017, Oxford University Press. 2. Dr. R. NageswaraRao, "Core Python Programming", First Edition, 2017, Dream tech Publishers.						
ReferenceBooks	1. Vamsi Kurama, "Python Programming: A Modern Approach", Pearson Education. **2.** Mark Lutz," Learning Python", Orielly. 3. Adam Stewarts, "Python Programming", Online. 4. Fabio Nelli, "Python Data Analytics", A Press. Kenneth A. Lambert, "Fundamentals of Python – First Programs", CENGAGE Publication						
Website and e-learningsource	1. https://www.w3schools.com/python/python_intro.asp 2. https://www.geeksforgeeks.org/python-programming-language						

Course Outcomes:

On completion of the course the students should be able to

CO1: Demonstrate the understanding of syntax and semantics of Python language
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	M	H	H	H	M	L
CO2	L	L	M	L	L	M
CO3	H	H	H	M	L	H
CO4	L	M	M	H	L	H
CO5	M	L	H	M	M	M

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

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

Title of the Course	SKILL ENHANCEMENT COURSE: INTRODUCTION TO HTML						
Paper No.	**Skill Enhancement Course 1**						
Category	**Practical**	**Year**	I	**Credits**	2	**Course Code**	USCS124
		Semester	I				
Instructional hours per week	**Lecture**	**Tutorial**		**Lab Practice**		**Total**	
	2			-		2	
Prerequisites	Nil						
Objectives ofthe course	1. Develop Working Knowledge of HTML. 2. To impart knowledge in designing web pages with text and images. 3. Analyze a web page and identify its elements and attributes. 4. To learn and implement HTML Concepts. 5. Write codes to create web Application.						
Course Outline	**Unit I (Hours 6) (K1)** Introduction: HTML - Understanding HTML Tags - Creating the Head, and Body Sections.						
	Unit II (Hours 6) (K1, K2, K3) Creating Paragraphs and Line Breaks - Creating Hyperlinks and Anchors - Formatting Text by Using Tags.						
	Unit III (Hours 6) (K1, K2, K4) Creating Headings - Applying Bold and Italic Formatting - Creating tables.						
	Unit IV (Hours 6) (K1, K2, K3) 1. Write a program to change the Font style, Font color, Font Sizes and Background Image. 2. Write a program to design Bio-data using Basic HTML tags. 3. Write a program in HTML to develop a College Website						
	Unit V (Hours 6) (K1, K2, K3, K4) 4. Write a HTML program for Lists. 5. Write a HTML program to create Time Table preparation using HTML tags. 6. Write a HTML program using links						

Recommended Text	**Text Books** 1. Faithe Wempen, "Step by Step HTML5", Published with the O'Reilly Media, Inc.2012. 2. Kogent Learning Solutions Inc," Html5 Black Book: Covers CSS3,

	JavaScript, XHTML, AJAX, PHP and jQuery", Dreamtech Press, 2011.
Reference Books	**Reference Books** 1. HTML by Tutorials point, Published by Tutorials Point Pvt. Ltd, 2015.
Website and e-learning source	**Open Educational Resources (OER)** 1. NPTEL & MOOC Courses titled Introduction to HTML. 2. https://www.geeksforgeeks.org

Recommended Text	1. "Photoshop CS6 in Simple Steps", Paperback, Kogent Learning Solutions Inc., 2012. 2. "Flash CS5 in Simple Steps", Kogent Learning Solutions Inc., Dreamtech Press Publication, 2011.
Reference Books	1. Chris Grover with E.A.Vander Veer, "Flash CS4", Pogue Press O'Reilly,2008. 2. Jeffcoate Judith,"Multimedia in Practice", Pearson Education, 2009.
Website and e-learning source	1. http://webmail.camaradesantacruzcabralia.ba.gov.br/flash-cs6-in-simple-steps-by-kogent-learning.pdf 2. http://ptgmedia.pearsoncmg.com/images/9780321827333/samplepage

---

Course Outcomes:

On completion of this course, students will
1. Know the basic concept in HTML.
2. Understand the page formatting.
3. Learn the Concept of list.
4. Know the concept of creating Links.
5. Understand the table creation.

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

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

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

Title of the Course	FC: PROBLEM SOLVING TECHNIQUES					
Paper No.	**Foundation Course**					
Category	**Foundation Course**	**Year**	I	**Credits**	2	**Course Code** UFCS24
		Semester	I			
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**		**Total**	
	2		-		2	
Objectives ofthe course	1. Familiarize with writing of algorithms, fundamentals of C and philosophy of problem solving. 2. Implement different programming constructs. 3. Use data flow diagram, Pseudo code to implement solutions. 4. Define and use of arrays with simple applications. 5. Understand about data flow diagrams.					
Course Outline	**Unit I (Hours 6) (K1, K2)** Introduction: History - characteristics and limitations of Computer - Hardware/Anatomy of Computer- Memory- Secondary storage devices. Software: System software and Application software - Machine language- Assembly language- High-level language. 4GL and 5GL - Features of good programming language. Translators: Interpreters and Compilers.					
	Unit II (Hours 6) (K2, K3) Structured Programming: Algorithm - Features of good algorithm - Benefits and drawbacks of algorithm. Flowcharts: Advantages and limitations of flowcharts - Flowchart symbols and types of Flowcharts. Pseudo code: Writing a pseudo code - Program Design - Modular Programming.					
	Unit III (Hours 6) (K2, K3) Selection Structures: Relational and Logical Operators - Selecting from Several Alternatives - Applications of Selection Structures - Repetition Structures: Counter Controlled Loops - Nested Loops - Applications of Repetition Structures.					
	Unit IV (Hours 6) (K3) Data: Numeric Data and Character Based Data - Arrays: One Dimensional Array - Two Dimensional Arrays- Strings as Arrays of Characters.					
	Unit V (Hours 6) (K3, K4) Data Flow Diagrams: Definition, DFD symbols - Types of DFDs. Program Modules: Subprograms - Value and Reference parameters.					

Recommended Text	1. Stewart Venit, "Introduction to Programming: Concepts and Design", Fourth Edition, 2010, Dream Tech Publishers.
Reference Books	2. Stewart Venit, "Introduction to Programming: Concepts and Design", Fourth Edition, 2010, Dream Tech Publishers.
Website and e-learning source	1. https://www.codesansar.com/computer-basics/problem-solving-using-computer.html 2. http://www.nptel.iitm.ac.in/video.php?subjectId=106102067 3. http://utubersity.com/?page_id=876

Course Outcomes:

Course Outcomes (Cos)
CO1: Study the basic knowledge of Computers.
CO2: Analyze the programming languages.
CO3: Study the data types and arithmetic operations.
CO4: Illustrate the concept of Loops.
CO5: Study about Numeric data and character-based data.

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

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

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

Title of the Course	DATA STRUCTURES AND ALGORITHMS						
Paper No.	Core 3						
Category	CORE	Year	I	Credits	5	Course Code	UCCSC24
		Semester	II				
Instructional Hours per week	Lecture	Tutorial	Lab Practice			Total	
	5	-	-			5	
Prerequisites	C, C++						
Objectives of the course	This course aims at providing an overall view of the • To understand the concepts of ADTs • To learn linear data structures-lists, stacks, queues • To learn Tree structures and application of trees. • To learn graph structures and application of graphs. • To understand various sorting and searching.						
Course Outline	**UNIT-I (15 hours)** (K1, K2, K3) 1.1 Introduction to Data Structures-Definition 1.2 Terminologies related to Data Structures 1.3 Classification of Data Structures- Primitive Data structure- Non-Primitive Data Structures 1.4 Linear Data Structures- Types of Linear Data Structure 1.5 Non-Linear Data Structures- Types of Non-Linear Data Structures Trees-Applications of Trees- Graphs- Some Applications of Graphs						
	UNIT-II (15 hours) (K1, K2, K3) 2.1 Basic Operations of Data Structures- Singly Linked - Insertion - Searching – Deletion 2.2 Traversing the list - Traversing the list in reverse order List 2.3 Doubly Linked List- Insertion- Searching – Deletion-Reverse 2.4 Traversal 2.5 Binary Search Tree- Insertion- Searching – Deletion 2.6 Finding the parent of a given node						
	UNIT-III (15 hours) (K1, K3, K4) 3.1 Tree Data structure (DS Tree) -Binary Tree-Binary Search Tree 3.2 Finding the smallest and largest values in the binary search tree 3.3 Tree Traversals- Preorder-Post order- In Order-Breadth First Search. 3.4 B Tree 3.5 B+ Tree						

	UNIT-IV (15 hours) (K1, K2) 4.1 Heap: Insertion- Deletion- Searching- Traversal 4.2 Sets: Unordered- Ordered 4.3 Queues: A standard queue- Priority Queue- Double Ended Queue 4.4 Sorting: Bubble Sort- Merge Sort- Quick Sort 4.5 Insertion Sort- Shell Sort- Radix Sort
	UNIT-V (15 hours) (K3, K4) 5.1 Graphs - Warshall Algorithm Shortest paths. 5.2 Adjacency - First Search - Depth First Search. 5.4 Warshall Algorithm Matrix - Path Matrix - Heap Sort. 5.3 Traversing on Graphs - Breadth Shortest paths 5.5 Hashing- Hash Function - Collision Resolution 5.6 Chaining. .

Recommended Text	1. Granville Barne, Luca Del Tongo, "Data Structures and Algorithms: Annotated Reference with Examples", First Edition,2008.
Reference Books	1. James A.Storer, "An Introduction to Data Structures and Algorithms" published by birkhauser bostom/springer-verlag New York, 2002. 2. Dr. Basand Agarwal, "Hands-on Data Structures and Algorithms with Python", Pack Publishing, Third Edition,2022
Website and e-learning source	1. https://www.javatpoint.com/b-tree.

Course Outcomes: On completion of this course, students will 1. Understand the concept of Dynamic memory management, data types, algorithms, Big O notation 2. Understand basic data structures such as arrays, linked lists, stacks and queues. 3. Describe the hash function and concepts of collision and its resolution methods and to introduce the basic concepts of algorithms. 4. Solve problem involving graphs, trees and heaps. 5. Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data.

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

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

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

Title of the Course	**PRACTICAL II: DATA STRUCTURES AND ALGORITHMS**						
Paper No.	**Core 4**						
Category	CORE	**Year**	I	**Credits**	3	**Course Code**	UCCSD24
		Semester	II				
Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	-	-	3			3	
Prerequisites	C,C++						
Objectives of the course	This course aims at providing an overall view of the • To understand the concepts of ADTs • To learn linear data structures-lists, stacks, queues • To learn Tree structures and application of trees. • To learn graph structures and application of graphs. • To understand various sorting and searching.						
Course Outline	**Practical Programs (45 Hours) (K2, K3,K4)** 1. Create a Python program to demonstrate stack implementation using list. 2. Create a Python program to demonstrate queue implementation using Queue module. 3. Create a python program to demonstrate stack implementation using Linked list, Node class. 4. Create a python program to Inserting into a Tree. 5. Create a python program to Plot Matplotlib using Bar Chart. 6. Create a python program for Bubble Sort. 7. Create a python program for Binary Search Using Recursive						

Course Outcomes:

On completion of this course, students will

1. Understand the concept of Dynamic memory management, data types, algorithms, Big O notation
2. Understand basic data structures such as arrays, linked lists, stacks and queues.
3. Describe the hash function and concepts of collision and its resolution methods and to introduce the basic concepts of algorithms.
4. Solve problem involving graphs, trees and heaps.
5. Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data.

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

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

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

Title of the Course	SKILL ENHANCEMENT COURSE: DIGITAL LOGICS AND FUNDAMENTALS						
Paper No.	**Skill Enhancement 2**						
Category	**Foundation Course**	**Year**	I	**Credits**	2	**Course Code**	USCS224
		Semester	II				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**		**Total**		
	2		-		2		
Prerequisites	Nil						
Objectives ofthe course	1. The objective of this course is to provide the fundamental concepts associated with the digital logic and Circuit design. 2. To introduce the basic concepts and laws involved in the Boolean algebra and logic families and digital circuits. 3. To familiarize with the different number systems, logic gates and combinational and sequential circuits utilized in the different digital circuits and systems. 4. The course will help in design and analysis of the digital circuit and system. 5. The course will help in design and analysis of the Combinational circuits and system.						
Course Outline	**Unit I (K1, K2)** 1.1 Number System - Binary Numbers - Conversion from one number system to other –Number Base Conversion. 1.2 Octal and Hexadecimal Numbers 1.3 Complements - Binary Arithmetic. 1.4 Binary Codes - Binary Logics. 1.5 Logic gates. 1.6 Truth Table - Boolean Algebra - Basic Definition.						
	Unit II (K2, K3) 2.1 Simplification of Boolean Function 2.2 The Map method. 2.3 Two and Three Variable Maps 2.4 Adders - Half Adder - Full Adder. 2.5 Subtractor – Half Subtractor – Full Subtractor. 2.6 Encoders – Decoders						
	Unit III (K2, K3) 3.1 Multiplexer - Demultiplexer. 3.2 Flip Flops - Basic Flip Flop 3.3 JK Flip flops 3.4 D Flip flops 3.5 Registers 3.6 Shift Register						

	Unit IV (K4, K5) 1. Verify the truth table of logic gates AND, OR and NOT gate. 2. Construct the Half Adder Circuit using Logic Gates. 3. Construct the Full Adder Circuits using Logic Gates.
	Unit V (K4, K5) 4. Construct the Half Subtractor Circuit using Logic Gates. 5. Construct the Full Subtractor Circuit using Logic Gates. 6. Implement the Karnaugh Map method as Sum of Product (SOP) using NAND Gate.
Recommend ed Text	1. Morris M.Mano, "Digital Logic Fundamentals" - Pearson's Education- 5 th edition, 2015.
Reference Books	1. Vijendran, "Digital Computer Fundamentals", 1 st Edition - Lakshmi Publications, 2001. 2. Thomas M.Floyd, "Digital Fundamentals", 8 th Edition-USB Publications, 2009.
Website and e-learning source	1. Karnaugh Map video Tutorial- http// Youtube/ wjM2RDG5Yti. 2. Full Adder and Half Adder Video Tutorial-http//youtube/FSFNefbKckM. 3. Karnaugh Map – NAND Gate https://www.youtube.com/watch?v=LuXdFI8iK1U

Course Outcomes:
The Learners will be able to
1. Understand working of logic families and logic gates.
2. To minimize the Boolean expression using Boolean algebra.
3. Design and analyze the combinational and sequential logic circuits.
4. Simulate digital circuits and implement them using hardware component.
5. Design and implementation of combinational circuits.

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

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

Title of the Course	**SKILL ENHANCEMENT COURSE: WEB DESIGNING**						
Paper No.	**Skill Enhancement 3**						
Category	**Skill Enhancement Course**	**Year**	I	**Credits**	2	**Course Code**	USCS324
		Semester	II				
Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	-	-	2			2	
Prerequisites	Basic Knowledge of HTML						
Objectives of the course	This course aims at providing an overall view of the - Understand the basics of HTML and its components. - To study about the Graphics in HTML. - Understand and apply the concepts of XML and DHTML - Understand the concept of JavaScript. - To identify and understand the goals and objectives of the Ajax.						
Course Outline	**UNIT-I (6 hours)** XML Overview: Working with Basics of XML - XML Namespaces – XML - HttpRequest. **UNIT-II (6 hours)** XML Tree - XML Syntax - XML Elements – DTD-XML Schema. Extensible Style Sheets - XSL Transformation. **UNIT-III (6 hours)** CSS Introduction - CSS Syntax - CSS Selectors - CSS Colors - CSS Backgrounds - CSS Borders - CSS Text - CSS Fonts. **UNIT-IV (6 hours)** 1. Write a program to apply Style Sheet in a webpage. 2. Write a program to flip the text using XML. 3. Write a XML program using elements. 4. Write a XML program using DTD. **UNIT-V (6 hours)** 5. Create a progress bar using HTML and CSS. 6. Write a program to apply inline CSS. 7. Write a program to put the caption below the table using CSS						

Recommended Text	1. Mark Pankaj Sharma, "Web Technology", SkKataria& Sons Bangalore 2011.
	2. Joe Fawcett, Danny Ayers, Liam R. E. Quin, "Beginning XML", Wiley publishers 2012.
	3. Eric A.Meyer, "CSS:The Definitive Guide", 3nd Edition,O'Reilly,2006.
Reference Books	1. Laura Lemay, RafeColburn , Jennifer Kyrnin, "Mastering HTML, CSS &Javascript Web Publishing", 2016..
	2. DT Editorial Services (Author), "HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)", Paperback 2016, 2nd Edition.
Website and e-learning source	1. NPTEL& MOOC courses titled Web Design and Development.
	2. https://www.geeksforgeeks.org.

Course Outcomes:

On completion of this course, students will
1. Develop working knowledge of HTML
2. Ability to Develop and publish Web pages using Hypertext Markup Language (HTML).
3. Ability to optimize page styles and layout with Cascading Style Sheets (CSS).
4. Ability to develop a java script.
5. An ability to develop web application using Ajax.

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

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

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

Title of the Course	JAVA PROGRAMMING						
Paper No.	**Core 5**						
Category	**Core**	**Year**	I	**Credits**	5	**Course Code**	UCCSE24
		Semester	I				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**		**Total**		
	5	1	-		5		
Prerequisites	C, C++						
Objectives ofthe 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 provide fundamental knowledge of object-oriented programming						
Course Outline	**Unit I (Hours 15) (K2)** 1.1 Introduction: Review of Object-Oriented Concepts. 1.2 History of Java – Java buzz words – JVM Architecture. 1.3 Data types – Variables – Scope and life time of Variables. 1.4 Arrays – operators –Control statements –Type conversion and casting. 1.5 Constructors -Methods – Static block – Static Data. 1.6 Static Method String and String Buffer Classes.						
	Unit II (Hours 15) (K2) 2.1 Member access rules – Usage of this and Super keyword. 2.2 Method Overloading – Method overriding. 2.3 Abstract classes – Dynamic method dispatch – Usage of final keyword. 2.4 Packages: Definition- Access Protection -Importing Packages. 2.5 Exception Handling: try – catch- throw 2.6 finally – Built-in Exceptions – Creating own Exception classes.						
	Unit III (Hours 15) (K2, K3) 3.1 Multithreaded Programming: Thread Class. 3.2 Runnable interface –Synchronization. 3.3 Using synchronized methods– Using synchronized statement. 3.4 Interthread Communication –Deadlock. 3.5 I/O Streams: Concepts of streams – Stream classes. 3.6 File Handling.						

	Unit IV (Hours 15) (K3, K4) 4.1 AWT Controls: The AWT class hierarchy. 4.2 User Interface components- Labels – Button – Text Components – Check Box. 4.3 List Box – Panels – Scroll Pane – Menu – Scroll Bar. 4.4 Event Handling: Events – Event sources. 4.5 Event Listeners – Event Delegation Model (EDM) Handling. 4.6 Mouse and Keyboard Events – Adapter classes – Inner classes
	Unit V (Hours 15) (K3, K4) 5.1 Swing: Introduction to Swing Hierarchy of swing. 5.2 Components Containers – Top level containers –J frame. 5.3 J Window – J Dialog – J Panel – J Button – JToggleButton. 5.4 JcheckBox – J Radio Button – J Label-J Text Field. 5.5 J text Area–J list 5.6 J combo Box–JScrollPane.

Recommended Text	1. Herbert Schildt, The Complete Reference, Tata McGraw Hill , New Delhi, 7th Edition, 2010. 2. Gary Cornell, Core Java 2 Volume I – Fundamentals, Addison Wesley, 1999.
ReferenceBooks	1. Head First Java, O'Reilly Publications. 2. Y. Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson Education India, 2010.
Website and e-learningsource	1. https://javabeginnerstutorial.com/core-java-tutorial 2. http://docs.oracle.com/javase/tutorial/ 3. https://www.coursera.org/

Course Outcomes:

CO1: Understand the basic Object-oriented concepts. **CO2:** Implement the basic constructs of Core Java. **CO3:** Implement inheritance, packages, interfaces and exception handling of Core Java. **CO4:** Implement multi-threading and I/O Streams of Core Java. **CO5:** Implement AWT and Event handling.

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

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

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

Title of the Course	**PRACTICAL III: JAVA PROGRAMMING**						
Paper No.	Core 6						
Category	Core	Year	II	Credits	3	Course Code	UCCSF24
		Semester	III				
Instructional hours perweek	Lecture	Tutorial	Lab Practice			Total	
	3	-	-			3	
Prerequisites	C, C++						
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 (Hours 45) (K2, K3)
	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. Generate random numbers between two given limits using Random class and print messages according to the range of the value generated.
	4. Write a program to do String Manipulation using Character Array and perform the following string operations:
	a. String length.
	      b. Concatenating two strings.
	5. Write a program to demonstrate the use of following exceptions.
	      a. Arithmetic Exception
	      b. ArrayIndexOutofBound Exception
	6. Write a program to accept a text and change its size and font. Include bold italic options. Use frames and controls.
	7. Generate random numbers between two given limits using Random class and print messages according to the range of the value generated.						

Recommended Text	1. Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010. 2. Gary Cornell, Core Java 2 Volume I – Fundamentals, Addison Wesley, 1999.						
ReferenceBooks	1. Head First Java, O'Reilly Publications. 2. Y. Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson, Education India, 2010.						

Website and e-learningsource	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

1. Implement the basic constructs of Core Java.
2. Implement inheritance, packages, interfaces and exception handling of Core Java.
3. Implement multi-threading and I/O Streams of Core Java.
4. Implement AWT and Event handling.
5. Use Swing to create GUI.

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

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

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

Title of the Course	SKILL ENHANCEMENT COURSE: MULTIMEDIA SYSTEMS						
Paper No.	Skill Enhancement 4						
Category	Skill Enhancement Course	Year	II	Credits	2	Course Code	USCS424
		Semester	III				
Instructional Hours per week	Lecture	Tutorial	Lab Practice			Total	
		-	2			2	
Prerequisites	• Basic computer skills						
Objectives of the course	This course aims at providing an overall view of the • To learn the basics and fundamentals of Multimedia. • To introduce Multimedia components and tools. • To understand how multimedia can be incorporated. • To study the various applications of design techniques. • Demonstrate in depth knowledge of multimedia development tools.						
Course Outline	**UNIT-I (6 hours)** Introduction to Multimedia – The Elements of Multimedia System-Using Multimedia: Benefits of using Multimedia-Multimedia Platform Multimedia Hardware-System Software-Future Directions-Storage for Multimedia: Choice of Storage – Magnetic Media – Optical Media.						
	UNIT-II (6 hours) Introduction – Bitmaps and Vectors Toolbox-Selection tools – Painting tools – Editing tools – Retouching Tool-Colors setting-Layer Working with Layers-Layer Styles – Locking Layers-Merging Layers – Managing Layers Components – Palette.						
	UNIT-III (6 hours) Introduction flash – Basic- Creating objects – Editing objects-Color and text – Symbols and instances- Library – Text Animation – Motion Tweening-Shape Tweening – Motion Guide.Movie Clip – Working with Action Script.						
	UNIT-IV (6 hours) 1. Create an Action in Photoshop. 2. Color Transformation Using Photoshop. 3. Design a Book Cover in Photoshop. 4. Create an Animation using Photoshop.						
	UNIT-V (6 hours) 5. Traffic Light Control Using Action Script in Flash. 6. Create a Slide Show Presentation in Flash. 7. Design a Greeting Card Using Button in Flash. 8. Create a Public Service Awareness Using Action Script in Flash.						

Recommended Text	1. "Photoshop CS6 in Simple Steps", Paperback,Kogent Learning Solutions Inc., 2012. 2. "Flash CS5 in Simple Steps", Kogent Learning Solutions Inc., Dreamtech Press Publication, 2011.
Reference Books	3. Chris Grover with E.A.Vander Veer, "Flash CS4", Pogue Press O'Reilly,2008. 4. JeffcoateJudith,"Multimedia in Practice", Pearson Education, 2009.
Website and e-learning source	1.http://webmail.camaradesantacruzcabralia.ba.gov.br/flash-cs6-in-simple-steps-by-kogent-learning.pdf 2.http://ptgmedia.pearsoncmg.com/images/9780321827333/samplepages/0321827333.pdf

Course Outcomes:

On completion of this course, students will

1. Understand Multimedia components using various tools and techniques.
2. Analyze and Interpret Multimedia Data.
3. Discuss about different types of media format and their properties.
4. Understand and apply principles of design into given projects.
5. Acquire and analyze different ideas about designs and its implementation.

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

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

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

Title of the Course	**SKILL ENHANCEMENT COURSE: MICROPROCESSOR**						
Paper No.	**Skill Enhancement 5**						
Category	**Skill Enhanc ement Course**	**Year**	II	**Credits**	1	**Course Code**	USCS524
		Semester	III				
Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
		-	1			1	
Prerequisites	Basic computer skills						
Objectives of the course	1. To develop background knowledge and core expertise of microprocessor. 2. To know the importance of different peripheral devices and addressing modes. 3. To know the design aspects of Instruction Set. 4. To know the concept of Data Manipulation. 5. To understand and implement the concept of Assembly Code.						
Course Outline	**Unit I (Hours: 3)** 1.1 Introduction – Introduction to Intel processors. 1.2 Minimum mode. 1.3 Maximum mode. 1.4 Pin layouts of 8086. 1.5 Pin functions of 8086. 1.6 8086 Architecture.						
	Unit II (Hours: 3) 2.1 Machine language and Assembly language. 2.2 Programmer's model of 8086 – The 8086 addressing modes. 2.3 Data transfer instructions. 2.4 Arithmetic instructions. 2.5 Logic Instructions - Shift Instructions. 2.6 Rotate Instructions.						
	Unit III (Hours: 3) 3.1 Compare instructions. 3.2 Jump instructions. 3.3 Loop Instructions. 3.4 Loop Instructions. 3.5 String Instructions. 3.6 String Instructions.						
	Unit IV (Hours :3) 1. Write the assembly code in Data Manipulation using 8 Bit. 2. Write the assembly code in Data Manipulation using 16 Bit. 3. Write the assembly code to find the largest number in an array.						
	Unit V(Hours:3) 4. Write the assembly code to sort the data in ascending order.						

	5. Write the assembly code for Block Move.
	6. Write the assembly code to reverse array elements.

Recommended Text	1. V. Vijayendra, "Fundamentals of Microprocessor 8086: Architecture, Programming and Interfacing", Viswanathan, S., Printers & Publishers Pvt Ltd, 2009. 2. Ramesh Gaonkar, "Microprocessor Architecture: Programming and Applications with8085" – 6 th Edition –Penram International Publishing Limited, 2013.
Reference Books	1. Dr. D. K. Kaushik, "An Introduction to Microprocessor 8085" – DhanpatRai Publishing Company, 2014. 2. Nagoor Kani, "Microprocessor 8086 Programming & Interfacing" – RBA Publications, 2004.
Website and e-learning source	1. http//www.pdfdrive.com/the-intel-microprocessors-80868088-8018680188-80286-80386-80486-pentium-pentium-pro-e89806753.html 2. http//www.slideshare.net/gpkm/microprocessor-8086 3. http//vardhaman.org/wp-content/uploads/2018/03/Unit-1%20MPMC.pdf 4. http://gbcramgarh.in/e-learning-study-materials/

Course Outcomes:

CO1: Understand the Architecture of a typical microprocessor.

CO2: Understand different addressing modes and instructions of 8086 design and to develop assembly language programs using software interrupts.

CO3: Understand the concepts of Instruction sets.

CO4: Write the assembly code for 8 bit and 16-bit data manipulation.

CO5: Write the assembly code for Sorting and reversing elements.

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

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

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

Title of the Course	OPERATING SYSTEM						
Paper No.	Core 7						
Category	CORE	Year	II	Credits	5	Course Code	UCCSG24
		Semester	IV				
Instructional Hours per week	Lecture	Tutorial	Lab Practice		Total		
	5	-	-		5		
Objectives of the course	This course aims at providing an overall view of the • To describe basic components of operating system. • To understand basic principles used in the design of modern operating systems. • To illustrate the general architecture of computers. • To Understand and analyze theory. • To analyze, processes, resource control (concurrency etc.), physical and virtual memory, scheduling, I/O.						
Course Outline	**Unit I (Hour 15)** (K1) 1.1 Linux: Introduction, Brief history. Unix Components/Architecture - Features of Unix. 1.2 Basic Command Directory and File. 1.3 Command pwd, ls, cd, cp, mv, rm, mkdir, rmdir, chmod. 1.4 Full and Relative Pathnames, File and Directory Naming Conventions. 1.5 Wildcard Characters 1.6 Ownership and Permission: chmod, chgrp, chown.						
	Unit II (Hour 15) (K1) 2.1 Shell Programming Language: Naming Shell Programs. 2.2 Shell Variables and Arguments. 2.3 Command Line Arguments. 2.4 Looping and Conditional Execution: if..then..else..elseif..fi 2.5 while...do, for.do. done, for, while, until and case statements. 2.6 break and continue, true and false commands.						
	Unit III (Hour 15) (K3) 3.1 System calls - Types of System calls 3.2 Process Management: Process Concepts - Inter Process Communication 3.3 Multithreaded Programming: Multithreading Models. 3.4 Process Scheduling: Basic Concepts. 3.5 Scheduling Criteria - Scheduling Algorithms. 3.6 Deadlock: Deadlock Characterization - Deadlock Avoidance.						

Unit IV (Hours 15) (K4)
4.1 Memory Management: Background.
4.2 Swapping - Contiguous Memory Allocation.
4.3 Paging - Structure of the Page Table.
4.4 Segmentation.
4.5 Virtual Memory Management: Demand Paging.
4.6 Page Replacement - Thrashing.
Unit V (Hours 15) (K1, K2, K4)
5.1 File System: File Concept.
5.2 Access methods - Directory Structure.
5.3 Implementing File System File System Structure and Implementation.
5.4 Allocation Methods.
5.5 Free Space Management.
5.6 Secondary Storage Structure Disk Structure - Disk Scheduling.

Recommended Text	1. Behrouz A. Forouzan, Richard F. Gilberg.Thomson, "Unix and shell Programming", 1st Edition, 2002. 2. Silberschatz Galvin Gagne, "Operating System Principles", 7th Edition, Prentice Hall, 2011
Reference Books	1. Sumitabha Das, "Your UNIX the ultimate guide", 2nd Edition, TMH, 2007. 2. Graham Glass, King Ables, "UNIX for programmers and users", 3rd edition, Pearson Education. 3. Richard Rosinski, Douglas Host, Kenneth Rosen, Rachel Klee, "UNIX: The Complete Reference", 2nd Edition, 2007. 4. Andrew S. Tanenbaum, "Operating Systems, Design and Implementation", 2nd Edition, Prentice Hall of India, 2012.
Website and e-learning source	1. http//www.amazon.in/UNIX-Shell-Programming-Behrouz-Forouzan/dp/8131503259/ref=asc_df_8131503259/?tag=googleshopdes21&linkCode=df0&hvadid=413541290540&hvpos=&hvnetw=g&hvrand=10951669279431710762&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=20469&hvtargid=pla-870900476121&psc=1&ext_vrnc=hi 2. http//www.amazon.in/Operating-Systems-Implementation-Prentice-Hall-Software/dp/0136374069 3. https://www.youtube.com/watch?v=vBURTt97EkA&list=PLBlnK6fEyqRiVhbXDGLXDk_OQAeuVcp2O

Course Outcomes:

The Learners will be able to
1. Acquire the Knowledge of important computer system resources and the role of operating system in their management policies and algorithms.
2. Understand the process management policies and scheduling of processes by CPU.
3. Evaluate the requirement for process synchronization and coordination handled by operating system.
4. Describe and analyze the memory management and its allocation policies.
5. Edify and evaluate the storage management policies with respect to different storage management technologies.

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

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

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

Title of the Course	**PRACTICAL IV: LINUX**						
Paper No.	**Core 8**						
Category	**Practical**	**Year**	II	**Credits**	3	**Course**	UCCSH24
		Semester	IV			**Code**	
Instructional	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
Hours per week	-	-	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

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

Title of the Course	SKILL ENHANCEMENT COURSE: PHP PROGRAMMING						
Paper No.	**Skill Enhancement 6**						
Category	**Skill Enhancement Course**	**Year**	II	**Credits**	2	**Course Code**	USCS624
		Semester	IV				
Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**		**Total**		
		-	2		2		
Prerequisites	Basic computer skills						
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 (Hours: 6)** **JavaScript:** Introduction – Values – Numbers – Strings – Unary Operators -Boolean Values-Empty Values – Automatic Type Conversion- PHP Programming Basics – Syntax of PHP. **Unit II (Hours: 6)** Introduction to PHP Variable – Understanding Data Types – Using Operators – Using Conditional Statements - If (), else if () **Unit III (Hours: 6)** Switch() Statements -Using the while () Loop – Using the for () Loop – PHP Functions – Creating an Array – Modifying Array Elements – Processing Arrays with Loops **Unit IV (Hours: 6)** 1. Implement factorial of a number in JavaScript. 2. Animation in JavaScript. 3. Addition and Multiplication of two numbers in JavaScript. **Unit V (Hours: 6)** 4. Convert the first letter of each word of the sting to Uppercase in JavaScript. 5. Implementing Arrays in JavaScript. 6. Implementing Control Statements and Looping in PHP						

Recommended Text	1. MarijiHaverbeke, "Eloquent JavaScript, A Modern Introduction to Programming", Third Edition, Published by No Starch Press, 2018. 2. Julie C Meloni, Sams "Teach yourself PHP, MySQL and Apache", 6th edition, Sams Publishing, 2012.
Reference Books	1. PHP: The Complete Reference-Steven Holzner. 2. DT Editorial Services (Author), "HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)", Paperback 2016, 2nd Edition. 3.The Joy of PHP: A Beginners Guide to Programming Interactive Web Applications withPHP and MySQL- Alan Forbes
Website and e-learning source	https://www.w3schools.com/php/default.asp

Course Outcomes (COS)

CO1: Write PHP scripts to handle HTML forms.
CO2: Write regular expressions including modifiers, operators, and metacharacters.
CO3: Create PHP Program using the concept of array.
CO4: Create PHP programs that use various PHP library functions.
CO5: Manipulate files and directories.

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

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

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

Title of the Course	SKILL ENHANCEMENT COURSE: UNDERSTANDING INTERNET						
Paper No.	Skill Enhancement 7						
Category	Skill Enhanc ement Course	Year	III	Credits	1	Course Code	USCS724
		Semester	V				
Instructional Hours per week	Lecture	Tutorial	Lab Practice		Total		
		-	1		1		
Prerequisites	Basic computer skills						
Objectives of the course	1. Knowledge of Internet Medium. 2. Internet as Mass Medium. 3. Features of Internet Technology. 4. Internet as Source of Infotainment. 5. Knowledge on JavaScript.						
Course Outline	**Unit I (Hours 3)** Internet Connection Concepts: Internet Communication Protocols – Internet Hosts – Internet Protocol (IP) Addresses – Domain and Host Name – Servers and Clients.						
	Unit II (Hours 3) World Wide Web Concepts: URLs and Transfer Protocols – HTML – Java and JavaScript - Directories and Search Engines.						
	Unit III (Hours 3) JavaScript: Introduction – Advantage of JavaScript – JavaScript Syntax – data type – Variable.						
	Unit IV (Hours 3) 1. Write a program to check the vowel or consonant in JavaScript. 2. Develop a JavaScript to display today's date. 3. Write a program to check palindrome in a given string						
	Unit V (Hours 3) 4. Write a program to create Simple Calculator in Java Script. 5. Write a JavaScript program to Scroll your name in the Scroll bar. 6. Write a program to display even and odd numbers using JavaScript.						

Recommended Text	1. Ivan Bayross, Web Enable Commercial Application Development using HTML, DHTML, JavaScript, PERL CGI, BPB Publications, 2000.

Reference Books	1. Thomas A. Powell – HTML and XHTML: The Complete Reference, Tata McGraw-Hill, 4th Edition 2003.
	2. E. Stephen Mack and Janan Platt, HTML 4.0: No Experience Required, Sybex Inc.
	3. H. M. Deitel, P.J. Deitel, A.B. Goldberg, Internet & World Wide Web: How to Programme, Prentice Hall, Third Edition
Website and e-learning source	1 .https://www.geeksforgeeks.org/multimedia-systems-with-features-or-characteristics/

Course Outcomes:

CO1: Knowledge in Internet Connection Technologies.
CO2: Knowledge in World Wide Web Concepts.
CO3: Programming Skills using HTML Tags.
CO4: Programming Skills using Style Sheets.
CO5: Programming Skills using JavaScript.

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

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

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

Title of the Course	COMPUTER NETWORKS					
Paper No.	Core 9					
Category	Core	Year	III	Credits	4	Course Code
		Semester	V			UCCSI24
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

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

Title of the Course	DATABASE MANAGEMENT SYSTEM					
Paper No.	Core 10					
Category	Core	Year	III	Credits	4	Course Code
		Semester	V			UCCSJ24
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total	
	5		-		5	
Prerequisites	Operating System					
Objectives of the course	1. To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms. 2. To understand the concepts of data base 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 data base systems, foundation on the relational model of data and normal forms. 5. To understand the concepts of data base management system, design simple Database models.					
Course Outline	**Unit I (Hours 15) (K1, K2)** 1.1 Database Concepts: Database Systems. 1.2 Data vs Information - Introducing the database. 1.3 File system -Problems with file system. 1.4 Database systems - Data models. 1.5 Importance - Basic Building Blocks. 1.6 Evolution of Data models - Degrees of Data Abstraction.					
	Unit II (Hours 15) (K2) 2.1 Design Concepts: Relational database model. 2.2 Logical view of data-keys -Integrity rules. 2.3 Relational set operators - data dictionary and the system catalog. 2.4 Relationships -data redundancy revisited. 2.5 Indexes- rules. 2.6 Entity relationship model - ER diagram					
	Unit III (Hours 15) (K3. K4) 3.1 Normalization of Database Tables: Database tables and Normalization. 3.2 The Normalization Process – Higher level Normal Form. 3.3 Introduction to SQL: Data Definition Commands. 3.4 Data Manipulation Commands – SELECT Queries. 3.5 Additional Data Definition Commands. 3.6 Additional SELECT Query Keywords – Joining Database Tables.					

	Unit IV (Hours 15) (K4) 4.1 Advanced SQL: Relational SET Operators: UNION 4.2 UNION ALL – INTERSECT - MINUS. 4.3 SQL Join Operators: Cross Join – Natural Join. 4.4 Join USING Clause – JOIN ON Clause. 4.5 Outer Join. Sub Queries and Correlated Queries: WHERE – IN – HAVING. 4.6 SQL Functions: Date and Time Function – Numeric Function – String Function.
	Unit V (Hours 15) (K4) 5.1 Nested Blocks – SQL in PL/SQL – Data Manipulation. 5.2 Transaction Control statements - PL/SQL. 5.3 Cursors and Exceptions: Cursors – Implicit Cursors. 5.4 Explicit Cursors and Attributes – Cursor FOR loops. 5.5 SELECT…FOR UPDATE - Cursor with Parameters. 5.6 Cursor Variables –Exceptions – Types of Exceptions.

Recommended Text	1. Coronel, Morris, Rob, Database Systems, Design, Implementation and Management Ninth Edition. 2. Nilesh Shah, Database Systems Using Oracle,2nd edition, Pearson Education India,2016.
ReferenceBooks	1. Abraham Silberschatz, Henry Forth and S. Sudarshan, "Database SystemConcepts", McGraw Hill International Publication, VI Edition. 2. Shio Kumar Singh, "Database Systems ", Pearson publications, II Edition.
Website and e-learningsource	Web resources from NDL Library, E-content from open-source libraries

Course Outcomes:

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

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.

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

CO5: Learn to design Data base operations and implement PL/SQL programs. Learn basics of PL/SQL and develop programs using Cursors, Exceptions.

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

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

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

Title of the Course	PRACTICAL V: DATABASE MANAGEMENT SYSTEM						
Paper No.	Core 11						
Category	Core	Year	III	Credits	4	Course Code	UCCSK24
		Semester	V				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
			5		5		
Prerequisites	Operating System						
Objectives of the course	1. To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms. 2. To understand the concepts of data base 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 data base systems, foundation on the Relational model of data and normal forms. 5. To understand the concepts of data base management system, design simple Database models.						
Course Outline	**Practical Programs (Hours: 45) (K2, K4)** 1. SQL (i) DDL Commands (ii) DML commands (iii) TCL Commands. 2. PL/SQL (i) Fibonacci Series (ii) Factorial. 3. Student Mark Analysis using Cursor. 4. Library Management System. 5. Student Mark Analysis.						

Recommended Text	1. Coronel, Morris, Rob, Database Systems, Design, Implementation and Management Ninth Edition. 2. Nilesh Shah, Database Systems Using Oracle,2nd edition, Pearson Education India,2016.
ReferenceBooks	1. Abraham Silberschatz, Henry Forth and S. Sudarshan, "Database System Concepts", McGraw Hill International Publication, VI Edition. 2. Shio Kumar Singh, "Database Systems ", Pearson publications, II Edition.
Website and e-learningsource	Web resources from NDL Library, E-content from open-source libraries

Course Outcomes (COs)

CO1: Understand the various basic concepts of Data Base System and the difference between file system and DBMS and compare various data models.
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. 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 Data base operations and implement using PL/SQL programs. Learn basics of PL/SQL and develop programs using Cursors, Exceptions.

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

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

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

Title of the Course	ELECTIVE: CLOUD COMPUTING					
Paper No.	Discipline Specific Elective 1A					
Category	Elective	Year	III	Credits	3	Course Code
		Semester	V			UECSA24
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total	
	5		-		5	
Prerequisites	Nil					
Objectives of the course	1. Learning fundamental concepts and Technologies of Cloud Computing. 2. Learning various cloud service types and their uses and pitfalls. 3. To learn about Cloud Architecture and Application design. 4. To know the various aspects of application design, benchmarking and security on the Cloud. 5. To learn the various Case Studies in Cloud Computing.					
Course Outline	**Unit I (Hours 15) (K2)** 1.1 Introduction to Cloud Computing: Definition of Cloud Computing. 1.2 Characteristics of Cloud Computing – Cloud Models – Cloud Service. 1.3 Examples – Cloud-based Services and Applications. 1.4 Cloud Concepts and Technologies: Virtualization – Load balancing. 1.5 Scalability and Elasticity – Deployment – Replication – Monitoring. 1.6 Software Defined Networking – Network Function Virtualization.					
	Unit II (Hours 15) (K2) 2.1 Compute Services: Amazon Elastic Computer Cloud. 2.2 Google Compute Engine - Windows Azure Virtual Machines. 2.3 Storage Services: Amazon Simple Storage Service. 2.4 Google Cloud Storage - Windows Azure Storage. 2.5 Analytics Services: Amazon Elastic MapReduce. 2.6 Open-Source Private Cloud Software: Cloud Stack – Eucalyptus –Open Stack.					
	Unit III (Hours 15) (K2, K3) 3.1 Cloud Application Design: Introduction. 3.2 Scalability – Reliability and Availability. 3.3 Architectures for Cloud Applications – Cloud Application Design 3.4 Methodologies: Service Oriented Architecture (SOA). 3.5 Cloud Component Model, IaaS, PaaS and SaaS. 3.6 Services for Cloud Applications, Model View Controller (MVC).					

	Unit IV (Hours 15) (K2, K3)
	4.1 Cloud Application Benchmarking and Tuning.
	4.2 Introduction to Benchmarking.
	4.3 Steps in Benchmarking.
	4.4 Workload Characteristics.
	4.5 Application Performance Metrics.
	4.6 Design Consideration for Benchmarking Methodology.
	Unit V (Hours 15) (K4)
	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.
	5.6 Cloud Computing for Mining.

Recommended Text	1. Arshdeep Bahga, Vijay Madisetti, Cloud Computing – A Hands on Approach, Universities Press (India) Pvt. Ltd., 2018.
ReferenceBooks	1. Anthony T Velte, Toby J Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Tata McGraw-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. Kumar Saurabh, Cloud Computing, Wiley India, Second Edition 2012.
Website and e-learningsource	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:

> **Course Outcomes (Cos):**
> **CO1:** Understand the fundamental concepts and Technologies in Cloud Computing.
> **CO2:** Able to understand various cloud service types and their uses and pitfalls.
> **CO3:** Able to understand Cloud Architecture and Application design.
> **CO4:** Understand the various aspects of application design, benchmarking and security in the Cloud.
> **CO5:** Understand various Case Studies in Cloud Computing.

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

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

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

Title of the Course	**ELECTIVE: ARTIFICIAL INTELLIGENCE**						
Paper No.	**Discipline Specific Elective 1B**						
Category	Core	Year	III	Credits	3	Course Code	UECSB24
		Semester	V				
Instructional Hours per week	Lecture	Tutorial	Lab Practice			Total	
	5	-	-			5	
Prerequisites	Solid Knowledge in Mathematics, Programming, Machine Learning, Data Handling and Preprocessing.						
Objectives of the course	This course aims at providing an overall view of the • To learn various concepts of AI Techniques. • To learn various Search Algorithm in AI. • To learn probabilistic reasoning and models in AI. • To learn about Markov Decision Process. • To learn various type of Reinforcement learning.						
Course Outline	**UNIT-I (15 hours) (K1, K2)** 1.1 Introduction: Concept of AI, history, current status, scope, agents, 1.2 Environments, Problem Formulations. 1.3 Review of tree and graph structures. 1.4 State space representation. 1.5 Search graph and Search tree.						
	UNIT-II (15 hours) (K1, K2) 2.1 Search Algorithms: Random search, 2.2 Search with closed and open list. 2.3 Depth first and Breadth first search, 2.4 Heuristic search. 2.5 Best first search, A* algorithm. 2.6 Game Search.						
	UNIT-III (15 hours) (K1, K2) 3.1 Probabilistic Reasoning: Probability, conditional probability. 3.2 Bayes Rule. 3.3 Bayesian Networks. 3.4 Representation, construction and inference. 3.5 Temporal model. 3.6 Hidden Markov model.						
	UNIT-IV (15 hours) (K1, K2) 4.1 Markov Decision process: MDP formulation, 4.2 Utility theory. 4.3 Utility functions, value iteration. 4.4 Policy iteration. 4.5 Partially observable MDPs.						

	UNIT-V (15 hours) (K1, K2)
	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.
	5.6 Q learning.

Recommended Text	1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 3rd Edition, Prentice Hall. 2. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill.
Reference Books	1. Trivedi, M.C., "A Classical Approach to Artificial Intelligence", Khanna Publishing House, Delhi. 2. Saroj Kaushik, "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.https://github.com/dair-ai/ML-Course-Notes 2.https://web.cs.hacettepe.edu.tr/~erkut/ain311.f21/index.html 3.https://www.toolify.ai/?gclid=CjwKCAjwvdajBhBEEiwAeMh1U6tlq U1LXlRFbcghLMZVwICm_4PkIRcDRE-VYq_wTDcuaQeq_bCHnhoCcm4QAvD_BwE

Course Outcomes:

The Learners will be able to
1. Understand the various concepts of AI Techniques.
2. Understand various Search Algorithms in AI.
3. Understand probabilistic reasoning and models in AI.
4. Understand Markov Decision Process.
5. Understand various type of Reinforcement learning Techniques.

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

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

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

Title of the Course	ELECTIVE: INTRODUCTION TO DATA SCIENCE						
Paper No.	Discipline Specific Elective 2A						
Category	Elective	Year	III	Credits	3	Course Code	UECSC24
		Semester	V				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	4		-		4		
Prerequisites	Big Data						
Objectives of the course	1. To learn about basics of Data Science and Big data. 2. To learn about overview and building process of Data Science. 3. To learn about various Algorithms in Data Science. 4. To learn about Hadoop Framework. 5. To learn about case study about Data Science.						
Course Outline	**Unit I (Hours 12) (K1)** 1.1 Introduction. 1.2 Benefits and uses. 1.3 Facts of data. 1.4 Data science process 1.5 Big data ecosystem and data science. 1.6 The Data science process						
	Unit II (Hours 12) (K2) 2.1 Overview. 2.2 Research goals. 2.3 Retrieving data. 2.4 Transformation. 2.5 Exploratory Data Analysis. 2.6 Model building						
	Unit III (Hours 12) (K3) 3.1 Algorithms 3.2 Machine learning algorithms. 3.3 Modeling Process-Types. 3.4 Supervised 3.5 Unsupervised. 3.6 Semi-supervised						
	Unit IV (Hours 12) (K2, K3) 4.1 Introduction to Hadoop 4.2 Hadoop framework 4.3 Spark – replacing 4.4 MapReduce – NoSQL. 4.5 ACID – CAP. 4.6 BASE – types.						

	Unit V (Hours 12) (K4) 5.1 Case Study: Prediction of Disease. 5.2 Setting research goals. 5.3 Data retrieval – preparation. 5.4 Exploration. 5.5 Disease profiling. 5.6 Presentation and Automation
Recommendedd Text	1. Davy Cielen, Arno D. B. Meysman, Mohamed Ali, "Introducing Data Science", manning Publications 2016.
ReferenceBooks	1. Roger Peng, "The Art of Data Science", lulu.com 2016. 2. MurtazaHaider, "Getting Started with Data Science – Making Sense of Data with Analytics", IBM press, E-book. 3. Davy Cielen, Arno D.B. Meysman, Mohamed Ali, "Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools", Dreamtech Press 2016.
Website and e-learningsource	**Web Resources** 1. https://www.w3schools.com/datascience/ 2. https://en.wikipedia.org/wiki/Data_science 3. http://www.cmap.polytechnique.fr/~lepennec/en/post/references/refs/

Course Outcomes:

Course Outcomes (Cos)
CO1: Understand the basics in Data Science and Big data. **CO2:** Understand overview and building process in Data Science. **CO3:** Understand various Algorithms in Data Science. **CO4:** Understand Hadoop Framework in Data Science. **CO5:** Case study in Data Science.

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

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

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

Title of the Course	**ELECTIVE: HUMAN COMPUTER INTERACTION**					
Paper No.	**Discipline Specific Elective 2B**					
Category	**Elective**	**Year**	III	**Credits**	3	**Course Code**
		Semester	V			UECSD24
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) 2.1 Interactive Design 2.2 Basics- Process- Scenarios. 2.3 Navigation: Screen Design Iteration 2.4 Prototyping. 2.5 Software Life Cycle 2.6 Design Rules: Principles					
	Unit III (Hours 12) (K2) 3.1 HCI Models: Cognitive Models 3.2 Socio Organizational 3.3 Issues and Stakeholder requirements. 3.4 Communication and Collaboration Models. 3.5 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

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

Title of the Course	DATA ANALYTICS USING R						
Paper No.	Core 13						
Category	CORE	Year	III	Credits	5	Course Code	UCCSM24
		Semester	VI				
Instructional Hours per week	Lecture	Tutorial	Lab Practice		Total		
	6	-	-		6		
Prerequisites	Knowledge of Statistics *and* Mathematics						
Objectives of the course	This course aims at providing an overall view of the • To understand the problem-solving approaches. • To learn the basic programming constructs in R Programming. • To practice various computing strategies for R Programming - based solutions to real world problems. • To use R Programming data structures - lists, tuples, and dictionaries. • 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 — Big data characteristics -Basic Command Directory and File. 1.2 Validating — The Promotion of the Value of Big Data — Big Data Use Cases. 1.3 Characteristics of Big Data Applications — Perception and Quantification of Value. 1.4 Understanding Big Data Storage — A General Overview of High Performance Architecture 1.5 HDFS — Map Reduce and YARN. 1.6 Map Reduce Programming Model.						
	UNIT-II (18 hours) 2.1 Control Structures and Vectors-Control structures, functions, scoping rules 2.2 Date and Time - Strings. 2.3 Matrices, Lists, Data Frames, Classes Vectors: Generating sequences, Vectors and subscripts. 2.4 Extracting elements of a vector using subscripts, working with logical subscripts, Scalars, Vectors, Arrays, and Matrices. 2.5 Adding and Deleting Vector Elements, Obtaining the Length of a Vector. 2.6 Matrices and Arrays as Vectors Vector Arithmetic and Logical Operations- Vector Indexing, Common Vector Operations.						

	UNIT-III (18 hours)
	3.1 Lists: Creating Lists, General List Operations.
	3.2 List Indexing Adding and Deleting List Elements, Getting the Size of a List.
	3.3 Extended Example: Text Concordance
	3.4 Accessing List Components & Values.
	3.5 Applying Functions to Lists, 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.
	4.3 Extracting a Sub table, Finding the Largest Cells in a Table, Math Functions.
	4.4 Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus.
	4.5 Functions for Statistical Distributions R Programming.
	UNIT-V (18 hours)
	5.1 Object-Oriented Programming S Classes, S Generic Functions.
	5.2 Writing S Classes, Using Inheritance, S Classes.
	5.3 Writing S Classes, Implementing a Generic Function on an S Class.
	5.4 Visualization, Simulation.
	5.5 Code profiling, Statistical Analysis with R, data manipulation.

Recommended Text	1. Roger D. Peng," R Programming for Data Science ", 2012 2. Norman Matloff", The Art of R Programming- A Tour of Statistical Software Design", 2011.
Reference Books	1. Roger D. Peng," R Programming for Data Science ", 2012 2. Norman Matloff", The Art of R Programming- A Tour of Statistical Software Design", 2011.
Website and e-learning source	1.https://www.simplilearn.com.

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 No SQL databases and management.

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

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

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

Title of the Course	**PRACTICAL - VI: DATA ANALYTICS USING R**						
Paper No.	**Core Course 14**						
Category	CORE	**Year**	III	**Credits**	2	**Course Code**	UCCSN24
		Semester	VI				
Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	-	-	3			3	
Prerequisites	Knowledge of Statistics and Mathematics						
Objectives of the course	This course aims at providing an overall view of the • To understand the problem-solving approaches. • To learn the basic programming constructs in R Programming. • To practice various computing strategies for R Programming - based solutions to real world problems. • To use R Programming data structures - lists, tuples and dictionaries. • To do input/output with files in R Programming.						
Course Outline	**Practical Programs(45 Hours)** 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 of even numbers from 1 to n using R-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 cbind() and rbind() 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. Program to find factorial of the given number using recursive function.						

	12. Write a R program to count the number of even and odd numbers from array of N numbers.

Course Outcomes:

The Learners will be able to
1. Acquire programming skills in core R Programming.
2. Acquire Object-oriented programming skills in R Programming.
3. Develop the skill of designing graphical-user interfaces (GUI) in R Programming.
4. Acquire R Programming skills to move into specific branches.
5. Perform analytics on data streams.

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

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

Title of the Course	.NET PROGRAMMING						
Paper No.	Core 15						
Category	Core	Year	III	Credits	4	Course Code	UCCSO24
		Semester	VI				
Instructional Hours per week	Lecture	Tutorial	Lab Practice			Total	
	6	-	-			6	
Prerequisites	A Solid Understanding of Basic Coding, Web Development.						
Objectives of the course	This course aims at providing an overall view of the • To identify and understand the goals and objectives of the .NET framework and ASP.NET with C# language. • To develop ASP.NET Web application using standard controls. • To implement file handling operations. • To handles SQL Server Database using ADO.NET. • Understand the Grid view control and XML classes.						
Course Outline	**UNIT I (18 hours)** 1.1 Overview of .NET framework: 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 (18 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 (18 hours) 3.1 Rich Controls: Properties and its events. 3.2 Validation controls: Properties and its events. 3.3 File Stream classes. 3.4 File Modes – File Share 3.5 Reading and Writing to files. 3.6 Creating, Moving, Copying and Deleting files - File uploading						
	UNIT IV (18 hours) 4.1 ADO.NET Overview – Database Connections. 4.2 Commands. 4.3 Data Reader - Data Adapter. 4.4 Data Sets.						

	4.5 Extracting Data Controls and its Properties. 4.6 Data Binding.
	UNIT V (18 hours) 5.1 Grid View control: Deleting, editing. 5.2 Sorting and Paging. 5.3 XML classes – Web form to manipulate XML files. 5.4 Website Security - Authentication – Authorization. 5.5 Creating a Web application.

Recommended Text	1. Svetlin Nakov, Veselin Kolev & Co., Fundamentals of Computer Programming with C#, Faber publication, 2019. 2. Mathew, Mac Donald, The Complete Reference ASP.NET, Tata McGraw-Hill,2015.
Reference Books	1. Herbert Schildt, The Complete Reference C#.NET, Tata McGraw Hill, 2017. 2. Kogent Learning Solutions, C# 2012 Programming Covers .NET 4.5 Black Book, Dreamtech Press, 2013. 3. Anne Boehm, Joel Murach, Murach's C# 2015, Mike Murach& Associates Inc.2016. 4. Denielle Otey, Michael Otey, ADO.NET: The Complete reference, McGrawHill,2008. 5. Matthew MacDonald, Beginning ASP.NET 4 in C# 2010, APRESS, 2010.
Website and e-learning source	1. https://www.simplilearn.com 2. https://www.javatpoint.com/net-framework

Course Outcomes:

The Learners will be able to
1. Develop working knowledge of C# programming constructs and the .NET Framework.
2. To develop a software to solve real-world problems using ASP.NET.
3. To Work on Various Controls Files.
4. To create a web application using MicrosoftADO.NET.
5. To develop web applications using XML.

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

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

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

Title of the Course	**PRACTICAL - VII: .NET PROGRAMMING**						
Paper No.	**Core 16**						
Category	**Core**	**Year**	III	**Credits**	2	**Course**	UCCSP24
		Semester	VI			**Code**	
Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	-	-	3			3	
Prerequisites	A Solid Understanding of Basic Coding, Web Development.						
Objectives of the course	This course aims at providing an overall view of the • To develop ASP.NET Web application using standard controls. • To create rich database applications usingADO.NET. • To implement file handling operations. • To implement XML classes. • To utilize ASP.NET security features for authenticating the website.						

Course Outline	**Practical Programs (45 hours)**
	 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.
	    (i) Validate user input using Validation controls.
	    (ii) Working with File concepts.
	 7. Web application using Data Controls.
	 8. Data binding with Web controls.
	 9. Data binding with Data Controls.
	 10. Database application to perform insert, update and delete operations.
	 11. Implement the Xml classes.
	 12. Database application using Data Controls to perform insert, delete, edit, paging and Sorting operation.
	 13. Implement Authentication – Authorization.
	 14. Ticket reservation using ASP.NET controls.
	 15. Online examination using ASP.NET controls.						

Course Outcomes:

The Learners will be able to
1. To create web applications and implement various controls.
2. Create web pages in Rich control.
3. Develop knowledge about file handling operations.
4. An ability to design XML classes.
5. To develop a software to solve real-world problems using ASP.NET.

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

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

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

Title of the Course	**ELECTIVE: BIG DATA ANALYTICS**						
Paper No.	**Discipline Specific Elective 3A**						
Category	Core	**Year**	III	**Credits**	3	**Course**	UECSE24
		Semester	VI			**Code**	
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. - Understand 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: NATURAL LANGUAGE PROCESSING**						
Paper No.	**Discipline Specific Elective 3B**						
Category	Core	Year	III	Credits	3	Course Code	UECSF24
		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

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

Title of the Course	ELECTIVE: IOT AND ITS APPLICATIONS						
Paper No.	Discipline Specific Elective 4A						
Category	Core	Year	III	Credits	3	Course Code	UECSG24
		Semester	VI				
Instructional Hours per week	Lecture	Tutorial	Lab Practice			Total	
	4	-	-			4	
Prerequisites	Basic Knowledge in Electronics, Programming, Networking and Communication Protocols, Data Handling and Cloud Services.						
Objectives of the course	This course aims at providing an overall view of the • Use of Devices, Gateways and Data Management in IoT. • Design IoT applications in different domain and be able to analyze their performance. • To Implement basic IoT applications on embedded platform. • To gain knowledge on Industry Internet of Things. • To Learn about the privacy and Security issues in IoT.						
Course Outline	**UNIT-I (12 hours) (K1, K2)** 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, IoT Applications. 1.3 Future Internet Technologies, Infrastructure, Networks and Communication, Processes. 1.4 Data Management, Security, Privacy & Trust, Device Level Energy Isses. 1.5 IoT Related Standardization, Recommendations on Research Topics. **UNIT-II (12 hours) (K2, K3)** 2.1 M2M to IoT – A Basic Perspective– Introduction, Some Definitions, M2M Value Chains. 2.2 IoT Value Chains, An emerging industrial structure for IoT. 2.3 The international driven global value chain and global information monopolies. 2.4 M2M to IoT-An Architectural Overview– Building an architecture. 2.5 Main design principles and needed capabilities, An IoT architecture outline, standards considerations. **UNIT-III (12 hours) (K3, K4)** 3.1 IoT Architecture -State of the Art – Introduction, State of the art. 3.2 Architecture. Reference Model- Introduction, Reference Model and architecture. 3.3 IoT reference Model, IoT Reference Architecture.						

	3.4 Introduction, Functional View, Information View, Deployment. 3.5 Operational View, Other Relevant architectural views.
	UNIT-IV (12 hours) (K3, K4) 4.1 IoT Applications for Value Creations Introduction, IoT applications for industry: Future Factory Concepts. 4.2 Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in Business to Master IoT. 4.3 Value Creation from Big Data and Serialization, IoT for Retailing Industry. 4.4 IoT for Oil and Gas Industry, Opinions on IoT Application. 4.5 Value for Industry, Home Management.
	UNIT-V (12 hours) (K3, K4) 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-Data-Platforms for Smart Cities 5.4 First Steps towards a Secure Platform, Smartie Approach. 5.5 Data Aggregation for the IoT in Smart Cities, Security.

Recommended Text	1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things: (A Hands-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", kindle version. 2. Francis da Costa, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", Apress Publications 2013, 1st Edition. 3. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and 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:

The Learners will be able to
1. Work with big data tools and its analysis techniques.
2. Analyze 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	H	L	H	L	H	M
CO2	M	M	H	M	L	H
CO3	H	H	M	M	M	M
CO4	L	M	L	H	M	L
CO5	L	H	M	M	L	M

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

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

Title of the Course	ELECTIVE: CYBERSECURITY						
Paper No.	Discipline Specific Elective 4B						
Category	Elective	Year	III	Credits	3	Course Code	UECSH24
		Semester	VI				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	4		-		4		
Prerequisites	Network Security						
Objectives of the 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

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

Title of the Course	GENERATIVE AI					
Paper No.	**Professional competency SEC 8**					
Category	Core	Year		Credits	2	Course Code
		Semester				UPCS24
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)