

JP COLLEGE OF ARTS & SCIENCE (AUTONOMOUS)

(Run by DMI Sisters)

(Affiliated to Manonmaniam Sundaranar University – Tirunelveli)

Accredited by NAAC with “B++” Grade

2(f) status of UGC Act, 1956 | ISO 9001:2015 Certified Institution

Ayikudy, Tenkasi District - 627852.

SYLLABUS



Bachelor of Computer Applications

Choice Based Credit System (CBCS)

(w.e.f. June 2026-2027)



JP COLLEGE OF ARTS & SCIENCE

(AUTONOMOUS)

(Run by DMI Sisters)

(Affiliated to Manonmaniam Sundaranar University – Tirunelveli)

Accredited by NAAC with “B++” Grade

2(f) status of UGC Act, 1956 | ISO 9001:2015 Certified Institution

Ayikudy, Tenkasi District - 627852.

SYLLABUS

PROGRAMME OUTCOMES (PO) FOR UG PROGRAMME

The successful completion of the BCA programme shall enable the students to:

PO1	Disciplinary knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study
PO2	Communication Skills: Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.
PO3	Critical thinking: Capability to apply analytic thought to a body of knowledge; analyze and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.
PO4	Problem solving: Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.
PO5	Analytical reasoning: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.
PO6	Research-related skills: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesizing and articulating; Ability to recognize cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyze, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation
PO7	Cooperation/Team work: Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team
PO8	Scientific reasoning: Ability to analyze, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.
PO9	Reflective thinking: Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society.
PO10	Information/digital literacy: Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.
PO11	Self-directed learning: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion
PO12	Multicultural competence: Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.



JP COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

Run by DMI Sisters - Ayikudy, Tenkasi - 627852
Affiliated to Manonmaniam Sundaranar University - Tirunelveli



Regulations 2026 - 2027 for Undergraduate Programme

Learning Outcomes Based Curriculum Framework (LOCF) model with Choice Based Credit System (CBCS)

Programme: Bachelor of Computer Applications (BCA)

(Applicable for the Students admitted during the Academic Year 2026 - 2027 onwards)

Computer Applications

- The **Learning Outcome-based Curriculum Framework (LOCF)** has been implemented for the Computer Applications programme to ensure the structured delivery of up-to-date technological knowledge. The programme aims to cultivate industry-aligned technical expertise and enable students to acquire the key employability skills required by the time they graduate.

Vision

- To make students and organizations succeed with innovative, coherent applications that boost productivity, creativity, and decision-making, molding the future of technology.

Mission

- To create new and innovative applications that make technologies better and more accessible.
- To develop easy-to-use applications that solve problems and make tasks simpler.
- To motivate the students to become an effective software entrepreneur.

Programme Outcomes (POs)

The successful completion of the BCA programme shall enable the students to:

PO1	Disciplinary knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study
PO2	Communication Skills: Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.
PO3	Critical thinking: Capability to apply analytic thought to a body of knowledge; analyze and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.
PO4	Problem solving: Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.
PO5	Analytical reasoning: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.
PO6	Research-related skills: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesizing and articulating; Ability to recognize cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyze, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation
PO7	Cooperation/Team work: Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team

PO8	Scientific reasoning: Ability to analyze, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.
PO9	Reflective thinking: Critical sensibility to lived experiences, with self-awareness and reflexivity of both self and society.
PO10	Information/digital literacy: Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.
PO11	Self-directed learning: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion
PO12	Multicultural competence: Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.

Programme Specific Outcomes (PSOs)

PSO1	To enable students to apply basic microeconomic, macroeconomic and monetary concepts and theories in real life and decision making
PSO2	To sensitize students to various economic issues related to Development, Growth, International Economics, Sustainable Development and Environment.
PSO3	To familiarize students to the concepts and theories related to Finance, Investments and Modern Marketing.
PSO4	Evaluate various social and economic problems in the society and develop answer to the problems as global citizens
PSO5	Enhance skills of analytical and critical thinking to analyze effectiveness of economic policies
PSO6	To develop proficiency in quantitative, analytical, and data interpretation skills for effective economic analysis, policy evaluation, and evidence-based decision-making using modern tools and techniques.

Choice Based Credit System (CBCS), Learning Outcomes Based Curriculum Framework (LOCF)
Guideline Based Credit and Hours Distribution System
for all UG courses including Lab Hours

First Year
Semester - I

Part	List of Courses	Credit	No. of Hours
Part-1	Language – Tamil	3	5
Part-2	English	3	5
Part-3	Core Courses & Elective Courses [in Total]	11	14
Part-4	Skill Enhancement Course SEC-1	2	2
	Foundation Course	2	2
	NME	2	2
		23	30

Semester - II

Part	List of Courses	Credit	No. of Hours
Part-1	Language – Tamil	3	5
Part-2	English	3	5
Part-3	Core Courses & Elective Courses including laboratory [in Total]	11	14
Part-4	Skill Enhancement Course -SEC-2	2	2
	Skill Enhancement Course -SEC-3 (Discipline / Subject Specific)	2	2
	NME	2	2
		23	30

Second Year
Semester - III

Part	List of Courses	Credit	No. of Hours
Part-1	Language – Tamil	3	5
Part-2	English	3	5
Part-3	Core Courses & Elective Courses including laboratory [in Total]	11	14
Part-4	Skill Enhancement Course -SEC-4 (Entrepreneurial Based)	2	2
	Skill Enhancement Course -SEC-5 (Discipline / Subject Specific)	2	2
	Environmental Studies	2	2
		23	30

Semester-IV

Part	List of Courses	Credit	No. of Hours
Part-1	Language – Tamil	3	5
Part-2	English	3	5
Part-3	Core Courses & Elective Courses including laboratory [in Total]	11	14
Part-4	Skill Enhancement Course -SEC-5 (Discipline / Subject Specific)	2	2
	Skill Enhancement Course -SEC-6 & 7 (Discipline / Subject Specific)	2	2
	Value Education	2	2
		23	30

**Third Year
Semester - V**

Part	List of Courses	Credit	No. of Hours
Part-3	Core Courses including Project / Elective Based	22	28
Part-4	Internship / Industrial Visit / Field Visit	2	-
Part-4	Ability Enhancement Course - I	2	2
		26	30

Semester - VI

Part	List of Courses	Credit	No. of Hours
Part-3	Core Courses including Project / Elective Based & LAB	23	28
Part-4	Ability Enhancement Course - II	2	2
Part-5	Extension Activity	1	-
		26	30

Total Credits: 144

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	11	11	11	11	22	23	89
Part IV	6	6	6	6	4	2	30
Part V	-	-	-	-	-	1	1
Total	23	23	23	23	26	26	144

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

Part I – Tamil / Other Languages

Part II - English

Part III – Core Papers, Electives and Project

Part IV – Environmental Studies, Value Based Education, Non Major Elective, Skill Enhancement Courses, Foundation Course and Internship

Part V – Extension Activity

Curriculum

Semester - 1									
Course Code	Part	Course Category	Course Name	Hours/ Week	Examination				Credits
					Duration in Hours.	Max Marks			
						CIA	ESE	Total	
26U1TL11	I	Language - I	Tamil - I	5	3	50	50	100	3
26U1HD11	I		Hindi - I						
26U1MY11	I		Malayalam - I						
26U1FR11	I		French - I						
26U2EN11	II	Language - II	English - I	5	3	50	50	100	3
26UCCA11	III	Core - I	C Programming	4	3	50	50	100	4
26UCCAP1	III	Core - I	C Programming Lab	6	3	50	50	100	4
26UECA11	III	EC - I	Discrete Mathematics – I /	4	3	50	50	100	3
26UECA12			Numerical Methods						
26USCAP1	IV	SEC - I	Office Automation Lab	2	3	50	50	100	2
26UFCA11	IV	FC - I	Fundamentals of Information Technology	2	3	50	50	100	2
26UNCA11	IV	NME - I	Basic Programming Design	2	3	50	50	100	2
Total				30				800	23

Semester - 2									
Course Code	Part	Course Category	Course Name	Hours/ Week	Examination				Credits
					Duration in Hours	Max Marks			
						CIA	ESE	Total	
26U1TL21	I	Language - I	Tamil - II	5	3	50	50	100	3
26U1HD21	I		Hindi - II						
26U1MY21	I		Malayalam - II						
26U1FR21	I		French - II						
26U2EN21	II	Language - II	English - II	5	3	50	50	100	3
26UCCA21	III	Core - III	Object Oriented Programming Concepts using C++	4	3	50	50	100	4
26UCCAP2	III	Core - IV	C++ Programming Lab	6	3	50	50	100	4
26UECA21	III	EC - II	Digital Logic Fundamentals	4	3	50	50	100	3
26UECA22			Optimization Techniques						
26USCA21	IV	SEC - II	Web Designing	2	3	50	50	100	2
26USCAP2	IV	SEC - III	Web Designing Lab	2	3	50	50	100	2
26UNCA21	IV	NME - II	Basics of Artificial Intelligence	2	3	50	50	100	2
Total				30				800	23

Semester - 3									
Course Code	Part	Course Category	Course Name	Hours/ Week	Examination				Credits
					Duration in Hours	Max Marks			
						CIA	ESE	Total	
26U1TL31	I	Language - I	Tamil - III	5	3	50	50	100	3
26U1HD31	I		Hindi - III						
26U1MY31	I		Malayalam - III						
26U1FR31	I		French - III						
26U2EN31	II	Language - II	English - III	5	3	50	50	100	3
26UCCA31	III	Core - V	Data Structures and Algorithms	4	3	50	50	100	4
26UCCAP3	III	Core - VI	Data Structures and Algorithms using C++ Lab	6	3	50	50	100	4
26UECA31	III	EC - III	Microprocessor and Microcontroller	4	3	50	50	100	3
26UECA32			Cyber Forensics						
26USCAP3	IV	SEC - IV	Multimedia Systems Lab	2	3	50	50	100	2
26USCA31	IV	SEC - V	Software Engineering	2	3	50	50	100	2
26UEVS31	IV	Common	Environmental Science	2	3	50	50	100	2
Total				30				800	23

Semester - 4									
Course Code	Part	Course category	Course Name	Hours/ Week	Examination				Credits
					Duration in Hours	Max Marks			
						CIA	ESE	Total	
26U1TL41	I	Language - I	Tamil - IV	5	3	50	50	100	3
26U1HD41	I		Hindi - IV						
26U1MY41	I		Malayalam - IV						
26U1FR41	I		French - IV						
26U2EN41	II	Language - II	English - IV	5	3	50	50	100	3
26UCCA41	III	Core - VII	Dot Net with MYSQL	4	3	50	50	100	4
26UCCAP4	III	Core - VIII	Dot Net with MYSQL Lab	6	3	50	50	100	4
26UECA41	III	EC - IV	Financial Accounting	4	3	50	50	100	3
26UECA42			Cloud Computing						
26USCAP4	IV	SEC - VI	PHP Programming Lab	2	3	50	50	100	2
26USCAP5	IV	SEC - VII	Desktop Publishing Lab	2	3	50	50	100	2
26UVBE41	IV	Common	Value Based Education	2	3	50	50	100	2
Total				30				800	23

Semester - 5

Course Code	Part	Course Category	Course Name	Hours/ Week	Examination				Credits
					Duration in hrs.	Max Marks			
						CIA	ESE	Total	
26UCCA51	III	Core - IX	Operating Systems	4	3	50	50	100	4
26UCCA52	III	Core - X	Java Programming	4	3	50	50	100	4
26UCCAP5	III	Core - XI	Java Programming Lab	6	3	50	50	100	4
26UCCA5P	III	Core - XII	Mini Project with Viva Voce	6	3	50	50	100	4
26UECA51	III	Elective - V	Software Project Management	4	3	50	50	100	3
26UECA52			Agile Project Management						
26UECA53	III	Elective - VI	Artificial Intelligence	4	3	50	50	100	3
26UECA54			Cyber Security						
26UFIK51	IV	Internship	Internship/Industrial Visit/Field Visit/Knowledge Updation Activity	-	3	50	50	100	2
26UAEC51	IV	AEC - I	Empowered Vocational English	2	3	50	50	100	2
Total				30				800	26

Semester - 6

Course Code	Part	Course Category	Course Name	Hours / Week	Examination				Credits
					Duration in hrs.	Max Marks			
						CIA	ESE	Total	
26UCCA61	III	Core - XIII	Machine Learning	4	3	50	50	100	4
26UCCA62	III	Core - XIV	Python Programming	4	3	50	50	100	4
26UCCAP6	III	Core - XV	Machine Learning Lab	6	3	50	50	100	4
26UCCA6P	III	Core - XVI	Major Project with Viva voce	6	3	50	50	100	5
26UECA61	III	Elective - VII	Robotics and its Applications	4	3	50	50	100	3
26UECA62			Computer Networks						
26UECA63	III	Elective - VIII	Introduction to Data Science	4	3	50	50	100	3
26UECA64			Data Mining and Warehousing						
26UAEC61	IV	AEC - II	Design Thinking	2	3	50	50	100	2
26U5EA61	V	Common	Extension Activity	-	-	-	100	100	1
Total				30				800	26
Grand Total				180				4800	144

Internship (minimum of 30 hours): The students should submit certificate of attendance from the industry stating the nature of work done, duration and role played along with report (minimum of 20 pages) at the end of V semester for external evaluation.

Industrial Visit/ Field Visit: A report based on the observation and learning outcome to be submitted (minimum of 10 pages) along with suitable evidences at the end of V semester for external evaluation.

Knowledge Updation Activity: A report to be submitted (minimum of 10 pages) based on the study made along with the completion certificate stating the work done (MOOC/NPTEL) at the end of V semester for external evaluation.

Internship/Industrial Visit/Field Visit/Knowledge Updation Activity: Internal – 50 Marks,
External – 50 Marks

Project: Group Project report should be submitted for external evaluation. Internal – 50 Marks,
External – 50 Marks

Extension Activity (NSS/ NCC/ YRC/ RRC/ Games and Sports/ Youth Welfare Activities Outreach Programmes/Migration Awareness in the Tamil Nadu Education System): Individual report should be submitted at the end of VI semester for external evaluation.
External – 100 Marks

Ability Enhancement Compulsory Course: Empowered Vocational English and Design Thinking subjects is given to students.
Internal Marks – 50 Marks, External – 50 Marks

SEMESTER - 1

Semester - 1									
Course Code	Part	Course Category	Course Name	Hours/ Week	Examination				Credits
					Duration in Hours.	Max Marks			
						CIA	ESE	Total	
26U1TL11	I	Language - I	Tamil - I	5	3	50	50	100	3
26U1HD11	I		Hindi - I						
26U1MY11	I		Malayalam - I						
26U1FR11	I		French - I						
26U2EN11	II	Language - II	English - I	5	3	50	50	100	3
26UCCA11	III	Core - I	C Programming	4	3	50	50	100	4
26UCCAP1	III	Core - I	C Programming Lab	6	3	50	50	100	4
26UECA11	III	EC - I	Discrete Mathematics – I /	4	3	50	50	100	3
26UECA12			Numerical Methods						
26USCAP1	IV	SEC - I	Office Automation Lab	2	3	50	50	100	2
26UFCA11	IV	FC - I	Fundamentals of Information Technology	2	3	50	50	100	2
26UNCA11	IV	NME - I	Basic Programming Design	2	3	50	50	100	2
Total				30				800	23

CORE COURSE - I: C PROGRAMMING

V	Pointers: Understanding Pointers- Accessing the Address of a Variable- Declaring Pointer Variables- Initializing of Pointer Variables-Accessing a Variable through	12
----------	--	-----------

	its Pointer- Chain of Pointers- Pointer Expressions- Pointer and Scale Factor- Pointer and Arrays- Pointers and Character Strings- Array of Pointers- Pointer as Function Arguments- Functions Returning Pointers-Pointers to Functions- File Management in C	
TOTAL		60
CO	Course Outcomes	
CO1	Outline the fundamental concepts of C programming languages, and its features.	
CO2	Demonstrate the programming methodology.	
CO3	Identify suitable programming constructs for problem solving.	
CO4	Select the appropriate data representation, control structures, functions and concepts based on the problem requirement.	
CO5	Evaluate the program performance by fixing the errors	
Text Books		
1	Robert W. Sebesta, (2012), — Concepts of Programming Languages, Fourth Edition, Addison Wesley (Unit I : Chapter – 1)	
2	E. Balaguruswamy, (2010), — Programming in ANSI C, Fifth Edition, Tata McGraw Hill Publications	
Reference Books		
1.	Ashok Kamthane, (2009), —Programming with ANSI & Turbo C, Pearson Education	
2.	Byron Gottfried, (2010), —Programming with C, Schaums Outline Series, Tata McGraw Hill Publications	

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	2	3
CO2	3	3	1	2	2	3
CO3	3	3	1	3	2	3
CO4	3	2	1	2	2	3
CO5	3	2	1	2	2	3
Weightage of course contributed to each PSO	15	12	5	11	10	15

CORE COURSE - II: C PROGRAMMING LAB

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCAP1	0	0	6	I	4	6	50	50	100
Learning Objectives									
LO1	To write and execute C programs using input/output functions and command line arguments for basic problem-solving								
LO2	To design programs using conditional statements and loops to implement decision-making logic.								
LO3	To manipulate and process data efficiently using arrays and string handling techniques.								
LO4	To develop programs using functions, including recursive approaches, for structured and reusable code.								
LO5	To apply pointers, file handling, structures, and unions for efficient memory management and data organization.								
Prerequisites:									
Contents									
1. Programs using Input / Output functions 2. Programs on conditional structures 3. Command Line Arguments 4. Programs using Arrays 5. String Manipulations 6. Programs using Functions 7. Recursive Functions 8. Programs using Pointers 9. Files 10. Programs using Structures & Unions									
Total : 90 Hours									
CO	Course Outcomes								
CO1	Demonstrate the understanding of syntax and semantics of C programs.								
CO2	Identify the problem and solve using C programming techniques.								
CO3	Identify suitable programming constructs for problem solving.								
CO4	Analyze various concept of C language to solve the problem in an efficient way.								
CO5	Develop a C program for a given problem and test for its correctness.								

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	2	3
CO2	3	3	1	2	2	3
CO3	3	3	1	3	2	3
CO4	3	2	1	2	2	3
CO5	3	2	1	2	2	3
Weightage of course contributed to each PSO	15	12	5	11	10	15

ELECTIVE COURSE - I: DISCRETE MATHEMATICS - I

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECA11	4	0	0	I	3	4	50	50	100
Learning Objectives									
LO1	To introduce the fundamental concepts of relations, their properties, and representations.								
LO2	To understand and analyze different types of functions, including composition, inverse, and recursive functions.								
LO3	To develop logical reasoning skills through the study of mathematical logic, inference rules, and proof techniques.								
LO4	To apply matrix algebra concepts and operations to solve mathematical and computational problems.								
LO5	To understand graph theory concepts and apply appropriate graph representations for problem solving.								
Prerequisites:									
Unit	Contents								No. of Hours
I	Introduction to Relations – Binary relation – Classification of Relations – Composition of Relations – Inverse of Relation – Representation of Relations on a set -Closure operation on Relations – Reflexive Closure – Symmetric Closure -Transitive Closure -Matrix representation of Relation - digraphs.								12
II	FUNCTIONS Introduction to Functions –Classifications of Functions – Composition of Function – Inverse Function- Hash Function- Recursively Ackermann Function								12
III	MATHEMATICAL LOGIC Introduction – Statement (Propositions) – Laws of Formal Logic –Basic Set of Logical operators/operations - Propositions and Truth Tables – Algebra Propositions - Tautologies and Contradictions – Logical Equivalence – Logical Implication – Normal Forms								12
IV	MATRIX ALGEBRA Introduction – Definition of a Matrix - Types of Matrices – Operations on Matrices –Related Matrices – Transpose of a Matrix – Symmetric and Skew-symmetric Matrices –Complex Matrix– Conjugate of a Matrix – Determinant of a Matrix – Typical Square Matrices – Adjoint and Inverse of a Matrix – Singular and Non-singular Matrices								12
V	GRAPH Introduction – Graph and Basic Terminologies – Types of Graphs – Sub Graph and Isomorphic Graph – Operations on Graphs – Representation of Graph– Adjacency Matrix Representation – Incidence Matrix Representation								12
TOTAL								60	

CO	Course Outcomes
CO1	Recall fundamental concepts to develop a clear understanding of mathematical principles.
CO2	Explain and interpret practical problems using mathematical reasoning.
CO3	Construct matrices based on concepts of discrete mathematics.
CO4	Analyze mathematical techniques used for graph construction.
CO5	Design and represent graphs using appropriate mathematical representations.
Textbooks	
1	DISCRETE MATHEMATICS, Swapan Kumar Chakraborty and BikashKanti Sarkar, OXFORD University Press
Reference Books	
1.	Discrete Mathematics, Third Edition, Seymour Lipschutz and Marc Lars Lipson, Tata McGraw Hill Education Private Limited.
2.	Discrete Mathematical Structures with Applications to Computer Science by J.P.Tremblay, R.Manohar TMH edition

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	2	3
CO2	3	3	1	2	2	3
CO3	3	3	1	3	2	3
CO4	3	2	1	2	2	3
CO5	3	2	1	2	2	3
Weightage of course contributed to each PSO	15	12	5	11	10	15

ELECTIVE COURSE – I: NUMERICAL METHODS

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECA12	4	0	0	I	3	4	50	50	100
Learning Objectives									
LO1	To learn the principles of curve fitting and apply the method of least squares for fitting straight lines to given data.								
LO2	To implement numerical methods such as Bisection, Regula Falsi, and Newton-Raphson for solving algebraic and transcendental equations.								
LO3	To apply techniques like Gauss Elimination, Gauss-Jordan, Gauss-Seidel, and Jacobi methods for solving simultaneous linear equations.								
LO4	To compute derivatives using numerical methods such as Newton’s Forward, Backward, and Divided Difference formulas.								
LO5	To implement numerical methods including Runge-Kutta (2nd and 4th order) and Predictor-Corrector methods (Milne and Adams) for solving ODEs.								
Prerequisites:									
Unit	Contents								No. of Hours
I	Curve Fitting: Introduction, Method of Least squares, Curve Fitting, Fitting a Straight Line								12
II	Solution of Algebraic and Transcendental Equations: Bisection method, RegulaFalsi method, Newton Raphson Method								12
III	Solution of Simultaneous Linear Equations: Solution of Simultaneous Linear Equations: Gauss Elimination method, Gauss-Jordan method, Gauss Seidel Method, Jacobi’s method								12
IV	Numerical Differentiation & Integration: Differentiation: Using Newton’s Forward Difference, Newton’s Backward Difference, Newton’s Divided Difference (First Order Differentiation only)								12
V	Solution of Ordinary Differential Equations: Runge-Kutta 2nd Order and 4th Order methods, Predictor-Corrector Methods: Milne and Adam’s methods.								12
TOTAL								60	
CO	Course Outcomes								
CO1	Obtain numerical solutions of algebraic and transcendental equations								
CO2	Solve system of linear equations numerically using direct and iterative methods								

C03	Solve ordinary differential equations
C04	Compute integration using Simpson's & Trapezoidal Rule
C05	Apply numerical methods in real life
Text Books	
1	B.S. Grewal, "Numerical methods in Engineering & Science", Khanna Publishers, Fifth Edition, April 1999.
2	S.D. Sharma, "Operations Research", KadamathRamnath & Co. Meerut

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	2	3
CO2	3	3	1	2	2	3
CO3	3	3	1	3	2	3
CO4	3	2	1	2	2	3
CO5	3	2	1	2	2	3
Weightage of course contributed to each PSO	15	12	5	11	10	15

SKILL ENHANCEMENT COURSE - I: OFFICE AUTOMATION LAB

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26USCAP1	0	0	2	I	2	2	50	50	100
Learning Objectives									
LO1	To explain the fundamental concepts of computer systems and their components.								
LO2	To demonstrate the use of basic features of word processing software.								
LO3	To illustrate and apply the essential functions of electronic spreadsheet software.								
LO4	To design and develop effective presentations using the PowerPoint tool.								
LO5	To describe and apply the core concepts of a Database Management System (DBMS).								
Prerequisites:									
Contents									
MS – Word									
1. Prepare a word document for Spell checking and Thesaurus.									
2. Find a word and Replace with another in a document.									
3. Insert Header with College Name, Footer with Page No., and Footnote in a document.									
4. Preparing Newspaper format (Apply Alignment, Font, Property, Line spacing, Picture Format).									
5. Prepare a Bio-Data and insert the contents of qualification within the table.									
MS – Excel									
1. Apply formulas and functions.									
2. Prepare a chart for population growth.									
3. Apply ascending and descending order.									
MS – PowerPoint									
1. Create a power point presentation with 3 slides.									
2. Create a design template with 3 slides.									
3. Create a presentation with animation.									
MS – Access									
1. Create an employee database.									
Total Hours : 30									
CO	Course Outcomes								
CO1	Create, edit, and format professional documents using word processing tools such as MS Word, including mail merge, tables, equations, headers/footers, and document layout features.								
CO2	Apply spreadsheet techniques using MS Excel to perform calculations with formulas and Functions								
CO3	Design and deliver effective presentations using MS PowerPoint by applying themes								

C04	Develop and manage basic databases using MS Access
C05	Integrate various Office tools to prepare professional documents

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	2	3
CO2	3	3	1	2	2	3
CO3	3	3	1	3	2	3
CO4	3	2	1	2	2	3
CO5	3	2	1	2	2	3
Weightage of course contributed to each PSO	15	12	5	11	10	15

FOUNDATION COURSE (FC) - FUNDAMENTALS OF INFORMATION TECHNOLOGY

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UFCA11	2	0	0	I	2	2	50	50	100
Learning Objectives									
LO1	Understand the basic concepts and terminology of information technology								
LO2	Have a basic understanding of personal computers and their operation								
LO3	Be able to identify data storage and its usage								
LO4	Get great knowledge of software and its functionalities								
LO5	Understand about operating systems and their uses								
Unit	Contents							No. of Hours	
I	Introduction to Computers Introduction, Definition, Characteristics of computer, Evolution of Computer, Block Diagram of a computer, Generations of Computer, Classification of Computers, Applications of Computer, Capabilities and limitations of computer							6	
II	Basic Computer Organization Role of I/O devices in a computer system. Input Units: Keyboard, Terminals and its types. Pointing Devices, Scanners and its types, Voice Recognition Systems, Vision Input System, Touch Screen, Output Units: Monitors and its types. Printers: Impact Printers and its types. Non-Impact Printers and its types, Plotters, types of plotters, Sound cards, Speakers							6	
III	Storage Fundamentals Primary Vs Secondary Storage, Data storage & retrieval methods. Primary Storage: RAM ROM, PROM, EPROM, EEPROM. Secondary Storage: Magnetic Tapes, Magnetic Disks. Cartridge tape, hard disks, Floppy disks Optical Disks, Compact Disks, Zip Drive, Flash Drives							6	
IV	Software and its needs, Types of S/W. System Software: Operating System, Utility Programs Programming Language: Machine Language, Assembly Language, High Level Language their advantages & disadvantages. Application S/W and its types: Word Processing, Spread Sheets Presentation, Graphics, DBMS							6	
V	Operating System Functions, Measuring System Performance, Assemblers, Compilers and Interpreters. Batch Processing, Multiprogramming, Multi-Tasking, Multiprocessing, Time Sharing, DOS, Windows, Unix/Linux.							6	
TOTAL								30	

CO	Course Outcomes
CO1	Learn the basics of computer, Construct the structure of the required things
CO2	Develop organizational structure using for the devices present currently
CO3	Concept of storing data in computer using two headers namely RAM and ROM with different types of ROM with advancement in storage basis.
CO4	Work with different software, Write program in the software and applications of software.
CO5	Usage of Operating system in information technology which really acts as a interpreter between software and hardware.
Text Books	
1	Anoop Mathew, S. KavithaMurugesan (2009), “Fundamental of Information Technology”, Majestic Books.
2	Alexis Leon, Mathews Leon,” Fundamental of Information Technology”, 2nd Edition
3	S. K Bansal, “Fundamental of Information Technology”.
Reference Books	
1.	Bhardwaj SushilPuneet Kumar, “Fundamental of Information Technology”
2.	GG WILKINSON, “Fundamentals of Information Technology”, Wiley-Blackwell.
3.	A Ravichandran, “Fundamentals of Information Technology”, Khanna Book Publishing

MAPPING TABLE						
CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	3	2	2
CO2	2	3	2	3	2	2
CO3	2	3	2	2	3	1
CO4	1	2	2	1	3	2
CO5	2	2	2	1	3	3
Weightage of course contributed to each PSO	10	12	10	10	13	10

NON MAJOR ELECTIVE - I: BASIC PROGRAMMING DESIGN

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UNCA11	2	0	0	I	2	2	50	50	100
Learning Objectives									
LO1	Explain the concepts of program development, algorithms, flowcharts, and decision tables, and apply them to design simple programs.								
LO2	Demonstrate skills in program testing, debugging, and documentation, and distinguish between unstructured, structured, and object-oriented programming paradigms within Computer Programming.								
LO3	Describe the evolution, classification, and generations of programming languages, and identify features of a good programming language.								
LO4	Explain the relationship between hardware and software, classify software types, and differentiate terms such as firmware, freeware, shareware, and proprietary software.								
LO5	Understand the evolution and basics of the Internet, including email, web searching, connectivity, and awareness of internet security issues like Computer Virus.								
Unit	Contents								No. of Hours
I	Computer Program: Introduction – Developing a program – Algorithm – Flowchart – Decision Tables.								6
II	Program Testing and Debugging – Program Documentation – Program Paradigms: Unstructured programming, Structured programming and Object Oriented Programming – Characteristics of a Good Programming.								6
III	Computer Languages: Evolution Programming Languages – Classification of Programming Languages – Generation of Programming Languages – Features of Good Programming language.								6
IV	Computer Software: Software Definition – Relationship between Software and Hardware - Software Categories: System Software and Application Software – Terminology Software Firmware, Liveware, Freeware, Public Domain Software, Shareware, Commercial Software and Proprietary Software.								6
V	Evolution of Internet - Internet Basics: Basic Internet Terms – Getting connected to Internet -Internet Applications – E-mail – Searching the Web – Internet and Viruses.								6
TOTAL								30	
CO	Course Outcomes								
CO1	Define the basic design in programming								
CO2	Summarize various techniques in program testing.								

CO3	To develop and evaluate Programming Languages
CO4	To analyze computer hardware and software programs
CO5	To evaluate the Internet Applications
Text Books	
1	Introduction to Computer Science, ITL Education Solutions Limited, 2/e, Pearson
Reference Books	
1	Fundamentals of Computers, V.Rajaram, 5th Edition, PHI
2	Introduction to Computers, Peter Norton, 7/e, TMH.

MAPPING TABLE						
CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	3	2	2
CO2	2	3	2	3	2	2
CO3	2	3	2	2	3	1
CO4	1	2	2	1	3	2
CO5	2	2	2	1	3	3
Weightage of course contributed to each PSO	10	12	10	10	13	10

SEMESTER - 2

Semester - 2									
Course Code	Part	Course Category	Course Name	Hours / Week	Examination				Credits
					Duration in Hours	Max Marks			
						CIA	ESE	Total	
26U1TL21	I	Language - I	Tamil - II	5	3	50	50	100	3
26U1HD21	I		Hindi - II						
26U1MY21	I		Malayalam - II						
26U1FR21	I		French - II						
26U2EN21	II	Language - II	English - II	5	3	50	50	100	3
26UCCA21	III	Core - III	Object Oriented Programming Concepts using C++	4	3	50	50	100	4
26UCCAP2	III	Core - IV	C++ Programming Lab	6	3	50	50	100	4
26UECA21	III	EC - II	Digital Logic Fundamentals	4	3	50	50	100	3
26UECA22			Optimization Techniques						
26USCA21	IV	SEC - II	Web Designing	2	3	50	50	100	2
26USCAP2	IV	SEC - III	Web Designing Lab	2	3	50	50	100	2
26UNCA21	IV	NME - II	Basics of Artificial Intelligence	2	3	50	50	100	2
Total				30				800	23

FIRST YEAR
SEMESTER - II
CORE COURSE - III: OBJECT ORIENTED PROGRAMMING CONCEPTS USING C++

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCA21	4	0	0	II	4	4	50	50	100
Learning Objectives									
LO1	Describe the procedural and object-oriented paradigm with concepts of streams, classes, functions, data and objects								
LO2	Understand dynamic memory management techniques using pointers, constructors, destructors, etc.								
LO3	Describe the concept of function overloading, operator overloading, virtual functions and polymorphism								
LO4	Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming								
LO5	Demonstrate the use of various OOPs concepts with the help of programs								
Prerequisites:									
Unit	Contents								No. of Hours
I	Introduction to C++ - key concepts of Object-Oriented Programming I/O in C++ - C++ Declarations. Control Structures: - Decision Making and Statements: If ..else, jump, goto, break, continue, Switch case statements - Loops in C++ :for, while, do - functions in C++ - inline functions – Function Overloading								12
II	Classes and Objects: Declaring Objects – Defining Member Functions – Static Member variables and functions – array of objects –friend functions – Overloading member functions – Constructor and destructor with static members.								12
III	Operator Overloading: Overloading unary, binary operators – Overloading Friend functions –type conversion – Inheritance: Types of Inheritance – Single, Multilevel, Multiple, Hierarchal, Hybrid, Virtual base Classes – Abstract Classes.								12
IV	Pointers – Declaration – Pointer to Class, Object – this pointer – Pointers to derived classes and Base classes – Arrays – Characteristics – array of classes – Memory models – new and delete operators – dynamic object – Binding, Virtual								12

	Functions.	
V	Files – File stream classes – file modes – Sequential Read / Write operations – Binary and ASCII Files – Random Access Operation – Declaring and Initializing string objects – String Attributes – string functions.	12
TOTAL		60
CO	Course Outcomes	
CO1	Remember the program structure of C++ with its syntax and semantics	
CO2	Understand the programming principles in C (data types, operators, branching and looping, arrays, functions, structures, pointers and files)	
CO3	Apply the programming principles learnt in real-time problems	
CO4	Analyze the various methods of solving a problem and choose the best method	
CO5	Code, debug and test the programs with appropriate test cases	
Text Books		
1.	E. Balagurusamy, “Object-Oriented Programming with C++”, TMH 2013, 7th Edition	
Reference Books		
1	Ashok N Kamthane, “Object-Oriented Programming with ANSI and Turbo C++”, Pearson Education 2003	
2	Maria Litvin& Gray Litvin, “C++ for you”, Vikas publication 2002	

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	2	2	2
CO2	2	3	2	2	2	2
CO3	2	3	3	3	2	2
CO4	2	3	2	2	2	2
CO5	3	3	2	2	2	2
Weightage of course contributed to each PSO	12	14	11	11	10	10

CORE COURSE – IV: C++ PROGRAMMING LAB

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCAP2	0	0	6	II	4	6	50	50	100
Learning Objectives									
LO1	Describe the procedural and object-oriented paradigm with concepts of streams, classes, functions, data and objects								
LO2	Understand dynamic memory management techniques using pointers, constructors, destructors, etc.								
LO3	Describe the concept of function overloading, operator overloading, virtual functions and polymorphism								
LO4	Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming								
LO5	Demonstrate the use of various OOPs concepts								
List of Exercises									
1 Write a C++ program to demonstrate function overloading. Default Arguments and Inline function.									
2 Write a C++ program to demonstrate Class and Objects									
3 Write a C++ program to demonstrate the concept of Passing Objects to Functions									
4 Write a C++ program to demonstrate Friend Functions.									
5 Write a C++ program to demonstrate Constructor and Destructor									
6 Write a C++ program to demonstrate Unary Operator Overloading									
7 Write a C++ program to demonstrate Binary Operator Overloading									
8 Write a C++ program to demonstrate: • Single Inheritance • Multilevel Inheritance • Multiple Inheritance • Hierarchical Inheritance • Hybrid Inheritance									
9 Write a C++ program to demonstrate Virtual Functions.									
10 Write a C++ program to manipulate a Text File.									
11 Write a C++ program to perform Sequential I/O Operations on a file.									
TOTAL								90 Hrs	
CO	Course Outcomes								
CO1	Remember the program structure of C++ with its syntax and semantics								
CO2	Understand the programming principles in C++ (data types, operators, branching and looping,								

	arrays, functions, structures, pointers and files)
CO3	Apply the programming principles learnt in real-time problems
CO4	Analyze the various methods of solving a problem and choose the best method
CO5	Code, debug and test the programs with appropriate test cases

MAPPING TABLE						
CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	3	2	3	3
CO2	3	3	2	2	3	3
CO3	3	2	2	3	3	2
CO4	3	2	3	3	2	2
CO5	3	3	3	3	3	2
Weightage of course contributed to each PSO	15	12	13	13	14	12

ELECTIVE COURSE - II: DIGITAL LOGIC FUNDAMENTALS

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECA21	4	0	0	II	3	4	50	50	100
Learning Objectives									
LO1	To learn digital system concepts, binary numbers, number base conversions, signed numbers, binary codes, and basic binary logic.								
LO2	To understand Boolean algebra principles, theorems, and properties, and apply them to simplify Boolean functions using techniques like K-Maps.								
LO3	To design and implement digital circuits using logic gates, canonical forms, and universal gates like NAND and NOR.								
LO4	To analyze and design combinational circuits (adders, subtractors, multiplexers, encoders, decoders) and sequential circuits using latches and flip-flops.								
LO5	To study registers, shift registers, counters, and memory systems including RAM and memory decoding.								
Unit	Contents							No. of Hours	
I	Digital System and binary numbers: Digital systems – binary numbers – number base conversion –signed binary numbers – binary codes – binary storage and registers – binary logic. Boolean algebra: Introduction – basic definition – axiomatic definition of Boolean algebra – basic theorem and properties and of Boolean algebra – Boolean functions							12	
II	Logic gates: Canonical and standard forms – other logic operations – digital logic gates Gate-Level minimization: Introduction: The Map method – Four- variable Maps –Five-variable Map – Product –of-sums simplifications- Don ‘t conditions							12	
III	NAND and NOR implementation- other two-level implementations – Exclusive OR Functions. Combinational Logic: Combinational circuits – Analysis Procedure - Design Procedure – Binary Adder – Subtractor – Decimal Adder - Binary Multiplier							12	
IV	Combinational Logic: Decoders - Encoders – Multiplexers. Synchronous Sequential Logic: Introduction –Sequential Circuits – Storage Element Latches - Storage Element Flip							12	

V	Registers and Counters: Registers – Shift Registers – Ripple Counters – Synchronous Counters – Other Counters. Memory: Introduction – Random access memory –Memory Decoding	12
TOTAL		60
CO	Course Outcomes	
CO1	Know the definition of digital logics and circuits	
CO2	Understand the digital devices	
CO3	Understand the digital arithmetic circuits	
CO4	Acquire Knowledge on basics of Gates and its Applications	
CO5	Have the necessary understanding on Registers for Counting Applications	
Textbooks		
1	Digital Design - Fourth Edition – M.Morris Mano, Michael D Ciletti,- Prentice Hall of India Pvt Ltd., 2007	
2	Alexis Leon, Mathews Leon,” Fundamental of Information Technology”, 2nd Edition	
Reference Books		
1.	Digital Principles and Applications – Albert Paul Malvino, Donald P Leach, Tata McGraw-Hill Publishing Company Ltd.	
2.	Digital Principles and Design – Donald D.Givone, Tata McGraw-Hill Publishing Company Limited	

MAPPING TABLE						
CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	3	2	2
CO2	2	3	2	3	2	2
CO3	2	3	2	2	3	1
CO4	1	2	2	1	3	2
CO5	2	2	2	1	3	3
Weightage of course contributed to each PSO	10	12	10	10	13	10

ELECTIVE COURSE – II: OPTIMIZATION TECHNIQUES

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECA22	4	0	0	II	3	4	50	50	100
Learning Objectives									
LO1	To learn the nature, scope, and applications of Operations Research, including modeling techniques and general solution methods for decision-making problems.								
LO2	To develop mathematical models for Linear Programming Problems (LPP) and solve them using graphical and analytical methods.								
LO3	To formulate and solve assignment problems using the Hungarian method, including handling unbalanced cases.								
LO4	To model transportation problems and determine optimal solutions using methods for initial feasible solutions and optimality testing.								
LO5	To understand and apply PERT and CPM techniques for project scheduling, including network representation, time estimation, and identification of the critical path.								
Unit	Contents							No. of Hours	
I	INTRODUCTION OPERATIONS RESEARCH The Nature and Meaning of OR–Management–Applications of OR– Modeling in OR–General methods for solving OR models							12	
II	LINEAR PROGRAMMING PROBLEM Linear Programming Problem: Formulation of LP problems– Graphical solution of LP problems–General formulation of LPP							12	
III	ASSIGNMENT PROBLEMS Assignment Problem: Mathematical formulation–Hungarian method– Unbalanced assignment problem							12	
IV	TRANSPORTATION PROBLEMS Transportation Model: Mathematical formulation – Matrix form–Methods for finding Initial Basic Feasible solution and Optimal solution.							12	
V	PERT and CPM Techniques: Basic Steps–Network Diagram representation- Labeling Fulkerson’s I–J Rule – Time Estimates and Critical Path in Network Analysis –PERT.							12	
TOTAL							60		

CO	Course Outcomes
CO1	Formulate and solve Linear Programming Problems.
CO2	Analyze the usage of optimal solution.
CO3	Analyze the usage of Assignment Problems
CO4	Evaluate Transportation Models.
CO5	Apply PERT and CPM techniques to find the optimal solution
Text Books	
1	S.D. Sharma, “Operations Research”, Tenth Edition, Pearson, 2017.
Reference Books	
1.	Hamdy A Taha, “Operations Research” Ninth Edition, Pearson, 2016
2.	V. Sundaresan, K. S. Ganapathy Subramanian, K. Ganesan, “Resource Management Techniques”, Ninth Edition, A.R. Publications, 2015

MAPPING TABLE						
CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	3	2	2
CO2	2	3	2	3	2	2
CO3	2	3	2	2	3	1
CO4	1	2	2	1	3	2
CO5	2	2	2	1	3	3
Weightage of course contributed to each PSO	10	12	10	10	13	10

SKILL ENHANCEMENT COURSE – II: WEB DESIGNING

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26USCA21	2	0	0	II	2	2	50	50	100
Learning Objectives									
LO1	Understand the fundamental concepts of HTML and its components.								
LO2	Learn how to use and implement graphics in HTML.								
LO3	Understand and apply the principles of XML and DHTML.								
LO4	Gain knowledge of JavaScript concepts and functionality.								
LO5	Identify and understand the purpose and objectives of AJAX								
Unit	Contents								No. of Hours
I	HTML: HTML-Introduction-tag basics-page structure adding comments working with texts, paragraphs and line break. Emphasizing test- heading and horizontal rules-list-font size, face and color Alignment links-tables-frames.								6
II	Forms & Images Using Html: Graphics: Introduction How to work efficiently with images in web pages, Image maps, GIF animation, adding multimedia, data collection with html forms textbox, password, list box, combo box, text area								6
III	XML & DHTML: Cascading style sheet (CSS) - what is CSS-Why we use CSS-adding CSS to your WebPages-Grouping styles extensible mark-up language (XML).								6
IV	Dynamic HTML: Document object model (DCOM) - Accessing HTML & CSS through DCOM Dynamic content styles & positioning- JavaScript: : what is JavaScript, How to develop JavaScript, simple JavaScript, variables, functions, conditions								6
V	Objects, JavaScript own objects, the DOM and web browser environments, Advanced Form Handling, validation.								6
TOTAL								30	
CO	Course Outcomes								
CO1	Understand and apply fundamental HTML concepts								
CO2	Design web pages with images and multimedia								
CO3	Apply Cascading Style Sheets (CSS)								
CO4	Develop dynamic and interactive web pages								
CO5	Implement advanced JavaScript features								

Text Books	
1	Pankaj Sharma,—Web Technology, Sk Kataria & Sons Bangalore 2011
2	Achyut S Godbole & Atul Kahate,—Web Technologies, 2002, 2nd Edition
3	Mike Mcgrath,—JavaScript, Dream Tech Press 2006, 1st Edition
Reference Books	
1.	Laura Lemay, Rafe Colburn, Jennifer Kyrnin,— Mastering HTML, CSS & JavaScript Web Publishing, 2016.
2.	DTEditorial Services (Author),—HTML5 Black Book (Covers CSS3, JavaScript, XML, HTML, AJAX, PHP, jQuery), Paperback 2016, 2nd Edition

MAPPING TABLE						
CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	3	2	2
CO2	2	3	2	3	2	2
CO3	2	3	2	2	3	1
CO4	1	2	2	1	3	2
CO5	2	2	2	1	3	3
Weightage of course contributed to each PSO	10	12	10	10	13	10

SKILL ENHANCEMENT COURSE - III: WEB DESIGNING LAB

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26USCAP2	0	0	2	II	2	2	50	50	100
Learning Objectives									
LO1	Add an image to a web page.								
LO2	Create hyperlinks within a web page.								
LO3	Design and insert tables into a web page.								
LO4	Use different heading levels in a web page.								
LO5	Create both ordered and unordered lists in a web page.								
List of Exercises									
1. Create a website using internal links and images.									
2. Design a calendar using table tag.									
3. Create a HTML document to display a list of five flowers and link each one to another document displaying brief description of the flower, Add pictures wherever possible.									
4. Table & Lists: -Develop and demonstrate a HTML document that illustrates									
a) Unordered List(UL)									
b) Ordered List (OL) and Definition list (DL)									
c) Table Alignment (Cell Spacing, Cell Padding, Height, Width, Border, Row span, colspan)									
d) Setting Different Table Attributes (Color, Image)									
5. Create a simple HTML Form covering major form elements.									
6. DHTML									
a) Create a CSS document on Internal style sheet									
b) Create a CSS document on External style sheet									
c) Create a CSS document 8. Build a simple quiz.									
TOTAL								30 Hrs	
CO	Course Outcomes								
CO1	Understand the basic concepts of HTML, including the use of resources in HTML.								
CO2	Understand design concepts and the fundamentals of creating forms.								
CO3	Apply page formatting techniques in web development.								
CO4	Create hyperlinks and embed audio and video elements in a web page.								
CO5	Understand and create tables in a web page								

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	2	2	3
CO2	3	2	2	2	3	2
CO3	3	3	3	3	2	2
CO4	3	2	2	2	2	3
CO5	3	3	2	2	3	2
Weightage of course contributed to each PSO	15	12	11	11	12	12

NON MAJOR ELECTIVE - II: BASICS OF ARTIFICIAL INTELLIGENCE

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UNCA21	2	0	0	II	2	2	50	50	100
Learning Objectives									
LO1	To learn the definition, scope, history, and applications of Artificial Intelligence, along with its branches and the concept of intelligent agents.								
LO2	To formulate AI problems and solve them using state space representation and search algorithms such as BFS, DFS, Uniform Cost Search, Greedy, and A*.								
LO3	To understand the basics of NLP, text processing, chatbots, and the role of AI in robotics and automation.								
LO4	To understand different types of machine learning (supervised, unsupervised, reinforcement) and implement basic algorithms like Linear Regression, Decision Trees, and K-Means.								
LO5	To apply propositional logic, inference techniques, resolution, and forward/backward chaining for intelligent decision-making.								
Unit	Contents								No. of Hours
I	Introduction to Artificial Intelligence : Definition and scope of AI , History and evolution of AI , AI vs Human Intelligence , Applications of AI (healthcare, finance, robotics, NLP) , Branches of AI , Intelligent agents: types and characteristics								6
II	Problem Solving and Search Techniques : Problem formulation in AI , State space representation ,Uninformed search techniques :Breadth-First Search (BFS) ,Depth-First Search (DFS) ,Uniform Cost Search ,Informed search techniques : Greedy Best-First Search ,A* Algorithm								6
III	Natural Language Processing & Robotics : Basics of Natural Language Processing (NLP) , Text processing concepts ,Chatbots and virtual assistants ,Introduction to robotics ,AI in automation								6
IV	Introduction to Machine Learning : What is Machine Learning, Types of learning , Supervised learning ,Unsupervised learning ,Reinforcement learning (basic idea) ,Basic algorithms ,Linear Regression ,Decision Trees ,k-Means Clustering								6
V	Propositional Logic: Representation, Inference Resolution, Forward and Backward Chaining.								6
TOTAL								30	

CO	Course Outcomes
CO1	Understand and explain the fundamental concepts, history, and applications of Artificial Intelligence.
CO2	Formulate real-world problems as AI problems and apply appropriate search techniques to find solutions
CO3	Represent knowledge using logical and structured methods such as propositional and predicate logic.
CO4	Apply reasoning and inference mechanisms to draw conclusions from knowledge bases
CO5	Describe basic machine learning concepts and distinguish between different types of learning approaches
Text Books	
1	Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill
2	Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach” , 3rd Edition, Prentice Hall.
3	Ivan Bratko, “PROLOG Programming for Artificial Intelligence”, Addison-Wesley, 2nd Edition.
Reference Books	
1	Trivedi, M.C., “A Classical Approach to Artificial Intelligence”, Khanna Publishing House, Delhi.
2	SarojKaushik, “Artificial Intelligence”, Cengage Learning India, 2011
3	David Poole and Alan Mackworth, “Artificial Intelligence: Foundations for Computational Agents”, Cambridge University Press 2010

MAPPING TABLE						
CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	3	2	2
CO2	2	3	2	3	2	2
CO3	2	3	2	2	3	1
CO4	1	2	2	1	3	2
CO5	2	2	2	1	3	3
Weightage of course contributed to each PSO	10	12	10	10	13	10

SEMESTER - 3

Semester - 3									
Course Code	Part	Course Category	Course Name	Hours/ Week	Examination				Credits
					Duration in Hours	Max Marks			
						CIA	ESE	Total	
26U1TL31	I	Language - I	Tamil - III	5	3	50	50	100	3
26U1HD31	I		Hindi - III						
26U1MY31	I		Malayalam - III						
26U1FR31	I		French - III						
26U2EN31	II	Language - II	English - III	5	3	50	50	100	3
26UCCA31	III	Core - V	Data Structures and Algorithms	4	3	50	50	100	4
26UCCAP3	III	Core - VI	Data Structures and Algorithms using C++ Lab	6	3	50	50	100	4
26UECA31	III	EC - III	Microprocessor and Microcontroller	4	3	50	50	100	3
26UECA32			Cyber Forensics						
26USCAP3	IV	SEC - IV	Multimedia Systems Lab	2	3	50	50	100	2
26USCA31	IV	SEC - V	Software Engineering	2	3	50	50	100	2
26UEVS31	IV	Common	Environmental Science	2	3	50	50	100	2
Total				30				800	23

SECOND YEAR

SEMESTER – III

CORE COURSE - V: DATA STRUCTURES AND ALGORITHMS

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCA31	4	0	0	III	4	4	50	50	100
Learning Objectives									
LO1	To understand the concepts of ADTs								
LO2	To learn linear data structures-lists, stacks, queues								
LO3	To learn Tree structures and application of trees								
LO4	To learn graph structures and application of graphs								
LO5	To understand various sorting and searching								
Prerequisites:									
Unit	Contents								No. of Hours
I	Abstract Data Types (ADTs)- List ADT-array-based implementation linked list implementation singly linked lists-circular linked lists doubly-linked lists-applications of lists- All Operations-Insertion-Deletion-Merge-Traversal								12
II	Stack ADT-Operations- Applications- Evaluating arithmetic expressions – Conversion of infix to postfix expression-Queue ADT-Operations Circular Queue- Priority Queue- de Queue applications of queues.								12
III	Tree ADT-tree traversals-Binary Tree ADT-expression trees applications of trees-binary search tree ADT- Threaded Binary Trees AVL Trees- B-Tree- B+ Tree – Heap-Applications of heap.								12
IV	Definition- Representation of Graph- Types of graph-Breadth first traversal – Depth first traversal-Topological sort-Applications of graphs.								12
V	Searching- Linear Search-Binary Search-Sorting-Bubble Sort-Selection sort-Insertion sort-Shell sort-Radix sort-Hashing-Hash functions								12
TOTAL								60	
CO	Course Outcomes								
CO1	Explain the concepts of dynamic memory management, data types, algorithms, and Big O notation.								
CO2	Demonstrate understanding of fundamental data structures such as arrays, linked lists, stacks, and queues.								
CO3	Describe hash functions, collisions, and various collision resolution techniques.								
CO4	Analyze and solve problems involving graphs, trees, and heaps.								
CO5	Apply appropriate algorithms for sorting, searching, insertion, and deletion operations.								

Textbooks

1	Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Pearson Education 2014, 4th Edition.
2	Reema Thareja, “Data Structures Using C”, Oxford Universities Press 2014, 2nd Edition

Reference Books

1	Thomas H.Cormen, Chales E.Leiserson,RonaldL.Rivest, Clifford Stein, “Introduction to Algorithms”, McGraw Hill 2009, 3rd Edition.
2	Aho, Hopcroft and Ullman, “Data Structures and Algorithms”, Pearson Education 2003

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	2	3
CO2	3	3	1	2	2	3
CO3	3	3	1	3	2	3
CO4	3	2	1	2	2	3
CO5	3	2	1	2	2	3
Weightage of course contributed to each PSO	15	12	5	11	10	15

CORE COURSE – VI: DATA STRUCTURES AND ALGORITHMS USING C++ LAB

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCAP3	0	0	6	III	4	6	50	50	100

Learning Objectives

LO1	Understand the concepts of Abstract Data Types (ADTs).
LO2	Learn about linear data structures such as lists, stacks, and queues.
LO3	Understand tree data structures and their applications.
LO4	Learn graph structures and their practical applications.
LO5	Understand various sorting and searching techniques.

Prerequisites:

Contents

1. Write a program to implement the List ADT using arrays and linked lists.
2. Write a program to implement the following using a singly linked list.
 - Stack ADT
 - Queue ADT
3. Write a program that reads an infix expression, converts the expression to postfix form and then evaluates the postfix expression (use stack ADT).
4. Write a program to implement priority queue ADT.
5. Write a program to perform the following operations:
 - Insert an element into a binary search tree.
 - Delete an element from a binary search tree.
 - Search for a key element in a binary search tree.
6. Write a program to perform the following operations
 - Insertion into an AVL-tree
 - Deletion from an AVL-tree
7. Write a C++ program that implements Insertion sort algorithm to arrange a list of integers in ascending order.
8. Write a program for implementing the following searching methods:
 - Linear search
 - Binary search.
9. Write a program for implementing the following sorting methods:
 - Bubble sort • Selection sort • Insertion sort • Radix sort.

Total Hours: 90

CO	Course Outcomes
CO1	Comprehend the principles of dynamic memory allocation, data types, algorithms, and time complexity analysis (Big O notation).
CO2	Gain knowledge of core data structures such as arrays, linked lists, stacks, and queues.
CO3	Explain hashing techniques, collision issues, and different methods for resolving collisions.
CO4	Tackle and analyze problems involving trees, graphs, and heaps.
CO5	Utilize appropriate algorithms to perform sorting, searching, insertion, and deletion tasks.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	2	3
CO2	3	3	1	2	2	3
CO3	3	3	1	3	2	3
CO4	3	2	1	2	2	3
CO5	3	2	1	2	2	3
Weightage of course contributed to each PSO	15	12	5	11	10	15

ELECTIVE COURSE – III: MICROPROCESSOR AND MICROCONTROLLER

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECA31	4	0	0	III	3	4	50	50	100
Learning Objectives									
LO1	To introduce the internal organization of Intel 8085 Microprocessor.								
LO2	To know about various instruction sets and classifications								
LO3	To enable the students to write assembly language programs using 8085.								
LO4	To interface the peripheral devices to 8085 using Interrupt controller and DMA interface.								
LO5	To provide real-life applications using microcontroller.								
Prerequisites:									
Unit	Contents								No. of Hours
I	Digital Computers - Microcomputer Organization-Computer languages – Microprocessor Architecture and its operations – Microprocessor initiated operations and 8085 Bus organization – Internal Data operations								12
II	8085 Microprocessor – Pinout and Signals – Functional block diagram - 8085 Instruction Set and Classifications								12
III	BCD to Binary and Binary to BCD conversions - ASCII to BCD and BCD to ASCII conversions - Binary to ASCII and ASCII to Binary conversions. BCD Arithmetic - BCD addition and Subtraction - Multiplication and Division.								12
IV	The 8085 Interrupts – RIM AND SIM instructions-8259 Programmable Interrupt Controller-Direct Memory Access (DMA).								12
V	Introduction to Microcontroller - Microcontroller Vs Microprocessor - 8051 pin description. Timers and Counters – Operating Modes- Control Registers.								12
TOTAL								60	
CO	Course Outcomes								
CO1	Remember the Basic binary codes and their conversions. Binary concepts are used in Microprocessor programming and provide a good understanding of the architecture of 8085								
CO2	Understanding the 8085-instruction set and their classifications, enables the students to write the programs easily on their own using different logic.								
CO3	Apply different types of instructions to convert binary codes and analyzing the outcome. The instruction set is applied to develop programs on multibyte arithmetic operations.								
CO4	Analyze how peripheral devices are connected to 8085 using Interrupts and DMA controller								
CO5	Have an exposure to create real time applications using microcontroller.								

Text Books

1	R. S. Gaonkar- "Microprocessor Architecture- Programming and Applications with 8085", 5th Edition- Penram International Publications,2009. [For unit I to unit IV]
2	Soumitra Kumar Mandal -"Microprocessors and Microcontrollers – Architectures, Programming and Interfacing using 8085, 8086, 8051", Tata McGraw Hill Education Private Limited. [for unit V].

Reference Books

1	Mathur- "Introduction to Microprocessor"- 3rd Edition- Tata McGraw-Hill -1993.
2	Raj Kamal - "Microcontrollers: Architecture, Programming, Interfacing and System Design", Pearson Education, 2005.
3	Krishna Kant, "Microprocessors and Microcontrollers – Architectures, Programming and System Design 8085, 8086, 8051, 8096", PHI, 2008

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	2	2	3
CO2	3	2	2	2	3	2
CO3	3	3	3	3	2	2
CO4	3	2	2	2	2	3
CO5	3	3	2	2	3	2
Weightage of course contributed to each PSO	15	12	11	11	12	12

ELECTIVE COURSE – III: CYBER FORENSICS

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECA32	4	0	0	III	3	4	50	50	100
Learning Objectives									
LO1	Understand the definition of computer forensics fundamentals								
LO2	To study about the Types of Computer Forensics Evidence								
LO3	Understand and apply the concepts of Duplication and Preservation of Digital Evidence								
LO4	Understand the concepts of Electronic Evidence and Identification of Data								
LO5	To study about the Digital Detective, Network Forensics Scenario, Damaging Computer Evidence.								
Prerequisites:									
Unit	Contents								No. of Hours
I	Overview of Computer Forensics Technology: Computer Forensics Fundamentals: What is Computer Forensics Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/ Employment Proceedings, Computer Forensics Services, Benefits of professional Forensics Methodology?								12
II	Computer Forensics Evidence and capture: Data Recovery: Data Recovery Defined, Data Back-up and Recovery, The Role of Back –up in Data Recovery, The Data –Recovery Solution. Evidence Collection and Data Seizure: Collection Options, Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence.								12
III	Duplication and Preservation of Digital Evidence: Processing steps, Legal Aspects of collecting and Preserving Computer forensic Evidence. Computer image Verification and Authentication: Special needs of Evidential Authentication,								12
IV	Computer Forensics Analysis: Discovery of Electronic Evidence: Electronic Document Discovery: A Powerful New Litigation Tool. Identification of Data: Time Travel, Forensic Identification and Analysis of Technical Surveillance Devices								12

V	Digital Detective, Useable File Formats, Unusable File Formats, Converting Files. Networks: Network Forensics Scenario, a technical approach, Destruction Of E-Mail, Damaging Computer Evidence, Documenting the Intrusion on Destruction of Data.	12
TOTAL		60

CO	Course Outcomes
CO1	Understand the definition of computer forensics fundamentals.
CO2	Evaluate the different types of computer forensics technology.
CO3	Analyze various computer forensics systems.
CO4	Apply the methods for data recovery, evidence collection and data seizure.
CO5	Gain the knowledge of duplication and preservation of digital evidence.
Text Books	
1	John R. Vacca, “Computer Forensics: Computer Crime Investigation”, 3/E ,Firewall Media, New Delhi, 2002.
Reference Books	
1	Nelson, Phillips Enfinger, Steuart, “Computer Forensics and Investigations” Enfinger, Steuart, CENGAGE Learning, 2004.
2	Anthony Sammes and Brian Jenkinson, ”Forensic Computing: A Practitioner's Guide”, Second Edition, Springer–Verlag London Limited, 2007.
3	Robert M.Slade, ” Software Forensics Collecting Evidence from the Scene of a Digital Crime”, TMH 2005.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	2	2	2
CO2	2	3	2	2	2	2
CO3	2	3	3	3	2	2
CO4	2	3	2	2	2	2
CO5	3	3	2	2	2	2
Weightage of course contributed to each PSO	12	14	11	11	10	10

SKILL ENHANCEMENT COURSE - IV: MULTIMEDIA SYSTEMS LAB

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26USCAP3	0	0	2	III	2	2	50	50	100
Learning Objectives									
LO1	Define and explain the concept of multimedia.								
LO2	Study and understand different image, sound, and audio file formats.								
LO3	Understand the fundamental concepts of animation.								
LO4	Learn about various image cropping techniques.								
LO5	Understand different types of color effects and their applications.								
Prerequisites:									
Contents									
1. Create an animation to represent the growing moon. 2. Design and make a ball bouncing on steps. 3. Simulate the movement of a cloud showing the color effects. 4. Prepare a cover page for the book of your subject area. 5. Design a visiting card containing at least one graphic and text information. 6. Make a poster for the forthcoming election and show the difference in resolution and quality. 7. Paint the scenery of a park. 8. Use effective cropping techniques to design a collage. 9. Display your name through the given background with at least five text effects and shadow emboss 10. Create a one minute theme video with suitable audio effects.									
Total Hours: 30									
CO	Course Outcomes								
CO1	Comprehend the concepts, significance, applications, and development process of multimedia.								
CO2	Acquire foundational knowledge and skills in image processing techniques.								
CO3	Understand the use of frames and bitmap images in creating animations.								
CO4	Learn and apply various image cropping methods.								
CO5	Understand the principles and techniques involved in poster design.								

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	3	3	2	2
CO2	3	3	3	3	2	2
CO3	3	3	3	2	2	3
CO4	3	3	3	3	3	2
CO5	3	3	2	3	2	2
Weightage of course contributed to each PSO	15	14	14	14	11	11

SKILL ENHANCEMENT COURSE – V: SOFTWARE ENGINEERING

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26USCA31	2	0	0	III	2	2	50	50	100
Learning Objectives									
LO1	To list the software engineering basic concepts								
LO2	Interpret how the coding are managed in software engineering								
LO3	To develop testing and user interface design								
LO4	To Design the software projects								
LO5	To develop the software projects and software reliability and quality management								
Prerequisites:									
Unit	Contents								No. of Hours
I	Introduction-Software Engineering Discipline- Evolution and Impact- Programs Vs Software Products. Software Life Cycle Models: Use of a Life Cycle Models- Classical Waterfall Model- Iterative Waterfall Model- Prototyping Model- Evolutionary Model-Spiral Model								6
II	Requirements Analysis and Specification: Requirements Gathering and Analysis– Software Requirements Specification (SRS)-Formal System Development Techniques.								6
III	Function-Oriented Software Design: Overview of SA/SD Methodology-Structured Analysis - Data Flow Diagrams (DFDs).Object Modeling Using UML: Overview of Object-Oriented Concepts-UML Diagrams-Use Case Model								6
IV	Coding and Testing: Coding- Testing- UNIT Testing- Black-Box Testing- White-Box Testing-Debugging- Integration Testing- System Testing.								6
V	Software Maintenance: Characteristics of Software Maintenance - Software Reverse Engineering - Software Maintenance Process Models - Estimation of Maintenance Cost. Software Reuse: Issues in any Reuse Program-Reuse Approach.								6
TOTAL								30	
CO	Course Outcomes								
CO1	Explain the fundamental principles of Software Engineering, software development life cycle (SDLC) models, and process frameworks.								
CO2	Analyze software requirements and prepare Software Requirement Specifications								
CO3	Design software systems using appropriate design models, UML diagrams, and architectural patterns.								

CO4	Apply software project management techniques including estimation, scheduling, risk management, and quality assurance.
CO5	Implement testing strategies and evaluate software quality using verification and validation techniques.
Text Books	
1	Rajib Mall," Fundamentals of Software Engineering",3 rd Edition, Prentice Hall of India Private Limited, 2008.
Reference Books	
1	RajibMall,"Fundamentals of Software Engineering",4th Edition, Prentice Hall of India Private Limited, 2014.
2	Richard Fairley," Software Engineering Concepts", TMGH Publications,2004

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	2	2	2
CO2	2	3	2	2	2	2
CO3	2	3	3	3	2	2
CO4	2	3	2	2	2	2
CO5	3	3	2	2	2	2
Weightage of course contributed to each PSO	12	14	11	11	10	10

COMMON - ENVIRONMENTAL SCIENCE

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UEVS31	2	0	0	III	2	2	50	50	100
Learning Objectives									
LO1	To study the multidisciplinary nature of environmental studies, including the scope, importance, and sustainable management of natural resources such as forests, water, minerals, food, energy, and land.								
LO2	To understand different types of ecosystems, energy flow, ecological succession, food chains, food webs, and ecological pyramids.								
LO3	To examine the levels of biodiversity, its distribution in India and globally, threats to biodiversity, and conservation strategies including in-situ and ex-situ methods.								
LO4	To identify causes, effects, and control measures of various types of pollution, and to understand solid waste management and disaster management techniques.								
LO5	To analyze social and environmental issues such as climate change, global warming, and population growth, along with environmental protection laws and sustainable development practices.								
Prerequisites:									
Unit	Contents								No. of Hours
I	THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES Definition, scope and importance Natural resources and associated problems: a) Forest resources: Use and over-exploitation, deforestation, timber extraction, dams and their effects on forests and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, dams-benefits and problems, water conservation and watershed management. c) Mineral resources: Use and exploitation, environmental effects. d) Food resources: World food problems, changes, effects of modern agriculture, fertilizer-pesticide problems. e) Energy resources: Growing energy needs, renewables lion renewable energy sources, alternate energy sources. f) Land resources: Land as a resource, land degradation, man-induced landslides, soil erosion and desertification.								6
II	ECOSYSTEMS a) Forest Ecosystem b) Grassland Ecosystem c) Desert ecosystem d)Aquatic Ecosystem (Ponds, rivers, oceans, estuaries) Energy flow in the ecosystem Ecological succession Food Chains, Food Webs and Ecological Pyramids.								6

III	BIODIVERSITY AND ITS CONSERVATION Introduction Definition: Genetic, species and ecosystem diversity. Biogeographically classification of India ,Values of Biodiversity, Biodiversity at global, national and local levels India as a mega-diversity nation, Hot-Spots of biodiversity Threats to biodiversity Endangered and endemic species of India , Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity	6
IV	ENVIRONMENTAL POLLUTION Definition- Causes, effects and control measures of:- a) Air Pollution b) Water Pollution c) Soil Pollution d) Marine Pollution e) Noise Pollution f) Thermal Pollution Solid Waste Management, Disaster Management: Floods, earthquake, cyclone and Landslides.	6
V	SOCIAL ISSUES AND THE ENVIRONMENT Climatic change, global warming, acid rain, ozone depletion. Wasteland reclamation Consumerism and Waste products, use and through plastics Environment Protection Act Air (Prevention and Control of Pollution) Act Water (Prevention and Control of Pollution) Act Wildlife Protection Act Forest Conservation Act Population Explosion - Family Welfare Programme Human Rights	6

TOTAL		30
CO	Course Outcomes	
CO1	Students will be able to explain the scope and importance of environmental studies and analyze the use, over-exploitation, and conservation of natural resources.	
CO2	Students will be able to describe ecosystem types, energy flow, ecological succession, and relationships such as food chains, food webs, and ecological pyramids.	
CO3	Students will be able to assess biodiversity at different levels, identify threats, and explain conservation methods including in-situ and ex-situ approaches.	
CO4	Students will be able to identify various types of pollution, analyze their causes and effects, and suggest control measures along with waste and disaster management practices.	
CO5	Students will be able to evaluate major environmental issues such as climate change and population growth, and understand environmental protection laws and sustainable practices.	

Reference Books

1	N. Arumugam and V. Kumaresan, 2014, Environmental studies, 4th edition, Saras Publication, Nagercoil, TamilNadu.
2	M. Basu, and S. Xavier, 2016, Fundamentals of Environmental Studies, Cambridge University Press.
3	A.K. Mitra and R. Chakraborty, 2016, Introduction to Environmental Studies, Book Syndicate.
4	J.S. Singh, S.P.Singh, and S.R. Gupta, 2014, Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	2	2	2
CO2	2	3	2	2	2	2
CO3	2	3	3	3	2	2
CO4	2	3	2	2	2	2
CO5	3	3	2	2	2	2
Weightage of course contributed to each PSO	12	14	11	11	10	10

SEMESTER - 4

Semester - 4									
Course Code	Part	Course category	Course Name	Hours/ Week	Examination				Credits
					Duration in Hours	Max Marks			
						CIA	ESE	Total	
26U1TL41	I	Language - I	Tamil - IV	5	3	50	50	100	3
26U1HD41	I		Hindi - IV						
26U1MY41	I		Malayalam - IV						
26U1FR41	I		French - IV						
26U2EN41	II	Language - II	English - IV	5	3	50	50	100	3
26UCCA41	III	Core - VII	Dot Net with MYSQL	4	3	50	50	100	4
26UCCAP4	III	Core - VIII	Dot Net with MYSQL Lab	6	3	50	50	100	4
26UECA41	III	EC - IV	Financial Accounting	4	3	50	50	100	3
26UECA42			Cloud Computing						
26USCAP4	IV	SEC - VI	PHP Programming Lab	2	3	50	50	100	2
26USCAP5	IV	SEC - VII	Desktop Publishing Lab	2	3	50	50	100	2
26UVBE41	IV	Common	Value Based Education	2	3	50	50	100	2
Total				30				800	23

SEMESTER – IV

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCA41	4	0	0	IV	4	4	50	50	100
Learning Objectives									
LO1	Understand the fundamentals of the .NET framework and develop applications using C#.								
LO2	Design and develop dynamic web applications using ASP.NET.								
LO3	Create and manage databases using MySQL, including tables and relationships.								
LO4	Implement database connectivity using ADO.NET to perform CRUD operations.								
LO5	Develop data-driven applications by integrating .NET applications with MySQL databases.								
Prerequisites:									
Unit	Contents								No. of Hours
I	OBJECT ORIENTED CONCEPTS IN C# : Classes and Objects, Inheritance: Virtual methods and Overriding - Abstract Class, Sealed Class - Interfaces - Generic classes and methods – Collection.								12
II	ASP.NET AND DATABASE CONNECTIVITY : Data provider classes - Connection - Command - Data Reader - Data Adapter – Data Controls- Grid View – Form View – Details View - Concept of state - Web services.								12
III	INTRODUCTION TO DATABASE & ER MODEL: Introduction to Databases - File System Vs Database System - Database System Architecture- Database Users and Administrator - Data Models - Entity Relationship Model- E-R Diagrams - Design Issues - Extended E-R Features - Introduction to Relational Model -ER to Relational Schema Mapping.								12
IV	RELATIONAL MODEL & SQL : Structure of Relational Databases - Relational Query Languages - Relational Algebra – SQL: DDL, DML, DCL, TCL - Simple Queries, Complex Nested Queries, Correlated Nested Queries, Joins, Aggregate Functions, Grouping - PL/SQL : Functions, Procedures, Triggers, Views -Embedded SQL - Dynamic SQL.								12
V	TRANSACTION AND CONCURRENCY CONTROL : Transaction processing concepts - Need for concurrency control and recovery - Recoverability – Transaction Recovery – Serializability : Conflict Serializability, View Serializability, Testing for Serializability - Concurrency								12

	Control : Lock Based Protocols (Two phase locking Techniques, Strict Two Phase Locking, Deadlocks, Multiple Granularity) Timestamp Based protocol, Validation Based protocol.	
TOTAL		60
CO	Course Outcomes	
CO1	Build a simple C# application using jagged array	
CO2	Develop simple C# programs using different types of function Parameters	
CO3	Construct three tier applications using ASP.NET	
CO4	Infer the basic concepts of database system and model ER diagram for real time applications	
CO5	Use appropriate SQL commands to store and access data from Relational Database.	
Text Books		
1	Mathew, Mac Donald, The Complete Reference ASP.NET, Tata McGraw-Hill,2015.	
2	Svetlin Nakov, Veselin Kolev& Co, Fundamentals of Computer Programming with C#, Faber Publication,2019	
Reference Books		
1	Matthew MacDonald, Beginning ASP.NET 4 in C# 2010,APRESS,2010.	
2	Herbert Schildt, The Complete Reference C#.NET, TataMcGraw-Hill,2017.	

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	2	3
CO2	3	3	1	2	2	3
CO3	3	3	1	3	2	3
CO4	3	2	1	2	2	3
CO5	3	2	1	2	2	3
Weightage of course contributed to each PSO	15	12	5	11	10	15

CORE COURSE – VIII: DOT NET WITH MYSQL LAB

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCAP4	0	0	6	IV	4	6	50	50	100
Learning Objectives									
LO1	Provide knowledge of fundamental programming concepts in C# including arrays, control structures, and parameter passing techniques.								
LO2	Develop problem-solving skills using iterative and recursive approaches.								
LO3	Introduce object-oriented programming concepts such as classes, objects, inheritance, and constructors.								
LO4	Enable students to design and validate programs with proper input handling and exception management.								
LO5	Familiarize students with GUI development using Windows Forms.								
Prerequisites:									
Contents									
1) Implement a C# program to find the sum of each row of a jagged array									
2) a) Develop a C# program to swap two numbers using ref parameter									
b) Develop a C# program to find the area of triangle using in and out parameters									
c) Implement a calculator using switch-case for +, −, ×, ÷ operations.									
3) a) Create a C# class named Circle constructed by a data member “radius” and two methods which will compute the area and the perimeter of a circle									
b) Find factorial using: Loop ,Recursion									
c) Create a base class Person and derived class Employee and Display employee details									
d) Define a STUDENT class with roll number, name and marks in 3 tests of subjects. Use appropriate functions to find the average of two best marks for a student and print the roll number, name and average marks of a student. First, initialize the data members using constructors									
4) Create a class Time to display a time value with the data members of hours, minutes and seconds. Include the member functions to get and display the time separated by: (HH:MM:SS). Assume the time is represented in 12 hours. If the input value exceeds the hour, minute and second then your function should report the exception as invalid hour/minute/second. Write a C# program to model the above relationships									
5) Create a Simple Windows Form with: Label, Textbox and Button, Display entered text on button click									
6) The department table consists of two fields (Dept ID, Dept Name). Write an ASP.NET web application to insert, update, delete and display the records in the department table									
							Total Hours: 90		

CO	Course Outcomes
CO1	Apply C# programming constructs such as arrays, control statements, and parameter passing (ref, in, out) to solve problems.
CO2	Implement algorithms using both iterative and recursive techniques for real-world problems.
CO3	Design and develop object-oriented applications using classes, inheritance, and constructors.
CO4	Develop programs with proper validation and exception handling mechanisms.
CO5	Create basic GUI applications using Windows Forms and handle user interactions.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	2	3
CO2	3	3	1	2	2	3
CO3	3	3	1	3	2	3
CO4	3	2	1	2	2	3
CO5	3	2	1	2	2	3
Weightage of course contributed to each PSO	15	12	5	11	10	15

ELECTIVE COURSE – IV: FINANCIAL ACCOUNTING

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECA41	4	0	0	IV	3	4	50	50	100
Learning Objectives									
LO1	To learn the basic concepts, principles, terminology, and rules of accounting, including accounting equations and different branches of accounting.								
LO2	To understand and apply journalizing and ledger posting, including debit and credit rules, compound entries, and balancing of accounts.								
LO3	To learn the methods of preparing a trial balance, detect errors, and ensure the accuracy of financial records.								
LO4	To develop the ability to prepare trading, profit and loss accounts, and balance sheets, along with classification of assets and liabilities.								
LO5	To gain knowledge of preparing accounts for non-trading organizations, including receipts and payments accounts and income and expenditure accounts.								
Prerequisites:									
Unit	Contents								No. of Hours
I	BASIC CONCEPTS OF ACCOUNTING Introduction to Accounting: Need for Accounting –Branches of Accounting – Methods of Accounting – Types of Accounting – Accounting Rules - Bases of Accounting – Accounting terminology. Basic Accounting Concepts: Meaning and classification of Accounting- Accounting Concepts – Accounting Conversion – Accounting equations.								12
II	JOURNAL AND LEDGER Recording a Financial Data: Memorandum Book, business transaction, Journal, Rules for Debit and Credit, Compound Journal entry, Advantages of Journal, Ledger, Ledger Account, Ledger Posting, Process of Posting, Balancing of An Account								12
III	PREPARING TRIAL BALANCE Trail Balance: Objects, Methods of Preparing Trail Balance, how to locate errors, hints for the preparation of trail balance & problems.								12
IV	FINAL ACCOUNTS Trading account - individual items posted to the debit of trading account - individual items credited to trading account– profit & loss account –								12

	manufacturing account – balance sheet – classification of assets & liabilities.	
V	ACCOUNTS FOR NON-PROFIT ORGANISATION Final accounts of no trading concern – receipts and payments account – features – income & expenditure account - feature - distinction between the two – treatment of special items – some important adjustments	12
TOTAL		60
CO	Course Outcomes	
CO1	Students will be able to explain accounting concepts, terminology, rules, methods, and accounting equations used in financial recording.	
CO2	Students will be able to apply journal entries, ledger posting, and debit-credit rules to record business transactions accurately.	
CO3	Students will be able to prepare trial balances, identify accounting errors, and verify the accuracy of ledger accounts..	
CO4	Students will be able to prepare trading accounts, profit and loss accounts, manufacturing accounts, and balance sheets with proper classification of assets and liabilities.	
CO5	Students will be able to prepare receipts and payments accounts and income and expenditure accounts, including necessary adjustments for non-trading organizations.	
Text Books		
1	Financial Accounting-T.S.Reddy,A.Murthy–MarghamPublications,2012.	
2	Fundamentals of Advanced Accounting - R.S.N.Pillai, Bagavathi, S.Uma, 5th Edition,S.Chand Publication,2012.	
Reference Books		
1	Essentials of Financial Accounting–Asish K. Bhattacharayya, PHI,2020.	
2	Advanced Accountancy -S.P.Jainand Narang–KalyaniPublications,2017.	
3	Essentials of Financial Accounting–AsishK. Bhattacharayya, PHI,2020.	

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	2	2	3
CO2	3	2	2	2	3	2
CO3	3	3	3	3	2	2
CO4	3	2	2	2	2	3
CO5	3	3	2	2	3	2
Weightage of course contributed to each PSO	15	12	11	11	12	12

ELECTIVE COURSE – IV: CLOUD COMPUTING

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECA42	4	0	0	IV	3	4	50	50	100

Learning Objectives

LO1	Learning fundamental concepts and Technologies of Cloud Computing.
LO2	Learning various cloud service types and their uses and pitfalls.
LO3	To learn about Cloud Architecture and Application design.
LO4	To know the various aspects of application design, benchmarking and security on the Cloud.
LO5	To learn the various Case Studies in Cloud Computing.

Prerequisites:

Unit	Contents	No. of Hours
I	Introduction to Cloud Computing: Definition of Cloud Computing – Characteristics of Cloud Computing – Cloud Models – Cloud Service Examples – Cloud-based Services and Applications.	12
II	Cloud Services Compute Services: Google Compute Engine - Windows Azure Virtual Machines Storage Services: Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage Database Services: Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store	12
III	Cloud Application Design: Introduction – Design Consideration for Cloud Applications – Scalability – Reliability and Availability – Security – Maintenance and Upgradation – Performance – Reference Architectures for Cloud Applications – Cloud Application Design	12
IV	Cloud Application Benchmarking and Tuning: Introduction to Benchmarking – Steps in Benchmarking – Workload Characteristics – Application Performance Metrics – Design Consideration for Benchmarking Methodology – Benchmarking Tools and Types of Tests – Deployment Prototyping.	12
V	Case Studies Cloud Computing for Healthcare –Cloud Computing for Transportation Systems - Cloud Computing for Manufacturing Industry - Cloud Computing for Education.	12
TOTAL		60

CO	Course Outcomes
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.
Text Books	
1	Arshdeep Bahga, Vijay Madisetti, Cloud Computing – A Hands On Approach, Universities Press (India) Pvt. Ltd., 2018
Reference Books	
1	Anthony T Velte, Toby J Velte, Robert Elsenpeter, Cloud Computing: A 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.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	2	2	2
CO2	2	3	2	2	2	2
CO3	2	3	3	3	2	2
CO4	2	3	2	2	2	2
CO5	3	3	2	2	2	2
Weightage of course contributed to each PSO	12	14	11	11	10	10

SKILL ENHANCEMENT COURSE – VI: PHP PROGRAMMING LAB

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26USCAP4	0	0	2	IV	2	2	50	50	100
Learning Objectives									
LO1	To provide the necessary knowledge on basics of PHP.								
LO2	To design and develop dynamic, database-driven web applications using PHP.								
LO3	To get an experience on various web application development techniques.								
LO4	To learn the necessary concepts for working with the files using PHP.								
LO5	To get a knowledge on sessions and cookies								
Prerequisites:									
Contents									
1. Get name of a user from a form and show greeting text. 2. Write a PHP program to check whether given string is palindrome or not. 3. Write a PHP program to check whether given number is Armstrong or not. 4. Write a PHP program using function. 5. Create, Insert, Update, delete records using PHP & MySQL. 6. Write a PHP program for Array manipulation. 7. Write a PHP program to create, write and read a file. 8. Create a PHP page for login page with sql connection. 9 Create a web page to advertise a product of the company using images and audio. 10. Create a PHP page for login system using session.									
									Total Hours: 30
CO	Course Outcomes								
CO1	Write PHP scripts to handle HTML forms								
CO2	Write regular expressions including modifiers, operators, and meta characters.								
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/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	3	3	2	2
CO2	3	3	3	3	2	2
CO3	3	3	3	2	2	3
CO4	3	3	3	3	3	2
CO5	3	3	2	3	2	2
Weightage of course contributed to each PSO	15	14	14	14	11	11

SKILL ENHANCEMENT COURSE - VII – DESKTOP PUBLISHING LAB

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26USCAP5	0	0	2	IV	2	2	50	50	100
Learning Objectives									
LO1	Understand the fundamentals of Desktop Publishing (DTP)								
LO2	Identify and use DTP hardware and software tools								
LO3	Develop skills in page layout and design principles								
LO4	Create professional documents.								
LO5	Demonstrate creativity and design aesthetics								
Prerequisites:									
Contents									
1. Design ID Card (3'' * 2''). 2. Design Visiting Card (3.5'' * 2''). 3. Design an attractive invitation Card (5.5'' * 8''). 4. Design Letter Pad. (7.5'' * 9''). 5. Preparation of a small booklet with 6 pages (3.5'' * 4.5''). 6. Design a hand bill (5.5'' * 8.5''). 7. Create an advertisement for your college. 8. Design your college progress card. 9. Create a receipt bill with counter foil. 10. Create a graph/pie chart. 11. Create an advertisement for a mobile shop (with offers) 12. Design a Greeting Card 13. Design Aadhar Card 14. Design Workshop brochure 15. Design a feedback form									
Total Hours: 30									
CO	Course Outcomes								
CO1	Understand the basic principles of PageMaker								
CO2	Design Greeting cards								
CO3	Create advertisements								
CO4	Create better layouts using grids and guides								
CO5	Prepare Booklet								

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	2	2	2
CO2	2	3	2	2	2	2
CO3	2	3	3	3	2	2
CO4	2	3	2	2	2	2
CO5	3	3	2	2	2	2
Weightage of course contributed to each PSO	12	14	11	11	10	10

COMMON - VALUE BASED EDUCATION

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UVBE41	2	0	0	IV	2	2	50	50	100
Learning Objectives									
LO1	To provide basic knowledge of the Indian Constitution and its framework.								
LO2	To understand fundamental rights, duties, and directive principles.								
LO3	To create awareness about human rights and their protection mechanisms.								
LO4	To develop analytical skills regarding constitutional and human rights issues.								
LO5	To promote values of equality, justice, and democracy among students.								
Prerequisites:									
Unit	Contents								No. of Hours
I	Introduction to Indian Constitution Introduction: Meaning and importance of Constitution - Historical background of Indian Constitution - Making of the Constitution (Constituent Assembly) - Salient features of Indian Constitution - Preamble – Meaning, Objectives and Values.								6
II	Fundamental Rights and Duties Fundamental Rights – Types and significance - Right to Equality, Freedom, Religion, Cultural & Educational Rights - Right to Constitutional Remedies - Fundamental Duties – Meaning and importance.								6
III	Directive Principles of State Policy Meaning and objectives - Classification of Directive Principles - Relationship between Fundamental Rights and DPSP - Role in governance and welfare state.								6
IV	Human Rights – Concepts and Development Meaning and definition of Human Rights - Evolution of Human Rights - Universal Declaration of Human Rights (UDHR) - Types of Human Rights – Civil, Political, Economic, Social & Cultural								6
V	Human Rights in India Human Rights Protection Act, 1993 - National Human Rights Commission (NHRC) – Structure and functions - Role of NGOs in Human Rights protection - Issues: Women, Children, Minorities & Environment - Contemporary Human Rights challenges in India.								6
TOTAL									30

CO	Course Outcomes
CO1	Explain the structure and features of the Indian Constitution.
CO2	Identify and interpret Fundamental Rights and Duties.
CO3	Analyze the role of Directive Principles in governance.
CO4	Understand the concept and importance of Human Rights.
CO5	To create a congenial climate in the organization
Text Books	
1	Durga Das Basu – Introduction to the Constitution of India
Reference Books	
1	V.N. Shukla – Constitution of India
2	M. Laxmikanth – Indian Polity
3	Upendra Baxi – The Future of Human Rights
4	H.O. Agarwal – Human Rights
5	P.M. Bakshi – The Constitution of India

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	2	2	2
CO2	2	3	2	2	2	2
CO3	2	3	3	3	2	2
CO4	2	3	2	2	2	2
CO5	3	3	2	2	2	2
Weightage of course contributed to each PSO	12	14	11	11	10	10

SEMESTER - 5

Semester - 5

Course Code	Part	Course Category	Course Name	Hours/ Week	Examination				Credits
					Duration in hrs.	Max Marks			
						CIA	ESE	Total	
26UCCA51	III	Core - IX	Operating Systems	4	3	50	50	100	4
26UCCA52	III	Core - X	Java Programming	4	3	50	50	100	4
26UCCAP5	III	Core - XI	Java Programming Lab	6	3	50	50	100	4
26UCCA5P	III	Core - XII	Mini Project with Viva Voce	6	3	50	50	100	4
26UECA51	III	Elective - V	Software Project Management	4	3	50	50	100	3
26UECA52			Agile Project Management						
26UECA53	III	Elective - VI	Artificial Intelligence	4	3	50	50	100	3
26UECA54			Cyber Security						
26UFIK51	IV	Internship	Internship/Industrial Visit/Field Visit/Knowledge Updation Activity	-	3	50	50	100	2
26UAEC51	IV	AEC - I	Empowered Vocational English	2	3	50	50	100	2
Total				30				800	26

THIRD YEAR

SEMESTER - V

CORE COURSE – IX: OPERATING SYSTEMS

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCA51	4	0	0	V	4	4	50	50	100
Learning Objectives									
LO1	To understand the structure and design principles of an Operating System.								
LO2	To gain knowledge of CPU scheduling, process management, and memory management techniques.								
LO3	To develop and implement specialized programs for efficient management of computer resources and operations.								
LO4	To explore the concepts of job scheduling and processor scheduling.								
LO5	To understand memory organization and the principles of multiprogramming								
Prerequisites:									
Unit	Contents								No. of Hours
I	Introduction: operating system, distributed computing, parallel computation. Process concepts: definition of process, process states-Life cycle of a process, process management- process state transitions, process control block (PCB), process operations , suspend and resume, context switching, , Inter process communication-signals, message passing.								12
II	Asynchronous concurrent processes: mutual exclusion- critical section, mutual exclusion primitives. Semaphores – Mutual exclusion with Semaphores, counting semaphores, implementing semaphores. Concurrent programming: monitors, message passing								12
III	Deadlock and indefinite postponement: Resource concepts, four necessary conditions for deadlock, deadlock prevention, deadlock avoidance and Dijkstra’s Banker’s algorithm, deadlock detection, deadlock recovery								12
IV	Job and processor scheduling: scheduling levels, scheduling objectives, scheduling criteria, preemptive vs non-preemptive scheduling, priorities, scheduling algorithms- FIFO scheduling, RR scheduling, SJF scheduling, multilevel feedback queues.								12
V	Real Memory organization and Management:: Memory organization, Memory management, contiguous vs non-contiguous memory allocation,								12

	single user contiguous memory allocation, fixed partition multiprogramming, variable partition multiprogramming, Memory swapping Virtual Memory organization: Virtual memory basic concepts, paging basic concepts, segmentation, paging/segmentation systems. Virtual Memory Management: Demand Paging, Page replacement strategies	
TOTAL		60
CO	Course Outcomes	
CO1	Explain the fundamental concepts of operating systems, including processes, the process life cycle, scheduling algorithms, deadlock, and memory management	
CO2	Analyze processes using various algorithms and gain hands-on exposure to threads and semaphores.	
CO3	Examine deadlocks in depth, understand their impact on operating systems, and learn techniques and algorithms to prevent, avoid, and recover from deadlocks.	
CO4	Gain comprehensive knowledge of scheduling algorithms, including their types, functionality, and applications.	
CO5	Understand memory organization and management techniques in operating systems	
Text Books		
1	H.M. Deitel, Operating Systems, Third Edition, Pearson Education Asia, 2011	
Reference Books		
1	William Stallings, Operating System: Internals and Design Principles, Seventh Edition, Prentice-Hall of India, 2012.	
2	Silberschatz, and P.B. Galvin., Operating Systems Concepts, Ninth Edition, John Wiley & Sons(ASIA) Pte Ltd.,2012	

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	3	3	2	2
CO2	3	3	3	3	2	2
CO3	3	3	3	2	2	3
CO4	3	3	3	3	3	2
CO5	3	3	2	3	2	2
Weightage of course contributed to each PSO	15	14	14	14	11	11

CORE COURSE - X: JAVA PROGRAMMING

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCA52	4	0	0	V	4	4	50	50	100
Learning Objectives									
LO1	To provide fundamental knowledge of object-oriented programming								
LO2	To equip the student with programming knowledge in Core Java from the basics up.								
LO3	To enable the students to use AWT controls, Event Handling and Swing for GUI.								
LO4	To provide fundamental knowledge of object-oriented programming.								
LO5	To equip the student with programming knowledge in Swing.								
Prerequisites:									
Unit	Contents								No. of Hours
I	Introduction: Review of Object-Oriented concepts – JVM architecture –Data types - Variables - Scope and life time of variables - arrays - operators – control statements - type conversion and casting - simple java program - constructors - methods - Static Data – Static Method String and String Buffer Classes.								12
II	Inheritance: Basic concepts - Types of inheritance - Member access rules - Usage of this and Super key word - Method Overloading - Method overriding - Abstract classes - Dynamic method dispatch - Usage of final keyword. Packages: Definition-Access Protection -Importing Packages. Interfaces: Definition–Implementation-Exception Handling: try – catch - throw - throws – finally – Built-in exceptions - Creating own Exception classes.								12
III	Multithreaded Programming: Thread Class - Runnable interface – Synchronization–Using synchronized methods– Using synchronized statement- Inter thread Communication –Deadlock. I/O Streams: Concepts of streams - Stream classes- Byte and Character stream - Reading console Input and Writing Console output - File Handling.								12
IV	AWT Controls: The AWT class hierarchy - user interface components-Labels - Button - Text Components - Check Box - Check Box Group - Choice - List Box - Panels - Scroll Pane - Working with Frame class - Colour - Fonts and layout managers. Event Handling: Events - Event sources - Event Listeners - - Handling Mouse and Keyboard Events - Adapter classes - Inner classes								12

V	Swing: Introduction to Swing - Hierarchy of swing components. Containers - Top level containers - JFrame - JWindow - JDialog - JPanel - JButton — Jcheck Box – Jradio Button - JLabel, JtextField - JtextArea - JList – Jcombo Box – Jscroll Pane.	12
TOTAL		60
CO	Course Outcomes	
CO1	Understand the basic Object-oriented concepts. Implement the basic constructs of Core Java.	
CO2	Implement inheritance, packages, interfaces and exception handling of Core Java.	
CO3	Implement multi-threading and I/O Streams of Core Java	
CO4	Implement AWT and Event handling.	
CO5	Use Swing to create GUI.	
Text Books		
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	
Reference Books		
1	Head First Java, O“Reilly Publications	
2	Y. Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson Education India, 2010	

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	2	3
CO2	3	3	1	2	2	3
CO3	3	3	1	3	2	3
CO4	3	2	1	2	2	3
CO5	3	2	1	2	2	3
Weightage of course contributed to each PSO	15	12	5	11	10	15

CORE COURSE – XI: JAVA PROGRAMMING LAB

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCAP5	0	0	6	V	4	6	50	50	100
Learning Objectives									
LO1	To provide fundamental knowledge of object-oriented programming.								
LO2	To equip the student with programming knowledge in Core Java from the basics up.								
LO3	To enable the students to know about Event Handling.								
LO4	To enable the students to use String concepts.								
LO5	To equip the student with programming knowledge in to create GUI using AWT controls.								
Prerequisites:									
Contents									
1. Write a Java program that prompts the user for an integer and then prints out all the prime numbers up to that Integer 2. Write a Java program to multiply two given matrices. 3. Write a Java program that displays the number of characters, lines and words in text 4. Generate random numbers between two given limits using Random class and print messages according to the range of the value generated. 5. Write a program to do String Manipulation using Character array and perform the following string operations: a) String length b) Finding a character at a particular position c) Concatenating two strings 6. Write a program to perform the following string operations using String class: a) String Concatenation b) Search a substring c) To extract substring from given string 7. Write a program to perform string operations using String Buffer class: a) Length of a string b) Reverse a string c) Delete a substring from the given string 8. Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.									

9. Write a threading program which uses the same method asynchronously to print the numbers 1 to 10 using Thread1 and to print 90 to 100 using Thread2.
10. Write a program to demonstrate the use of following exceptions.
- Arithmetic Exception
 - Number Format Exception
 - Array Index Out of Bound Exception
 - Negative Array Size exception
11. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. (Use adapter classes).
12. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -, *, % operations. Add a text field to display the result. Handle any possible exceptions like divide by zero.

Total Hours: 90

CO	Course Outcomes
CO1	Comprehend the principles of dynamic memory allocation, data types, algorithms, and time complexity analysis (Big O notation).
CO2	Gain knowledge of core data structures such as arrays, linked lists, stacks, and queues.
CO3	Explain hashing techniques, collision issues, and different methods for resolving collisions.
CO4	Tackle and analyze problems involving trees, graphs, and heaps.
CO5	Utilize appropriate algorithms to perform sorting, searching, insertion, and deletion tasks.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	2	3
CO2	3	3	1	2	2	3
CO3	3	3	1	3	2	3
CO4	3	2	1	2	2	3
CO5	3	2	1	2	2	3
Weightage of course contributed to each PSO	15	12	5	11	10	15

CORE COURSE – XII: MINI PROJECT WITH VIVA VOCE

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCA5P	0	0	6	V	4	6	50	50	100
Learning Objectives									
LO1	Use concepts from subjects like Database Management Systems, Software Engineering, and Web Development in a real-world project.								
LO2	Identify a real-life problem and design an efficient software-based solution.								
LO3	Improve coding skills using languages like Java, Python, or PHP.								
LO4	Learn all phases including planning, analysis, design, development, testing, and deployment								
LO5	Create, manage, and optimize databases using tools like MySQL or Oracle Database.								
Prerequisites:									
GUIDELINES FOR PROJECT WORK									
➤ The aim of the Project work is to acquire practical knowledge on the implementation of the programming concepts studied. ➤ Each student should carry out group Project Work and it may be a work using the software packages that they have learned or the implementation of concepts from the papers studied or implementation of any innovative idea. ➤ The Project work should be compulsorily done in the college only under the supervision of the Department staff concerned. ➤ Viva-voce will be conducted at the end of VI semester for 100 marks.									
Total Hours: 90									
CO	Course Outcomes								
CO1	Analyze real-world problems and propose appropriate software-based solutions using concepts from Software Engineering.								
CO2	Design and model software systems using standard methodologies, including database design with Database Management Systems principles.								
CO3	Develop a functional application using suitable programming languages such as Java, Python, or web technologies.								
CO4	Apply testing techniques to ensure software quality, reliability, and performance.								
CO5	Utilize modern development tools, frameworks, and environments (e.g., MySQL, Visual Studio Code).								

ELECTIVE COURSE – V: SOFTWARE PROJECT MANAGEMENT

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECA51	4	0	0	V	3	4	50	50	100
Learning Objectives									
LO1	To gain knowledge of product development techniques, software development life cycle models, and process improvement frameworks such as SEI CMM and ISO standards.								
LO2	To learn methods for selecting software projects, defining project scope and goals, and developing work breakdown structures (WBS) for effective planning.								
LO3	To understand and apply estimation techniques including software size estimation, effort estimation, COCOMO models, and SLIM for project cost and resource planning.								
LO4	To develop skills in project scheduling using tools like PERT and CPM, and to manage resources effectively through organizational structures and dependency analysis.								
LO5	To understand software quality assurance concepts, quality planning, and configuration management principles to ensure reliable and maintainable software systems.								
Prerequisites:									
Unit	Contents								No. of Hours
I	Product Development Techniques - Management Skills - Product Development Life Cycle - Software Development Process and models - The SEI CMM - International Organization for Standardization.								12
II	Managing Domain Processes - Project Selection Models - Project Portfolio Management - Selecting a Project Team - Goal and Scope of the Software Project -Project Planning - Creating the Work Breakdown Structure - Approaches to Building a WBS - Project Milestones -Building a WBS for Software.								12
III	Tasks and Activities - Software Size and Reuse Estimating - The SEI CMM - Problems and Risks - Cost Estimation - Effort Measures - COCOMO: A Regression Model - COCOMO II - SLIM: A Mathematical Model								12
IV	Project Management Resource Activities - Organizational Form and Structure - Software Development Dependencies - Brainstorming - Scheduling Fundamentals - PERT and CPM - Leveling Resource Assignments								12
V	Quality: Requirements – The SEI CMM - Guidelines - Challenges - Quality Function Deployment - Building the Software Quality Assurance - Plan -								12

	Software Configuration Management: Principles - Requirements - Planning and Organizing	
TOTAL		60
CO	Course Outcomes	
CO1	Understand the principles and concepts of project management	
CO2	Acquire the knowledge required to effectively train and develop software project managers.	
CO3	Apply appropriate software project management methodologies in real-world projects.	
CO4	Develop comprehensive and well-structured software project plans.	
CO5	Analyze, evaluate, and mitigate risks associated with the software development process.	
Text Books		
1	Robert T. Futrell, Donald F. Shafer, Linda I. Safer, “Quality Software Project Management”, Pearson Education Asia 2002.	
Reference Books		
1.	Pankaj Jalote, “Software Project Management in Practice”, Addison Wesley 2002	
2.	Hughes, “Software Project Management”, Tata McGraw Hill 2004, 3rd Edition	

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	2	3
CO2	3	3	1	2	2	3
CO3	3	3	1	3	2	3
CO4	3	2	1	2	2	3
CO5	3	2	1	2	2	3
Weightage of course contributed to each PSO	15	12	5	11	10	15

ELECTIVE COURSE - V: AGILE PROJECT MANAGEMENT

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECA52	4	0	0	V	3	4	50	50	100
Learning Objectives									
LO1	Develop knowledge of software design principles, software technologies, and APIs.								
LO2	Provide a detailed explanation of Agile development and testing techniques.								
LO3	Gain understanding of Agile planning and execution processes.								
LO4	Learn about Agile management practices, design strategies, and quality assurance methods.								
LO5	Conduct an in-depth analysis of Agile development and testing techniques.								
Prerequisites:									
Unit	Contents								No. of Hours
I	Introduction: Modernizing Project Management: Project Management Needed a Makeover – Introducing Agile Project Management. Applying the Agile Manifesto and Principles: Understanding the Agile manifesto – Outlining the four values of the Agile manifesto – Defining the Agile Principles – Adding the Platinum Principles – Changes as a result of Agile Values – The Agile litmus test.								12
II	Being Agile Agile Approaches: Diving under the umbrella of Agile approaches Reviewing the Big Three: Lean, Scrum, Extreme Programming - Summary Agile Environments in Action: Creating the physical environment – Low-tech communicating – High-tech communicating – Choosing tools.								12
III	Agile Planning and Execution Defining the Product Vision and Roadmap: Agile planning – Defining the product vision – Creating a product roadmap – Completing the product backlog. Planning Releases and Sprints: Refining requirements and estimates – Release planning – Sprint planning.								12
IV	Agile Management Managing Scope and Procurement: What’s different about Agile scope management – Managing Agile scope – What’s different about Agile procurement – Managing Agile procurement. Managing Time and Cost: What’s different about Agile time management – Managing Agile schedules – What’s different about 12 Agile cost management – Managing Agile budgets.								12
V	Implementing Agile Building a Foundation: Organizational and individual commitment – Choosing the right pilot team members – Creating and environment that enables Agility – Support Agility initially and over time.								12
TOTAL								60	

CO	Course Outcomes
CO1	Understand software design principles, software technologies, and APIs using Agile management practices.
CO2	Understand Agile development and testing techniques.
CO3	Understand Agile planning and execution using sprints.
CO4	Understand Agile management design, scope management, procurement, time and cost management, and quality control.
CO5	Analyze Agile development and testing techniques.
Text Books	
1	Mark C. Layton, Steven J. Ostermiller, Agile Project Management for Dummies, 2nd Edition, Wiley India Pvt. Ltd., 2018
2	Jeff Sutherland, Scrum – The Art of Doing Twice the Work in Half the Time, Penguin, 2014.
Reference Books	
1.	Mark C. Layton, David Morrow, Scrum for Dummies, 2nd Edition, Wiley India Pvt. Ltd., 2018.
2.	Mike Cohn, Succeeding with Agile – Software Development using Scrum, Addison-Wesley Signature Series, 2010
3	Alex Moore, Agile Project Management, 2020.
4	Alex Moore, Scrum, 2020.
5	Andrew Stellman and Jennifer Greene, Learning Agile: Understanding Scrum, XP, Lean, and Kanban, Shroff/O'Reilly, First Edition, 2014.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	2	3
CO2	3	3	1	2	2	3
CO3	3	3	1	3	2	3
CO4	3	2	1	2	2	3
CO5	3	2	1	2	2	3
Weightage of course contributed to each PSO	15	12	5	11	10	15

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECA53	4	0	0	V	3	4	50	50	100
Learning Objectives									
LO1	Develop an understanding of various AI techniques.								
LO2	Learn different search algorithms used in Artificial Intelligence.								
LO3	Understand probabilistic reasoning and models in Artificial Intelligence.								
LO4	Gain knowledge of Markov Decision Processes.								
LO5	Explore different types of reinforcement learning methods.								
Prerequisites:									
Unit	Contents								No. of Hours
I	Introduction: Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, Search graph and Search tree								12
II	Search Algorithms : Random search, Search with closed and open list, Depth first and Breadth first search, Game Search								12
III	Probabilistic Reasoning : Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference, hidden Markov model								12
IV	Markov Decision process: MDP formulation, utility theory, utility functions, value iteration.								12
V	Reinforcement Learning : Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, active reinforcement learning- Q learning								12
TOTAL								60	
CO	Course Outcomes								
CO1	Understand the fundamental concepts of AI techniques.								
CO2	Understand various search algorithms used in AI.								
CO3	Understand probabilistic reasoning and modelling approaches in AI.								
CO4	Understand the principles of Markov Decision Processes.								
CO5	Understand different types of reinforcement learning techniques.								
Text Books									
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.	SarojKaushik, “Artificial Intelligence”, Cengage Learning India, 2011
3.	David Poole and Alan Mackworth, “Artificial Intelligence: Foundations for Computational Agents”, Cambridge University Press 2010

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	2	3
CO2	3	3	1	2	2	3
CO3	3	3	1	3	2	3
CO4	3	2	1	2	2	3
CO5	3	2	1	2	2	3
Weightage of course contributed to each PSO	15	12	5	11	10	15

ELECTIVE COURSE – VI: CYBER SECURITY

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECA54	4	0	0	V	3	4	50	50	100
Learning Objectives									
LO1	To learn cybercrime and cyber law.								
LO2	To understand the cyber-attacks and tools for mitigating them.								
LO3	To understand information gathering.								
LO4	To learn how to detect a cyber-attack.								
LO5	To learn how to prevent a cyber-attack								
Prerequisites:									
Unit	Contents								No. of Hours
I	INTRODUCTION: Cyber Security – History of Internet – Impact of Internet – CIA Triad; Reason for Cyber Crime – Need for Cyber Security – History of Cyber Crime; Cybercriminals – Classification of Cybercrimes – A Global Perspective on Cyber Crimes; Cyber Laws – The Indian IT Act – Cybercrime and Punishment.								12
II	ATTACKS AND COUNTERMEASURES: OSWAP; Malicious Attack Threats and Vulnerabilities: Scope of Cyber-Attacks – Security Breach – Types of Malicious Attacks – Malicious Software – Common Attack Vectors – Social engineering Attack – Wireless Network Attack – Web Application Attack – Attack Tools – Countermeasures.								12
III	RECONNAISSANCE: Harvester – Who is – Netcraft – Host – Extracting Information from DNS – Extracting Information from E-mail Servers – Social Engineering Reconnaissance; Scanning – Port Scanning – Network Scanning and Vulnerability Scanning – Scanning Methodology – Ping Sweer Techniques – Nmap Command Switches.								12
IV	INTRUSION DETECTION: Host -Based Intrusion Detection – Network -Based Intrusion Detection – Distributed or Hybrid Intrusion Detection – Intrusion Detection Exchange Format – Honeypots – Example System Snort.								12
V	INTRUSION PREVENTION : Firewalls and Intrusion Prevention Systems: Need for Firewalls – Firewall Characteristics and Access Policy – Types of Firewalls – Firewall Basing – Firewall Location and Configurations –Intrusion Prevention Systems – Example Unified Threat Management Products								12
TOTAL								60	

CO	Course Outcomes
CO1	Explain the basics of cyber security, cybercrime and cyber law
CO2	Classify various types of attacks and learn the tools to launch the attacks
CO3	Apply various tools to perform information gathering
CO4	Apply intrusion techniques to detect intrusion
CO5	Apply intrusion prevention techniques to prevent intrusion
Text Books	
1	Anand Shinde, “Introduction to Cyber Security Guide to the World of Cyber Security”, Notion Press, 2021. (Unit-1 &2).
2	William Stallings, Lawrie Brown, “Computer Security Principles and Practice”, Third Edition, Pearson Education, 2015. (Unit-4 & 5)
Reference Books	
1.	Patrick Engebretson, “The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made easy”, Elsevier, 2011. (Unit-3)
2.	David Kim, Michael G. Solomon, “Fundamentals of Information Systems Security”, Jones & Bartlett Learning Publishers, 2013

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	2	3
CO2	3	3	1	2	2	3
CO3	3	3	1	3	2	3
CO4	3	2	1	2	2	3
CO5	3	2	1	2	2	3
Weightage of course contributed to each PSO	15	12	5	11	10	15

ABILITY ENHANCEMENT COURSE – I: EMPOWERED VOCATIONAL ENGLISH

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UAEC51	2	0	0	V	2	2	50	50	100

Learning Objectives

LO1	To build self- assurance in students by mastering interpersonal, team- management, and leadership abilities.
LO2	To equip aspiring learners with skills that transform them into effective young managers.
LO3	To sharpen communication proficiency for professional and workplace contexts.
LO4	To foster strategic thinking and problem- solving through advanced writing & presentation techniques.
LO5	To develop etiquette and corporate- ready competencies for modern business environments

Prerequisites:

Unit	Contents	No. of Hours
I	Communication Skills , Current English Usage , Aptitude and Attitude , Team Building and Leadership , Psychological Tests , Effective Resume Writing	6
II	Précis Writing, Essay Writing, Goal Setting ,Conflict Management, Appearing for an Interview , Myths regarding Group Discussion	6
III	Debates, Presentation for Small and Large Groups , Prioritization ,Time Management ,Stress Interview , Prerequisites of a Group Discussion	6
IV	Marketing and Business Presentations, Report Writing , Cross- Cultural Communication, Lateral Thinking, Qualities of a Candidate for an Interview, Generating Ideas for Discussion	6
V	Telephone Etiquette, Email Etiquette, Concepts of Leadership, Insights from Great Leaders, Mock Interview, Mock Group Discussion	6
TOTAL		30

CO

Course Outcomes

CO1	Students will demonstrate strong interpersonal and leadership skills in team settings.
CO2	Learners will apply effective communication strategies in current English usage.
CO3	Graduates will craft professional résumés and master interview- ready writing styles.
CO4	Participants will manage conflicts, set goals, and deliver impactful presentations.
CO5	Individuals will exhibit polished telephone & email etiquette alongside refined leadership insights

Text Books

1	Covey, Stephen R. _The 7 Habits of Highly Effective People: Powerful Lessons in Personal Change_. Simon & Schuster, 1989.
2	Khera, Shiv. _You Can Win: A Step by Step Tool for Top Achievers_. Macmillan, 1998.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	2	2	2
CO2	2	3	2	2	2	2
CO3	2	3	3	3	2	2
CO4	2	3	2	2	2	2
CO5	3	3	2	2	2	2
Weightage of course contributed to each PSO	12	14	11	11	10	10

SEMESTER - 6

Semester - 6

Course Code	Part	Course Category	Course Name	Hours / Week	Examination				Credits
					Duration in hrs.	Max Marks			
						CIA	ESE	Total	
26UCCA61	III	Core - XIII	Machine Learning	4	3	50	50	100	4
26UCCA62	III	Core - XIV	Python Programming	4	3	50	50	100	4
26UCCAP6	III	Core - XV	Machine Learning Lab	6	3	50	50	100	4
26UCCA6P	III	Core - XVI	Major Project with Viva voce	6	3	50	50	100	5
26UECA61	III	Elective - VII	Robotics and its Applications	4	3	50	50	100	3
26UECA62			Computer Networks						
26UECA63	III	Elective - VIII	Introduction to Data Science	4	3	50	50	100	3
26UECA64			Data Mining and Warehousing						
26UAEC61	IV	AEC - II	Design Thinking	2	3	50	50	100	2
26U5EA61	V	Common	Extension Activity	-	-	-	100	100	1
Total				30				800	26
Grand Total				180				4800	144

THIRD YEAR**SEMESTER - VI****CORE COURSE - XIII: MACHINE LEARNING**

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCA61	4	0	0	VI	4	4	50	50	100
Learning Objectives									
LO1	Develop an understanding of Machine Intelligence and its applications in Machine Learning.								
LO2	Implement and apply machine learning algorithms to real-world problems.								
LO3	Identify and apply appropriate machine learning techniques for classification, pattern recognition, optimization, and decision-making problems.								
LO4	Develop and apply instance-based learning methods.								
LO5	Apply advanced learning techniques in machine learning.								
Prerequisites:									
Unit	Contents								No. of Hours
I	Introduction Machine Learning - Difference between AI, Machine Learning and Big data. Supervised and unsupervised learning, parametric vs non-parametric models, parametric models for classification and regression- Linear Regression, Logistic Regression, Naïve Bayes classifier, simple non-parametric classifier-K-nearest neighbour, support vector machines								12
II	Neural networks and genetic algorithms Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search								12
III	Bayesian and computational learning Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity								12
IV	Instant based learning K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.								12
V	Advanced learning Recommendation systems – opinion mining, sentiment analysis. Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules- – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning								12
TOTAL								60	

CO	Course Outcomes
CO1	Recognize the importance of data visualization in data analytics solutions
CO2	Apply structured thinking approaches to solve unstructured problems.
CO3	Understand a broad range of machine learning algorithms and related problem domains.
CO4	Learn the algorithmic foundations of machine learning with sufficient mathematical depth to Understand the underlying theory.
CO5	Develop an understanding of the key concepts and challenges involved in learning from data.
Text Books	
1	Tom M. Mitchell, —Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.
2	Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning" 2015, MIT Press
Reference Books	
1	EthemAlpaydin, —Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
2	Stephen Marsland, —Machine Learning: An Algorithmic Perspective, CRC Press, 2009

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	2	3
CO2	3	3	1	2	2	3
CO3	3	3	1	3	2	3
CO4	3	2	1	2	2	3
CO5	3	2	1	2	2	3
Weightage of course contributed to each PSO	15	12	5	11	10	15

CORE COURSE – XIV: PYTHON PROGRAMMING

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCA62	4	0	0	VI	4	4	50	50	100
Learning Objectives									
LO1	To understand the concepts of Python programming.								
LO2	To develop Python program using control statements.								
LO3	To impart knowledge on functions and modules.								
LO4	To get knowledge on list, sets, dictionaries and tuples.								
LO5	To know about file handling.								
Prerequisites:									
Unit	Contents								No. of Hours
I	Basics of Python Programming: Features of Python- History of Python - Future of Python – Writing and Executing First Python Program – Literal Constants -Variables and Identifiers - Data Types - Input Operation - Comments – Reserved Words – Indentation - Operators and Expressions.								12
II	Decision Control Statements: Introduction to Decision Control Statements- Selection / Conditional Branching statements: if, if-else, nested if and if-elif-else statements.								12
III	Basic Loop Structures / Iterative Statements: while loop, for loop, selecting an appropriate loop. Nested loops – break statement - continue statement - pass statement- the else statement used with loops.								12
IV	Lists: Creating a list -Access values in List-Updating values in Lists-Nested lists cloning list-Basic list operations-List Methods. Tuples: Creating tuple, utility of tuples – Accessing values in a tuple -								12
V	Sets: Creating a set. Dictionaries: Creating a Dictionary, Accessing values, adding and Modifying an item in a dictionary, Modifying an entry - Deleting items – Sorting items in a Dictionary-looping over a Dictionary- nested dictionaries								12
TOTAL								60	
CO	Course Outcomes								
CO1	Learn the basics of python, do simple programs on python								
CO2	Develop program using selection statement, work with Looping and jump statements, do programs on Loops and jump statements								
CO3	Concept of function, function arguments, significance of Modules, work with functions, and modules								

CO4	Work with list, tuples and dictionary, write program using list, tuples and dictionary.
CO5	Usage of File handlings in Python, concept of reading and writing files, do programs using files.
Text Books	
1	Reema Thareja, “Python Programming using problem solving approach”, First Edition, 2017, Oxford University Press
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”, APress. 5. Kenneth A. Lambert, “Fundamentals of Python – First Programs”, CENGAGE Publication

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	2	3
CO2	3	3	1	2	2	3
CO3	3	3	1	3	2	3
CO4	3	2	1	2	2	3
CO5	3	2	1	2	2	3
Weightage of course contributed to each PSO	15	12	5	11	10	15

CORE COURSE – XV: MACHINE LEARNING LAB

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCAP6	0	0	6	VI	4	6	50	50	100
Learning Objectives									
LO1	Provide hands-on experience in implementing machine learning algorithms								
LO2	Understand data preprocessing, model building, and evaluation								
LO3	Use Python libraries for real-world ML applications								
LO4	Develop practical problem-solving skills using ML techniques								
LO5	Gain the ability to tune and optimize models for improved performance and accuracy								
Prerequisites:									
Contents									
1. Introduction to Python for ML 2. Data Preprocessing 3. Data Visualization 4. Linear Regression 5. Logistic Regression 6. k-Nearest Neighbors (k-NN) 7. Decision Tree 8. Support Vector Machine (SVM) 9. Clustering – k-Means 10. Hierarchical Clustering									
Total Hours: 90									
CO	Course Outcomes								
CO1	Implement ML algorithms using Python								
CO2	Perform preprocessing and visualization								
CO3	Evaluate ML models								
CO4	Solve real-world problems using ML								
CO5	Deploy machine learning models into practical applications and interpret their results effectively								

CORE COURSE – XVI: MAJOR PROJECT WITH VIVA VOCE

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCA6P	0	0	6	VI	5	6	50	50	100

Learning Objectives

LO1	Use concepts from subjects like Database Management Systems, Software Engineering, and Web Development in a real-world project.
LO2	Identify a real-life problem and design an efficient software-based solution.
LO3	Improve coding skills using languages like Java, Python, or PHP.
LO4	Learn all phases including planning, analysis, design, development, testing, and deployment
LO5	Create, manage, and optimize databases using tools like MySQL or Oracle Database.

Prerequisites:

GUIDELINES FOR PROJECT WORK

- The aim of the Project work is to acquire practical knowledge on the implementation of the programming concepts studied.
- Each student should carry out group Project Work and it may be a work using the software packages that they have learned or the implementation of concepts from the papers studied or implementation of any innovative idea.
- The Project work should be compulsorily done in the college only under the supervision of the Department staff concerned.
- Viva-voce will be conducted at the end of VI semester for 100 marks.

Total Hours: 90

CO	Course Outcomes
CO1	Analyze real-world problems and propose appropriate software-based solutions using concepts from Software Engineering.
CO2	Design and model software systems using standard methodologies, including database design with Database Management Systems principles.
CO3	Develop a functional application using suitable programming languages such as Java, Python, or web technologies.
CO4	Apply testing techniques to ensure software quality, reliability, and performance.
CO5	Utilize modern development tools, frameworks, and environments (e.g., MySQL, Visual Studio Code).

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	2	3
CO2	3	3	1	2	2	3
CO3	3	3	1	3	2	3
CO4	3	2	1	2	2	3
CO5	3	2	1	2	2	3
Weightage of course contributed to each PSO	15	12	5	11	10	15

ELECTIVE COURSE - VII: ROBOTICS AND ITS APPLICATIONS

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECA61	4	0	0	VI	3	4	50	50	100
Learning Objectives									
LO1	To understand the fundamental principles of robotics.								
LO2	To study various sensors used in robotics and matrix methods for robotic analysis.								
LO3	To learn the fundamentals of the Robot Operating System (ROS) programming environment.								
LO4	To explore the various applications of robotics in different industries.								
LO5	To examine emerging trends and future developments in robotics.								
Prerequisites:									
Unit	Contents								No. of Hours
I	Introduction to Robotics								12
	Definition and history of robotics - Types of robots (industrial, mobile, service, etc.) - Key components of a robot: sensors, actuators, controllers								
II	Robotic Hardware								12
	Actuators: electric motors and servos - Sensors- Microcontrollers and processors in robotics - Design and construction of robotic systems								
III	Robot Programming								12
	Programming languages for robotics: Python, C++, ROS (Robot Operating System) - Basics of ROS: nodes, topics, services - Writing and executing basic robot programs								
IV	Applications of Robotics								12
	Robotics in healthcare: surgery, rehabilitation, assistive robots - Service robotics: domestic robots, logistics, customer service - Robotics in entertainment: animatronics, gaming, VR								
V	Ethics and Future Trends								12
	Ethical considerations in robotics - Legal and societal implications - Future trends: AI in robotics, collaborative robots (cobots), swarm robotics								
TOTAL									60
CO	Course Outcomes								
CO1	Explain the fundamental concepts and principles of robotics.								
CO2	Describe the components and hardware systems used in robotics.								
CO3	Develop and implement basic robot programs.								

CO4	Identify and analyse various application areas of robotics.
CO5	Discuss emerging trends and future advancements in robotics.
Text Books	
1	Introduction to Robotics: Mechanics and Control, John J. Craig
2	Robotics: Modelling, Planning and Control, Bruno Siciliano, Lorenzo Sciavicco, Luigi Villani, and Giuseppe Oriolo
3	Robot Programming: A Guide to Controlling Autonomous Robots, Cameron Hughes and Tracey Hughes
Reference Books	
1.	Learning ROS for Robotics Programming, Enrique Fernandez, Aaron Martinez, and Luis Sanchez
2.	Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	2	3
CO2	3	3	1	2	2	3
CO3	3	3	1	3	2	3
CO4	3	2	1	2	2	3
CO5	3	2	1	2	2	3
Weightage of course contributed to each PSO	15	12	5	11	10	15

ELECTIVE COURSE - VII: COMPUTER NETWORKS

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECA62	4	0	0	VI	3	4	50	50	100
Learning Objectives									
LO1	To understand the fundamental concepts of data communication and computer networks.								
LO2	To gain knowledge of various routing algorithms and their applications.								
LO3	To study networking and internetworking devices and their functions.								
LO4	To explore the principles and processes involved in network communication.								
LO5	To learn the concepts and functions of the transport layer in network architecture.								
Prerequisites:									
Unit	Contents								No. of Hours
I	Introduction – Network Hardware – Software – Reference Models – OSI and TCP/IP Models - Physical Layer – Theoretical Basis for Data Communication - Guided Transmission Media								12
II	Wireless Transmission - Communication Satellites – Telephone System: Structure, Trunks and Multiplexing and Switching. Data Link Layer: Design Issues – Error Detection and Correction.								12
III	Elementary Data Link Protocols - Sliding Window Protocols – Data Link Layer in the Internet - Medium Access Layer – Channel Allocation Problem– Bluetooth								12
IV	Network Layer - Routing Algorithms - Congestion Control Algorithms – IP Protocol – IP Addresses – Internet Control Protocols.								12
V	Transport Layer - Services - Connection Management - Addressing, Establishing Releasing a Connection – Simple Transport Protocol - Network Security: Cryptography.								12
TOTAL								60	
CO	Course Outcomes								
CO1	Explain the fundamentals of computer network architecture, including the OSI and TCP/IP reference models								
CO2	Describe the principles of telephone systems and wireless communication networks.								
CO3	Explain the concepts and functions of the Medium Access Control (MAC) layer.								
CO4	Analyze the characteristics of routing and congestion control algorithms.								
CO5	Discuss network security concepts and explain protocols such as FTP, HTTP, Telnet, and DNS.								

Text Books	
1	A. S. Tanenbaum, “Computer Networks”, 4th Edition, Prentice-Hall of India, 2008
Reference Books	
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. Gallager, “Data Networks”, 2nd Edition, PHI, 2008
4	Lamarca, “Communication Networks”, Tata McGraw- Hill, 2002

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	2	3
CO2	3	3	1	2	2	3
CO3	3	3	1	3	2	3
CO4	3	2	1	2	2	3
CO5	3	2	1	2	2	3
Weightage of course contributed to each PSO	15	12	5	11	10	15

ELECTIVE COURSE - VIII: INTRODUCTION TO DATASCIENCE

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECA63	4	0	0	VI	3	4	50	50	100
Learning Objectives									
LO1	To learn about the basics of Data Science and Big data.								
LO2	To learn about overview and building process of Data Science.								
LO3	To learn about various Algorithms in Data Science.								
LO4	To learn about Hadoop Framework.								
LO5	To learn about case study about Data Science.								
Prerequisites:									
Unit	Contents								No. of Hours
I	Introduction: Benefits and uses – Facts of data – Data science process – Big data ecosystem and data science								12
II	The Data science process: Overview – research goals - retrieving data - transformation – Exploratory Data Analysis – Model building								12
III	Algorithms :Machine learning algorithms – Modeling process – Types – Supervised – Unsupervised - Semi-supervised								12
IV	Introduction to Hadoop :Hadoop framework – Spark – replacing MapReduce– NoSQL – ACID – CAP – BASE – types								12
V	Case Study: Prediction of Disease - Setting research goals - Data retrieval – preparation - exploration - Disease profiling - presentation and automation								12
TOTAL								60	
CO	Course Outcomes								
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.								
Text Books									
1	Davy Cielen, Arno D. B. Meysman, Mohamed Ali, “Introducing Data Science”, manning publications 2016								
Reference Books									
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.
4.	Annalyn Ng, Kenneth Soo, “Numsense! Data Science for the Layman: No Math Added”, 2017, 1st Edition.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	2	3
CO2	3	3	1	2	2	3
CO3	3	3	1	3	2	3
CO4	3	2	1	2	2	3
CO5	3	2	1	2	2	3
Weightage of course contributed to each PSO	15	12	5	11	10	15

ELECTIVE COURSE - VIII: DATA MINING AND WAREHOUSING

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECA64	4	0	0	VI	3	4	50	50	100
Learning Objectives									
LO1	To provide the knowledge on Data Mining and Warehousing concepts and techniques								
LO2	To study the basic concepts of Data Mining, Architecture and Comparison.								
LO3	To study a set of Mining Association Rules, Data Warehouses.								
LO4	To study about Classification and Prediction, Classifier Accuracy								
LO5	To study the basic concepts of cluster analysis, Cluster Methods								
Prerequisites:									
Unit	Contents								No. of Hours
I	Introduction: Data mining – Functionalities – Classification – Introduction to Data Warehousing – Data Preprocessing: Preprocessing the Data – Data cleaning – Data Integration and Transformation – Data Reduction								12
II	Data Mining, Primitives, Languages and System Architecture: Data Mining – Primitives – Data Mining Query Language, Architecture of Data mining Systems. Concept Description, Characterization and Comparison: Concept Description, Data Generalization and Summarization, Analytical Characterization, Mining Class Comparison – Statistical Measures.								12
III	Mining Association Rules: Basic Concepts – Single Dimensional Boolean Association Rules From Transaction Databases, Multilevel Association Rules from transaction databases – Multi dimension Association Rules from Relational Database and Data Warehouses.								12
IV	Classification and Prediction: Introduction – Issues – Decision Tree Induction – Bayesian Classification – 15 CO4 Classification of Back Propagation. Classification based on Concepts from Association Rule Mining – Other Methods. Prediction – Introduction – Classifier Accuracy								12
V	Cluster Analysis: Introduction – Types of Data in Cluster Analysis, Partitioning Methods – Hierarchical Methods-Density Based Methods – GRID Based Method – Model based Clustering Method								12
TOTAL								60	

CO	Course Outcomes
CO1	Understand the basic concepts and the functionality of the various data mining and data warehousing component
CO2	Know the concepts of Data mining system architectures
CO3	Analyze the principles of association rules
CO4	Get analytical idea on Classification and prediction methods
CO5	Gain knowledge on Cluster analysis and its methods.
Text Books	
1	A. S. Tanenbaum, “Computer Networks”, 4th Edition, Prentice-Hall of India, 2008
Reference Books	
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. Gallager, “Data Networks”, 2nd Edition, PHI, 2008
4	Lamarca, “Communication Networks”, Tata McGraw- Hill, 2002

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	2	3
CO2	3	3	1	2	2	3
CO3	3	3	1	3	2	3
CO4	3	2	1	2	2	3
CO5	3	2	1	2	2	3
Weightage of course contributed to each PSO	15	12	5	11	10	15

ABILITY ENHANCEMENT COURSE – II: DESIGN THINKING

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UAEC61	2	0	0	VI	2	2	50	50	100

Learning Objectives		
LO1	To recall and describe the key concepts, stages, and principles of Design Thinking.	
LO2	To explain the importance of empathy, ideation, and prototyping in solving user- entered problems.	
LO3	To apply Design Thinking methods such as brainstorming, empathy mapping, and SCAMPER to real-world problems.	
LO4	To analyze user needs and problem statements using observation and structured frameworks.	
LO5	To design innovative solutions and develop prototypes based on insights gained through the Design Thinking process.	
Prerequisites:		
Unit	Contents	No. of Hours
I	Introduction to Design Thinking Introduction to Design Thinking, Essential Design Thinking Skills, Core Principles of Design Thinking, Foundations of Design Thinking, Building an Effective Design Thinking Team, Discussion of Problems from IT sector.	6
II	Design Thinking Phases Stages of Design Thinking, Role of observation in understanding product and process challenges, Preparation of AEIOU and other canvases with defined problem statement, Exploring Design Thinking innovations, Understanding the Role of Design Thinking in Product and Process Innovation, Double Diamond model and its applications.	6
III	Design Thinking Techniques Understanding, listening and Empathizing Techniques, Exploring observation methods, Utilizing a structured, open-ended approach for effective communication, Ideation Labs, Brainstorming techniques for idea generation, Applying innovation to foster creativity, Application of SCAMPER technique to support Problem Statement	6

IV	Prototyping Methods Methods and Tools for Design Thinking Practice; Empathize: Ask five why questions, Empathy map, storytelling, critical items diagram, mind map, journey map; Ideate: Brainstorming, 2x2 matrix, Need-Approach-Benefit-Competition (NABC) Methods; Prototype: Exploration map, Minimum Viable Product (MVP), Feasibility Testing, Viability Testing, A/B Testing, Sustainability Verification, Collect Feedback, Iterate and Improve, PDC canvas versioning	6
V	Case Studies Quick-Commerce Applications – Food and Grocery Delivery (eg. Swiggy, Instamart), Uber, OLA, Rapido, E-Commerce Applications – Online Shopping (eg. Amazon), Online Publishing (eg. Canva), Online Ticket Booking (eg. BookMyShow), Fintech apps (eg. Google Pay, Razorpay etc.)	6
TOTAL		30
CO	Course Outcomes	
CO1	Understand the fundamental principles and importance of Design Thinking in fostering innovation, ethics and its relevance.	
CO2	Apply systematic problem identification, problem framing, articulation, and problem-solving approaches in the context of Design Thinking	
CO3	Analyze and evaluate different tools and methodologies used in Design Thinking, such as observation, ethnographic research and mind mapping to gain insights into users’ needs	
CO4	Develop and refine product concepts by preparing product development canvases (PDC) that consider product experience, functions, features, and sustainable development of the components	
CO5	Create a final working prototype for projects with limitations, documenting the functionality and features, viability, sustainability, scalability, cost and resource utilization for the product	
Open Source and Websites		
1	Google Workspace: Docs, Sheets and Slides	
2	Google Jamboard	
3	Mind-mapping tools: Wise mapping, Free plane, Seman tik	
Reference Books		
1.	Soni, Pavan. Design Your Thinking: The Mindsets, Toolsets and Skill Sets for Creative Problem-solving. Penguin Random House India Private Limited, 2020	

2.	Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, HarperCollins e-books (2009)
3	Liedtka, Jeanne, Randy Salzman, and Daisy Azer. Design thinking for the greater good: Innovation in the social sector. Columbia University Press, 2019

Suggested MOOC Courses

1.	B. K. Chakravarthy, Design Technology and Innovation, SWAYAM NPTEL (Online)
2.	B. K. Chakravarthy, Innovation by Design, SWAYAM NPTEL (Online)
3.	Nina Sabnani, Understanding Design, SWAYAM NPTEL (Online)
Note: Activities are to be performed in a team size of 3-4 students. Report is to be prepared based on these activities	
4.	Brainstorm and explore various problems in IT field. Select an appropriate problem, draft a Problem Statement and get it approved for performing further activities.
5.	Design AEIOU canvas
6.	Design Empathy map

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	2	2	3
CO2	3	2	2	2	3	2
CO3	3	3	3	3	2	2
CO4	3	2	2	2	2	3
CO5	3	3	2	2	3	2
Weightage of course contributed to each PSO	15	12	11	11	12	12