

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 Science

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 B.Sc Computer Science 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; analyse 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; analyse 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, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, 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 analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.



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 Science (BSC)
Programme code: BSC**

(Applicable for the Students admitted during the Academic Year 2026-27 onwards)

B.Sc. Computer Science

Education is the key to development of any society. Role of higher education is crucial for securing right kind of employment and also to pursue further studies in best available world class institutes elsewhere within and outside India. Quality education in general and higher education in particular deserves high priority to enable the young and future generation of students to acquire skill, training and knowledge in order to enhance their thinking, creativity, comprehension and application abilities and prepare them to compete, succeed and excel globally. Learning Outcomes-based Curriculum Framework (LOCF) which makes it student-centric, interactive and outcome-oriented with well-defined aims, objectives and goals to achieve. LOCF also aims at ensuring uniform education standard and content delivery across the state which will help the students to ensure similar quality of education irrespective of the institute and location.

Computer Science is the study of quantity, structure, space and change, focusing on problem solving, application development with wider scope of application in science, engineering, technology, social sciences etc. throughout the world in last couple of decades and it has carved out a space for itself like any other disciplines of basic science and engineering. Computer science is a discipline that spans theory and practice and it requires thinking both in abstract terms and in concrete terms. Nowadays, practically everyone is a computer user, and many people are even computer programmers. Computer Science can be seen on a higher level, as a science of problem solving and problem solving requires precision, creativity, and careful reasoning. The ever-evolving discipline of computer science also has strong connections to other disciplines. Many problems in science, engineering, health care, business, and other areas can be solved effectively with computers, but finding a solution requires both computer science expertise and knowledge of the particular application domain. Computer science has a wide range of specialties. These include Computer Architecture, Software Systems, Graphics, Artificial Intelligence, Computational Science, and Software Engineering. Drawing from a common core of computer science knowledge, each specialty area focuses on specific challenges. Computer Science is

practiced by mathematicians, scientists and engineers. Mathematics, the origins of Computer Science, provides reason and logic. Science provides the methodology for learning and refinement. Engineering provides the techniques for building hardware and software.

Vision

- We aim to nurture academic excellence, promote collaborative teamwork, develop critical thinking and logical reasoning, and build leadership qualities in students for thriving in a globalized world

Mission

- To prepare students for global careers in Computer Science with skills in software development, research, and strong ethical values.
- To develop students into skilled software developers and researchers who uphold ethical standards and are ready for global challenges.
- To provide students with the knowledge and skills in Computer Science, focusing on software development, research, and ethics

Programme Outcome, Programme Specific Outcome and Course Outcome

Computer Science is the study of quantity, structure, space and change, focusing on problem solving, application development with wider scope of application in science, engineering, technology, social sciences etc. The key core areas of study in Mathematics include Algebra, Analysis (Real & Complex), Differential Equations, Geometry, and Mechanics. The Students completing this programme will be able to present Software application clearly and precisely, make abstract ideas precise by formulating them in the Computer languages. Completion of this programme will also enable the learners to join teaching profession, enhance their employability for government jobs, jobs in software industry, banking, insurance and investment sectors, data analyst jobs and jobs in various other public and private enterprises.

2. Programme Outcomes (PO) of B.Sc. degree programme in Computer Science

- Scientific aptitude will be developed in Students
- Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the Computer Science & humanities stream.
- Students will become employable; Students will be eligible for career opportunities in education field, Industry, or will be able to opt for entrepreneurship.
- Students will possess basic subject knowledge required for higher studies, professional and applied courses.
- Students will be aware of and able to develop solution oriented approach towards various Social and Environmental issues.
- Ability to acquire in-depth knowledge of several branches of Computer Science and aligned areas. This Programme helps learners in building a solid foundation for higher studies in Computer Science and applications.
- The skills and knowledge gained leads to proficiency in analytical reasoning, which can be utilized in modelling and solving real life problems.
- Utilize computer programming skills to solve theoretical and applied problems by critical understanding, analysis and synthesis.
- To recognize patterns and to identify essential and relevant aspects of problems.
- Ability to share ideas and insights while seeking and benefitting from knowledge and insight of others.
- Mould the students into responsible citizens in a rapidly changing interdependent society.

The above expectations generally can be pooled into 6 broad categories and can be modified according to institutional requirements:

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; analyse 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; analyse 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, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, 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 analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.

3. Programme Specific Outcomes of B.Sc. Degree Programme in Computer Science

PSO1: Think in a critical and logical based manner

PSO2: Familiarize the students with suitable software tools of computer science and industrial applications to handle issues and solve problems in mathematics or statistics and realtime application related sciences.

PSO3: Know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand.

PSO4: Understand, formulate, develop programming model with logical approaches to a Address issues arising in social science, business and other contexts.

PSO5: Acquire good knowledge and understanding to solve specific theoretical and applied problems in advanced areas of Computer science and Industrial statistics.

PSO6: Provide students/learners sufficient knowledge and skills enabling them to undertake further studies in Computer Science or Applications or Information Technology and its allied areas on multiple disciplines linked with Computer Science.

PSO7: Equip with Computer science technical ability, problem solving skills, creative talent and power of communication necessary for various forms of employment.

PSO8: Develop a range of generic skills helpful in employment, internships& societal activities.

PSO9: Get adequate exposure to global and local concerns that provides platform for further exploration into multi-dimensional aspects of computing sciences.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs) can be carried out accordingly, assigning the appropriate level in the grids:
(put tick mark in each row)

PO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
PO1	✓					
PO2		✓				
PO3			✓			
PO4				✓		
PO5					✓	
PO6						✓

S. No	Type	Name	Total Credit	Total Hour
1	Part I	Tamil / Malayalam / Hindi	12	20
2	Part II	English	12	20
3	Part III	Core Subject	89	112
4	Part IV	SEC, EVS,VBE, NME	30	28
5	Part V	Extension Activity	01	-
Total			144	180

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
Part-1		Language – Tamil
Part-2		English
Part-3		Core Courses & Elective Courses
Part-4		Skill Enhancement Course -SEC-4
		Skill Enhancement Course -SEC-5
		Environmental Studies

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
	Internship / Industrial Visit / Field Visit	2	-
Part-4	Ability Enhancement Course	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	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 – Non Major Elective, Environmental Studies, Value Based Education, 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
26UCCS11	III	Core- I	Programming in C++	4	3	50	50	100	4
26UCCSP1	III	Core -I	Practical- Programming in C++	6	3	50	50	100	4
26UECS11	III	EC - I	Digital Logic Fundamental	4	3	50	50	100	3
26USCSP1	IV	SEC - I	Office Automation Lab	2	3	50	50	100	2
26UFCS11	IV	FC	Problem Solving Techniques.	2	2	50	50	100	2
26UNCS11	IV	NME - I	Fundamentals of Computers	2	2	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
26UCCS21	III	Core-III	Java Programming	4	3	50	50	100	4
26UCCSP2	III	Core Lab-IV	Practical- Java Programming	6	3	50	50	100	4
26UECS21	III	EC - II	Discrete Mathematics	4	3	50	50	100	3
26USCSP2	IV	SEC - II	Practical -HTML	2	3	50	50	100	2
26USCS21	IV	SEC - III	Computer Architecture	2	2	50	50	100	2
26UNCS21	IV	NME - II	Introduction to Internet	2	2	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
26UCCS31	III	Core- V	Python Programming	4	3	50	50	100	4
26UCCSP3	III	Core -VI	Practical- Python Programming	6	3	50	50	100	4
26UECS31	III	EC - III	IOT and its applications	4	3	50	50	100	3
26UECS32			Introduction to data science						
26UECS33			Micro Processor and Micro Controller						
26USCSP3	IV	SEC - IV	Practical -PHP Programming	2	3	50	50	100	2
26USCSP4	IV	SEC – V	Multimedia using React Practical	2	3	50	50	100	2
26UEVS31	IV	Common	Environmental Studies	2	2	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
26UCCS41	III	Core- VII	Data Structure and Algorithms	4	3	50	50	100	4
26UCCSP4	III	Core -VIII	Practical - Data Structure and Algorithms	6	3	50	50	100	4
26UECS41	III	EC - IV	Resource Management Techniques	4	3	50	50	100	3
26UECS42			Analytics for Service Industry						
26UECS43			Biometrics						
26USCSP5	III	SEC -VI	Practical - Advanced Excel	2	3	50	50	100	2
26USCS41	IV	SEC - VII	Quantitative Aptitude	2	3	50	50	100	2
26UVBE41	V	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	
26UCCS51	III	Core-IX	Software Engineering	5	3	50	50	100	4
26UCCS52	III	Core -X	Database Management System	5	3	50	50	100	4
26UCCS53	III	Core -XI	Image Processing	4	3	50	50	100	4
26UCCSP5	III	Core -XII	Practical: Image Processing Lab	6	3	50	50	100	4
26UCCS5P	III	Core -XIII	Mini Project with Viva Voce	4	3	50	50	100	3
26UECS51	III	Elective- V	Cloud Computing	4	3	50	50	100	3
26UECS52			Data Analytics using R						
26UECS53			Natural Language Processing						
26UFIK51	III	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.	MaxMarks			
						CIA	ESE	Total	
26UCCS61	III	Core– XIV	Computer Networks	5	3	50	50	100	4
26UCCS62	III	Core -XV	.NET Programming	4	3	50	50	100	4
26UCCS63	III	Core -XVI	Operating System	5	3	50	50	100	4
26UCCSP6	III	Core -XVII	Practical: .NET Programming Lab(ASP.NET)	6	3	50	50	100	4
26UCCS6P	III	Core -XVIII	Major Project with Viva voce	4	3	50	50	100	4
26UECS61	III	Elective- VII	Artificial Intelligence	4	3	50	50	100	3
26UECS62			Artificial Neural Network						
26UECS63			Cyber Forensics						
26UAEC61	IV	AEC-II	Design Thinking	2	3	50	50	100	2
26U5EA61	V	Common	Extension Activity	-				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
26UCCS11	III	Core- I	Programming in C++	4	3	50	50	100	4
26UCCSP1	III	Core -I	Practical- Programming in C++	6	3	50	50	100	4
26UECS11	III	EC - I	Digital Logic Fundamental	4	3	50	50	100	3
26USCSP1	IV	SEC - I	Office Automation Lab	2	3	50	50	100	2
26UFCS11	IV	FC	Problem Solving Techniques.	2	2	50	50	100	2
26UNCS11	IV	NME - I	Fundamentals of Computers	2	2	50	50	100	2
Total				30				800	23

CORE – I: Programming in C++

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCS11	4	0	0	I	4	4	50	50	100
Learning Objectives									
LO1	Explain procedural, object-oriented, and generic programming paradigms using modern features.								
LO2	Apply RAII and smart pointers for efficient dynamic memory management.								
LO3	Implement polymorphism using virtual functions, operator overloading, and modern C++ keywords.								
LO4	Analyze inheritance, binding techniques, templates, and exception handling using best practices								
LO5	Develop efficient C++ programs using STL, lambdas, and modern memory management.								
Prerequisites:									
Unit	Contents								No. of Hours
I	Introduction to Modern C++ – OOP paradigms – Procedural vs Object-Oriented vs Generic Programming – C++ Standards overview Namespaces – Modern I/O – Control structures – Range-based for loop – Functions – Inline functions – Function overloading – <code>auto</code> keyword & <code>constexpr</code>								12
II	Classes and Objects – Encapsulation & RAII – Member functions – Static members – Array & vector of objects – Friend functions – Constructors & destructors – Delegating constructors – Defaulted & deleted functions								12
III	Operator Overloading – Best practices – Explicit constructors & type safety – Inheritance – Virtual base classes – Abstract classes – Override & final specifier – Runtime polymorphism using modern syntax								12
IV	Pointers – <code>this</code> pointer – Arrays – Smart pointers (<code>unique_ptr</code> , <code>shared_ptr</code> , <code>weak_ptr</code>) – Move semantics – <code>new/delete</code> vs smart pointers – Early & late binding – Polymorphism – Virtual functions								12
V	Pointers: Understanding Pointers- Accessing the Address of a Variable- Declaring Pointer Variables- Initializing of Pointer Variables-Accessing a Variable through 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								12
TOTAL								60	
CO	Course Outcomes								
CO1	Apply fundamental C++ programming concepts, including control structures, functions, namespaces, and modern language features (<code>auto</code> , <code>constexpr</code> , range-based loops) to develop basic programs.								
CO2	Design and implement classes using object-oriented principles such as encapsulation, constructors, destructors, static members, and RAII for effective software modeling.								
CO3	Analyze and implement operator overloading, inheritance, and polymorphism using modern C++ practices to build extensible and reusable software components.								

CO4	Demonstrate efficient memory management using pointers, smart pointers, move semantics, and virtual functions to achieve safe and optimized runtime behavior
CO5	Develop complete C++ applications using file handling, templates, STL containers and algorithms, lambda expressions, exception handling, and modern string processing techniques.
Textbooks	
➤	Robert W. Sebesta, (2012), —Concepts of Programming Languages, Fourth Edition, Addison Wesley (Unit I : Chapter – 1)
Reference Books	
1.	The C++ Programming Language (4th Edition) – Bjarne Stroustrup
2.	Effective Modern C++ – Scott Meyers
3.	Modern C++ Programming Cookbook – Marius Bancila
4.	Practical C++ STL Programming – Daniel Kusswurm

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

CORE – II: Programming in C++ Practical

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCSP1	0	0	4	I	4	6	50	50	100
Learning Objectives									
LO1	Explain fundamental programming concepts and object-oriented principles using modern C++.								
LO2	Apply classes, constructors, destructors, and inheritance to design modular programs.								
LO3	Implement polymorphism, operator overloading, and abstraction in C++ applications.								
LO4	Utilize dynamic memory management, smart pointers, and exception handling safely and efficiently.								
LO5	Develop real-world C++ applications using STL containers, algorithms, file handling, and modern language features.								
Prerequisites:									
Contents									
1. Input/output operations and control structures. 2. Functions, inline functions, and function overloading using modern C++ features. 3. Searching and sorting on arrays and manipulate strings using std::string. 4. Programs using Arrays 5. Static data members and friend functions. 6. Overload unary and binary operators for a user-defined class. 7. Single and multilevel inheritance. 8. Runtime polymorphism using virtual functions. 9. Abstract class using pure virtual functions. 10. Dynamic memory management using smart pointers. 11. STL containers for storing and manipulating data. 12. STL algorithms using lambda expressions. 13. Perform file handling with exception handling. 14. Perform file handling with exception handling. 15. OOP concepts, STL, and file handling									
Total Hours: 90									
CO	Course Outcomes								
CO1	Apply knowledge of C++ programming to solve basic computational problems.								
CO2	Design object-oriented solutions using appropriate C++ constructs and best practices.								
CO3	Analyze and implement inheritance, polymorphism, and abstraction for code reusability.								
CO4	Use modern C++ memory management techniques to develop safe and efficient programs.								

CO5	Build complete C++ applications using STL, file handling, and exception handling techniques.
------------	--

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

ELECTIVE COURSE – I DIGITAL LOGIC FUNDAMENTAL

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECS11	4	0	0	I	3	4	50	50	100

Learning Objectives

LO1	To Understand number systems, codes, and basic digital logic gates.
LO2	To Apply Boolean algebra and simplification techniques for combinational circuits.
LO3	To Analyse data processing circuits and arithmetic operations in digital systems.
LO4	To Explain the working principles of flip-flops and sequential circuits.
LO5	To Understand memory organization and different types of semiconductor memories.

Prerequisites:

Unit	Contents	No. of Hours
I	Number Systems: Codes and Digital Logic Binary Number System – Binary to Decimal Conversion – Decimal to Binary Conversion –Octal Numbers –Hexadecimal Numbers –The ASCII Code –The Excess- 3 Code –The Gray Code. Digital Logic: The Basic gates NOT, OR,AND– Universal Logic Gates NOR, NAND– AND-OR Invert Gates.	12
II	Combinational Logic: Circuits Boolean Laws and Theorems – Sum of Products Method–Truth Table to Karnaugh Map –Pairs, Quads and Octets –Karnaugh Simplifications –Don't Care Conditions –Product of Sums Method –Product of Sums Simplification	12
III	Data Processing and Arithmetic circuits: Multiplexers –Demultiplexers –1-of-16-Decoders –BCD- to-Decimal Decoders – Seven Segment decoders –Encoders – Exclusive-OR gates. Arithmetic Circuits: Binary Addition –Binary Subtraction – Unsigned BinaryNumbers–SignMagnitudeNumbers–2'sComplement Representation– 2's Complement Arithmetic.	12
IV	Flip-Flops: RS Flip Flops–gated flip flop-Edge Triggered RS Flip Flops-Edge Triggered D Flip Flops-Edge Triggered JK Flip Flops –FLIP FLOP Timing-Edge triggering through input lock Out- JK Master Slave Flip Flops.	12
V	Memory: Basic terms and Ideas – Magnetic memory – Optical memory –Memory addressing-ROMs, PROMs, EPROMs-RAMS.	12
TOTAL		60

CO	Course Outcomes
CO1	Convert numbers between different number systems and explain digital codes and logic gates.
CO2	Apply Boolean laws and Karnaugh maps to simplify combinational logic circuits.
CO3	Analyze multiplexers, decoders, encoders, and perform binary arithmetic operations.
CO4	Explain the operation and timing of different flip-flops and sequential circuits.
CO5	Describe memory concepts, types, and addressing methods used in digital systems.

Textbooks

1.	Digital Logic and Computer Design – M. Morris Mano, Pearson Education.
2.	Digital Design – M. Morris Mano & Michael D. Ciletti, Pearson Education.

Reference Books

1.	Digital Fundamentals – Thomas L. Floyd, Pearson Education.
2.	Modern Digital Electronics – R. P. Jain, Tata McGraw-Hill.
3.	Digital Systems: Principles and Applications – Ronald J. Tocci, Pearson Education.
4.	Digital Logic Applications and Design – Thomson Learning.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	1	2	2
CO2	3	3	1	2	2
CO3	3	3	1	3	2
CO4	3	2	1	2	2
CO5	3	2	1	2	2
Weightage of course contributed to each PSO	15	12	5	11	10

SKILL ENHANCEMENT COURSE (SEC-1) – PRACTICAL-OFFICE AUTOMATION

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26USCSP1	0	0	2	I	2	2	50	50	100

Learning Objectives

LO1	To develop document preparation skills using MS Word.
LO2	To perform data analysis and calculations using MS Excel
LO3	To create effective presentations using MS PowerPoint.
LO4	To design and manage simple databases using MS Access
LO5	To increase the prese

Prerequisites:

Contents

MS – Word

1. Create and format documents using fonts, alignment, spacing, and borders.
2. Create tables for student mark lists and apply formatting.
3. Prepare letters using Mail Merge.
4. Create project reports using styles, headers, and footers.
5. Create a News Paper with images, WordArt, shapes, and text boxes.

MS – Excel

1. Prepare student result sheets using formulas.
2. Use functions: SUM, AVERAGE, IF, MAX, MIN.
3. Create charts: Column, Pie, Line.
4. Perform sorting and filtering of data.
5. Prepare payroll sheets with salary calculations.

MS – PowerPoint

1. Create presentations using themes and layouts.
2. Apply animations and transitions.
3. Insert charts and SmartArt.
4. Prepare seminar/project presentations.

MS – Access

1. 1, Create a student database and tables with appropriate data types and Enter 10 records.
 - i. Create queries to calculate Total, Average and Result.
 - ii. Design data entry forms Student Database.
 - iii. Generate reports Student Database.

Total Hours: 30

CO	Course Outcomes
CO1	Create professional documents using MS Word.
CO2	Perform calculations and data analysis using MS Excel
CO3	Design multimedia presentations using MS PowerPoint
CO4	Create databases, queries, forms, and reports using MS Access
CO5	Create more number of presentations

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2	2	3	3	2
CO2	2	3	2	3	2
CO3	2	2	3	3	2
CO4	2	3	2	3	2
Weightage of course contributed to each PSO	8	10	10	12	8

FOUNDATION COURSE (FC) -Problem Solving Techniques

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UFCS11	2	0	0	I	2	2	50	50	100
Learning Objectives									
LO1	To analyze a problem with appropriate problem solving techniques								
LO2	To understand the main principles of imperative, functional and logic oriented programming languages.								
LO3	To increase the ability to learn new programming languages.								
LO4	To increase the ability to learn skills								
LO5	To understand the levels.								
Unit	Contents							No. of Hours	
I	Introduction: Characteristics of Computers - Evolution of Computers Basic Computer Organization: I/O Unit - Storage Unit - Arithmetic Logic Unit - Control Unit - Central Processing Unit.							6	
II	Computer Software: Types of Software - System Architecture Computer Languages: Machine Language - Assembly Language - High Level Language - Object Oriented Languages .							6	
III	Problem Solving Concepts: Problem Solving in Everyday life - Types of Problems - Problem solving with computers - Difficulties with Problem Solving.							6	
IV	Problem Solving concepts for the computer: Constant Variables - Data Types - Functions -Operators - Expressions and Equations - Organizing the Solution: Analyzing the problem - Algorithm - Flowchart - Pseudo code							6	
V	Programming Structure: Structuring a solution - Modules and their function - Local and Global variables - Parameters - Return values - Sequential Logic Structure - Problem solving with Decision - Problem Solving with Loops.							6	
TOTAL								30	
CO	Course Outcomes								
CO1	Outline the Computer fundamentals and various problem solving concepts in Computers								
CO2	Describe the basic computer organization, software, computer languages, software development life cycle and the need of structured programming in solving a computer problem.								
CO3	Identify the types of computer languages, software, computer problems and examine how to set up expressions and equations to solve the problem.								
CO4	Choose most appropriate programming languages, constructs and features to solve the problems in diversified domains.								
CO5	Analyze the design of modules and functions in structuring the solution and various Organizing tools in problem solving.								

Textbooks	
➤	Pradeep K.Sinha and Priti Sinha, (2004) —Computer FundamentalsI, Sixth Edition, BPB Publications. (Unit I : Chapter 1 & 2, Unit II : Chapter 10 & 12) .
➤	Maureen Sprankle and Jim Hubbard, (2009) —Problem Solving and Programming Concept, Ninth Edition, Prentice Hall. (Unit III: Chapter 1,2 &3) Unit IV : Chapter 3, Unit V : Chapter 4,5 ,6,7 & 8)
Reference Books	
1.	R.G. Dromey, (2007), —How to Solve it by ComputerI, Prentice Hall International Series in Computer Science
2.	C. S. V. Murthy, (2009), —Fundamentals of ComputersI, Third Edition, Himalaya Publishing House.

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2
CO2	3	2	2	2	3
CO3	3	3	3	3	2
CO4	3	2	2	2	2
CO5	3	3	2	2	3
Weightage of course contributed to each PSO	15	12	11	11	12

NON-MAJOR ELECTIVE 1(NME) -Fundamentals of Computers

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UNCS11	2	0	0	I	2	2	50	50	100
Learning Objectives									
LO1	Familiarize with fundamentals of Computers..								
LO2	Microsoft Word: Create, format, and edit professional documents with advanced formatting and referencing tools								
LO3	Microsoft Excel: Analyze and manipulate data using formulas, functions, and charts.								
LO4	Microsoft PowerPoint: Design engaging presentations with multimedia elements and animations.								
LO5	Microsoft Access: Build and manage databases with tables, queries, forms, and reports.								
Unit	Contents								No. of Hours
I	Introduction: History, characteristics and limitations of Computer. Hardware/Anatomy of Computer: CPU, Memory, Secondary storage devices, Input Devices and Output devices. Types of Computers: PC, Workstation, Minicomputer, Main frame and Supercomputer. Software: System software and Application software..								6
II	Introduction to Ms-word Menus, Shortcut menus, Toolbars, customizing tool bars, Files, Creating and opening documents, saving documents, renaming documents, working on multiple documents, Close a document, Text Formatting Paragraphs, Styles, Lists, Tables, Graphics Spelling and Grammar, Page Formatting, Mail Merge.								6
III	Introduction To Ms-Excel Spreadsheet Basics customizing Excel, Modifying A Worksheet,FormattingCells,Formulas and Functions,Sorting and Filtering,Charts.								6
IV	Introduction to Ms Power Point AutoContent Wizard, Create a presentation from a template, Create a blank presentation, Open an existing presentation, layout Views, Working with Slides, Adding Content, Working with Text, Color, Graphics Slide Effects, Master Slides.								6
V	Introductions to Ms-Access Getting started, Blank Access database, Access database wizards, pages, and projects, Open an existing database, Creating Tables, Datasheet Records, Queries, Forms, Reports								6
TOTAL								30	
CO	Course Outcomes								
CO1	Explain the basic concepts and components of computers.								
CO2	Create and format professional documents using Microsoft Word.								
CO3	Analyze data using formulas, functions, and charts in Microsoft Excel								
CO4	Design effective presentations using Microsoft PowerPoint								
CO5	Develop and manage databases using Microsoft Access..								
Textbooks									
1	Stewart Venit, —Introduction to Programming: Concepts and Design, Fourth Edition, 2010, Dream Tech Publishers								

Reference Books	
1	Microsoft office 2010 All-in-One for Dummies, Peter Weverka, Wiley Publishing, Inc..
2	Alexis Leon and Mathews Leon, “Fundamentals of Information Technology”, Vikas, 1999

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	1	2
CO2	2	2	3	3	2
CO3	2	3	3	2	2
CO4	2	2	3	3	2
CO5	2	3	3	2	2
Weightage of course contributed to each PSO	11	12	13	11	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
26UCCS21	III	Core-III	Java Programming	4	3	50	50	100	4
26UCCSP2	III	Core Lab-IV	Practical- Java Programming	6	3	50	50	100	4
26UECS21	III	EC - II	Discrete Mathematics	4	3	50	50	100	3
26USCSP2	IV	SEC - II	Practical -HTML	2	3	50	50	100	2
26USCS21	IV	SEC - III	Computer Architecture	2	2	50	50	100	2
26UNCS21	IV	NME - II	Introduction to Internet	2	2	50	50	100	2
Total				30				800	23

FIRST YEAR - SEMESTER – II
CORE COURSE (CC-3)–Java Programming

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCS21	4	0	0	II	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 Core Java from the basics								
Prerequisites:									
Unit	Contents								No. of Hours
I	Introduction: Review of Object Oriented concepts – History of Java – Java buzzwords – 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 block - 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–Extending Interfaces.								12
III	Multithreaded Programming: Thread Class - Runnable interface – Synchronization–Using synchronized methods– Using synchronized statement- Interthread Communication								12
IV	Event Handling: Events - Event sources - Event Listeners - Event Delegation Model (EDM) - Handling Mouse and Keyboard Events - Adapter classes - Inner classes- AWT Controls: The AWT class hierarchy - user interface components- Labels - Button - Text Components - Check Box - Check Box Group - Choice - List Box - Panels – Scroll Pane - Menu - Scroll Bar. Working with Frame class - Colour - Fonts								12
V	Swing: Introduction to Swing - Hierarchy of swing components. Containers - Top level containers - JFrame - JWindow - JDialog - JPanel - JButton - JToggleButton - JCheckBox - JRadioButton - JLabel,JTextField - JTextArea - JList - JComboBox - JScrollPane.								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.	
Textbooks		
1.	Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010	
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
CO1	3	2	2	2	2
CO2	2	3	2	2	2
CO3	2	3	3	3	2
CO4	2	3	2	2	2
CO5	3	3	2	2	2
Weightage of course contributed to each PSO	12	14	11	11	10

CORE COURSE (CC-4) –Java Programming Lab

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCSP2	0	0	6	II	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.								
List of Exercises									
1 Write a JAVA program using Multiple Constructors.									
2 Write a JAVA program using overloading method									
3 Write a JAVA program using Overriding Method									
4 Write a JAVA program using one-dimensional arrays.									
5 Write a JAVA program using Two-dimensional array									
6 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									
d. To extract substring from given string									
e. Reverse a string									
7 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.									
8 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.									
9 Write a program to demonstrate the use of following exceptions10 Write a C++ program to manipulate a Text File.									
a. Arithmetic Exception									
b. Number Format Exception									
c. ArrayIndexOutOfBoundsException									
d. NegativeArraySizeException									
10 Write a JAVA program for handling keyboard events									
11 Write a program to accept a text and change its size and font. Include bold italic options. Use frames and controls.									

12 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).

13 Write a Java program using swing 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.

14 Use Swing to create GUI type Login Form.

TOTAL		90 Hrs
CO	Course Outcomes	
CO1	Explain and apply object-oriented programming concepts using Java.	
CO2	Develop Java programs using control structures, classes, and methods.	
CO3	Implement event handling techniques in Java applications.	
CO4	Apply string manipulation techniques in Java programming.	
CO5	Design GUI applications using AWT components and layouts.	

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	1	2	2
CO2	3	3	1	3	2
CO3	2	3	1	3	2
CO4	2	2	1	2	2
CO5	2	3	2	3	2
Weightage of course contributed to each PSO	12	13	6	13	10

ELECTIVE COURSE (EC-2)–DISCRETE MATHEMATICS

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECS21	4	0	0	II	3	4	50	50	100
Learning Objectives									
LO1	To understand basic concepts of sets, relations, and functions..								
LO2	To develop logical thinking using mathematical logic.								
LO3	To learn matrix operations and their properties.								
LO4	To introduce basic concepts of graph theory.								
LO5	To improve problem-solving skills using mathematical methods.								
Unit	Contents							No. of Hours	
I	Set theory-Sets and elements-Specifications of sets-Identity and Cardinality-Set inclusion-Equality of sets-proper sets- Power sets- Universal set-Operations on sets-ordered pairs- Cartesian product of sets							12	
II	Relations and functions-Definition-example-Relations on sets-Equivalence relations-Equivalence Class – Functions							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–Properties of Adjoin to a Matrix– Properties of Inverse of a Matrix.							12	
V	Graph Theory: Definition of a Graph, Finite and infinite Graphs, Incidence and Degree of a vertex, Null Graph, Sub graphs, Walks, Paths, Circuits, Connected, Disconnected graphs and Components, Euler Graph, Hamiltonian Path and Hamiltonian Circuits.							12	

TOTAL	60
--------------	-----------

CO	Course Outcomes
CO1	Explain concepts of sets and perform set operations.
CO2	Understand relations, equivalence relations, and functions.
CO3	Apply logical laws and truth tables in problem solving.
CO4	Solve problems using matrices, determinants, and inverse.
CO5	Apply graph theory concepts like paths, circuits, and graphs.

Textbooks	
1.	Discrete Mathematics, Swapan Kumar, Chakraborty and BikashKanti Sarkar, OXFORD University Press
2.	Alexis Leon, Mathews Leon,” Fundamental of Information Technology”, 2nd Edition

Reference Books	
1.	Discrete Mathematics, Third Edition, Seymour LipschutzAnd Marc Lars Lipson, Tata Mcgraw Hill Education Private Limited.
2.	Discrete Mathematics, Third Edition, Seymour LipschutzAnd Marc Lars Lipson, Tata Mcgraw Hill Education Private Limited

MAPPING TABLE					
CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	-	-
CO2	3	2	1	-	-
CO3	3	3	2	1	-
CO4	3	3	2	1	1
CO5	3	3	2	2	1
Weightage of course contributed to each PSO	15	13	8	4	2

SKILL ENHANCEMENT COURSE (SEC-3) -Computer Architecture

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26USCS21	2	0	0	II	2	2	50	50	100
Learning Objectives									
LO1	To understand the basic structure and organization of a computer system.								
LO2	To learn CPU organization, instruction formats, and addressing modes.								
LO3	To understand arithmetic operations and hardware implementation.								
LO4	To introduce RISC and CISC architectures and their differences.								
LO5	To understand memory hierarchy and different types of memory.								
Unit	Contents								No. of Hours
I	Basic Computer Organization and Design: Instruction Codes- Computer Registers- Computer Instructions- Instruction cycle-Control memory.								6
II	Central Processing Unit: General register organization- Stack organization- Instruction formats- Addressing modes- Data transfer and manipulation								6
III	Computer Arithmetic: Hardware implementation and algorithm for addition, subtraction, Multiplication, Division.								6
IV	Reduced Instruction Set Computer (RISC)and CISC:Introduction to CISC and RISC Architecture CISC Architecture-Characteristics of CISC Architecture-Advantages of CISC Architecture-Disadvantages of CISC Architecture-RISC Architecture-Characteristics of RISC Architecture-Advantages of RISC Architecture-Disadvantages of RISC Architecture-RISC v/s CISC								6
V	Memory Organisation: Memory Hierarchy- Main memory- Auxiliary Memory- Associative Memory- Cache Memory.								6
TOTAL								30	
CO	Course Outcomes								
CO1	Explain instruction codes, registers, and instruction cycle of a computer.								
CO2	Describe CPU organization, instruction formats, and addressing modes.								
CO3	Apply arithmetic algorithms for addition, subtraction, multiplication, and division.								
CO4	Compare RISC and CISC architectures.								
CO5	Explain memory hierarchy and different memory types like cache and associative memory.								

Textbooks

- Computer System Architecture, M. Morris Mano, Pearson Education, 3rd Edition, 2007

Reference Books

1. Computer Organization and Architecture, William Stallings, Pearson Edition 10th Edition, 2016
2. Structured Computer Organization, Andrew S. Tanenbaum, Pearson Edition 6th Edition 2013
3. Digital Logic and Computer Design, M. Morris Mano, Pearson Edition , Reprint 2013

MAPPING TABLE

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	-	-
CO2	3	2	1	-	-
CO3	3	3	2	1	-
CO4	3	2	1	-	-
CO5	3	3	2	1	1
Weightage of course contributed to each PSO	15	12	7	2	1

SKILL ENHANCEMENT COURSE (SEC-3) –Practical -HTML

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26USCSP2	0	0	2	II	2	2	50	50	100
Learning Objectives									
LO1	To understand the basic structure and tags of HTML								
LO2	To design web pages using lists, tables, links, images, and frames.								
LO3	To create web forms and embed multimedia elements.								
LO4	To apply basic CSS for styling and transformations.								
LO5	To develop simple interactive web pages like quizzes.								
List of Exercises									
1. Creates a simple list of items using bullet points. The tag defines the unordered list, and defines each list item..									
2. Program creates a numbered list. The tag defines the ordered list..									
3. Create a website using internal links and images.									
4. Design a calendar using table tag.									
5.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									
6. Write an HTML code to display a list of 5 cars in a frame, Link each one to a brief description in second frame. The left frame should display the list and the right frame should display the paragraph about the frame.									
7. Create a simple HTML Form covering major form elements.									
8. Embed Audio and Video in an HTML page.									
9. Rotate an element using CSS.									
10. Build a simple quiz									
TOTAL									30Hrs
CO	Course Outcomes								
CO1	Create web pages using HTML tags and elements.								
CO2	Design web pages with links, images, tables, and frames..								
CO3	Develop forms and embed audio and video in web pages..								
CO4	Apply CSS for styling and basic animations.								
CO5	Build simple interactive web applications like quizzes								

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	1	-	-
CO2	3	3	2	1	-
CO3	3	2	1	-	1
CO4	3	3	2	1	2
CO5	3	3	3	2	2
Weightage of course contributed to each PSO	15	13	9	4	5

NON MAJOR ELECTIVE 2 (NME) – INTRODUCTION TO INTERNET

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UNCS21	2	0	0	II	2	2	50	50	100
Learning Objectives									
LO1	To acquire knowledge of the Internet and its applications								
LO2	To understand the format of the tags.								
LO3	To understand the tags and HTML document creation								
LO4	To understand table creation								
LO5	To get knowledge about forms								
Unit	Contents								No. of Hours
I	Introduction to the Internet: Networking, Internet, Email, Resource Sharing, Gopher, World Wide Web.								6
II	Internet Technologies: Browsers, Introduction to HTML, History of HTML, HTML Documents								6
III	HTML Structure and Lists: Head and Body Sections, Designing the Body Section, Ordered and Unordered Lists.								6
IV	Tables and Styles: Table Handling, DHTML and Styles sheets.								6
V	Frames and Forms: Frames, Web Page Design Project, Forms.								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								
Textbooks									
1	C. Xavier, <i>World Wide Web Design with HTML</i> , First Edition, Tata McGraw Hill Publication, 2000.								

MAPPING TABLE					
CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	3	3
CO2	3	3	2	2	2
CO3	3	2	3	2	2
CO4	3	2	2	2	2
CO5	3	2	2	3	2
Weightage of course contributed to each PSO	15	11	11	12	11

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
26UCCS31	III	Core– V	Python Programming	4	3	50	50	100	4
26UCCSP3	III	Core –VI	Practical- Python Programming	6	3	50	50	100	4
26UECS31	III	EC - III	IOT and its applications	4	3	50	50	100	3
26UECS32			Introduction to data science						
26UECS33			Micro Processor and Micro Controller						
26USCSP3	IV	SEC - IV	Practical -PHP Programming	2	3	50	50	100	2
26USCSP4	IV	SEC – V	Multimedia using React Practical	2	3	50	50	100	2
26UEVS31	IV	Common	Environmental Studies	2	2	50	50	100	2
Total				30				800	23

SECOND YEAR – SEMESTER – III

CORE – V: Python Programming

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCS31	4	0	0	III	4	4	50	50	100
Learning Objectives									
LO1	To understand basic concepts and syntax of Python programming.								
LO2	To develop programs using control structures and functions.								
LO3	To learn data structures like lists, tuples, and dictionaries.								
LO4	To understand modules, strings, and arrays in Python.								
LO5	To perform file handling operations using Python.								
Prerequisites:									
Unit	Contents								No. of Hours
I	Basics of Python Programming: History of Python-Features of Python Literal-Constants-Variables - Identifiers–Keywords-Built-in Data Types- Output Statements – Input Statements-Comments – Indentation- Operators Expressions-Type conversions. Python Arrays: Defining and Processing Arrays – Array methods.								12
II	Control Statements: Selection/Conditional Branching statements: if, if else, nested if and if-elif-else statements. Iterative Statements: while loop, for loop, else suite in loop and nested loops. Jump Statements: break, continue and pass statements.								12
III	Functions: Function Definition – Function Call – Variable Scope and its Lifetime-Return Statement. Function Arguments: Required Arguments, Keyword Arguments, Default Arguments and Variable Length Arguments- Recursion. Python Strings: String operations- Immutable Strings - Built-in String Methods and Functions - String Comparison. Modules: import statement- The Python module – dir() function – Modules and Namespace – Defining our own modules. .								12
IV	Lists: Creating a list -Access values in List-Updating values in Lists-Nested lists -Basic list operations-List Methods. Tuples: Creating, Accessing, Updating and Deleting Elements in a tuple – Nested tuples– Difference between lists and tuples. Dictionaries: Creating, Accessing, Updating and Deleting Elements in a Dictionary – Dictionary Functions and Methods -								12

	Difference between Lists and Dictionaries.	
V	Python File Handling: Types of files in Python - Opening and Closing files Reading and Writing files: write() and write lines() methods- append() method – read() and read lines() methods – with keyword – Splitting words – File methods - File Positions- Renaming and deleting files.	12
TOTAL		60
CO	Course Outcomes	
CO1	Understand Python syntax, data types, and operators.	
CO2	Apply control statements and loops in programming.	
CO3	Develop programs using functions and modules	
CO4	Use Python data structures such as lists, tuples, and dictionaries.	
CO5	Perform file handling operations in Python programs..	
Textbooks		
1	Programming in Python, ReemaThareja, Oxford University Press, 1st Edition, 2017	
Reference Books		
1	Python Crash Course, Eric Matthes, No Starch Press, 2nd Edition, 2019	
2	Learning Python, Mark Lutz, O'Reilly Media, 5th Edition, 2013	
3	Core Python Programming, Wesley J. Chun, Prentice Hall, 2nd Edition, Year : 2006	

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	1	-	-
CO2	3	3	2	1	-
CO3	3	3	2	1	1
CO4	3	3	3	2	1
CO5	3	3	2	2	2
Weightage of course contributed to each PSO	15	14	10	6	4

CORE – VI PYTHON PROGRAMMING LAB

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCSP3	0	0	6	III	4	6	50	50	100
Learning Objectives									
LO1	To understand basic Python programming concepts and syntax.								
LO2	To develop programs using control statements and loops..								
LO3	To implement functions, recursion, and data structures								
LO4	To apply exception handling and object-oriented programming concepts								
LO5	To improve problem-solving skills through practical programming.								
Prerequisites:									
Contents									
1. Write a Python program to read and print values of variables of different data types. 2. Write a Python program to perform addition, subtraction, multiplication, division, integer division and modulo division on two integer numbers.. 3. Write a Python program to determine whether the character entered is a vowel or not using conditional statement 4. Write a Python program to calculate the factorial of a number using loop.. 5. Write a Python program to calculate the square root of a number. Use break, continue and pass statements. 6. Write a Python program using function and return statement to check whether a number is even or odd. 7. Write a Python program to print the Fibonacci series using recursion. 8. Write a Python program to reverse the order of the items in the array. 9. Write a Python program that accepts a string from the user and redisplay the same string after removing vowels from it. 10. Write a Python program to remove all duplicates from a list. 11. Write a Python program that has a list of numbers. (Both positive and negative). Make new tuple that has only positive values from this list. 12. Write a Python program that creates a dictionary of radius of a circle and its circumference. 13. Write a Python program Exception handling 14. Write a Python program using Object-Oriented Programming to store and display student details.									
Total Hours: 90									

CO	Course Outcomes
CO1	Develop Python programs using basic data types and operators.
CO2	Apply conditional and looping statements to solve problems.
CO3	Implement functions, recursion, and arrays/lists.
CO4	Use tuples, dictionaries, and exception handling in programs.
CO5	Develop programs using object-oriented programming concepts..

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	1	-	-
CO2	3	3	2	1	-
CO3	3	3	3	2	1
CO4	3	3	2	2	1
CO5	3	3	3	2	2
Weightage of course contributed to each PSO	15	14	11	7	10

ELECTIVE COURSE – III IOT AND ITS APPLICATIONS

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECS31	4	0	0	III	3	4	50	50	100
Learning Objectives									
LO1	To understand the fundamentals, architecture, and characteristics of IoT systems..								
LO2	To learn IoT communication protocols, enabling technologies, and applications.								
LO3	To analyze IoT system design methodology and M2M communication concepts..								
LO4	To develop basic IoT applications using Python programming tools.								
LO5	To understand IoT hardware platforms and cloud services for IoT deployment.								
Prerequisites:									
Unit	Contents								No. of Hours
I	Introduction to IoT Introduction to Internet of Things — Definition and Characteristics of IoT — Physical Design of IoT — Things in IoT — IoT Communication Protocols: Link Layer, Network Layer, Transport Layer, Application Layer — Logical Design of IoT — Functional Blocks — IoT Communication Models — IoT Enabling Technologies: Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Embedded Systems and Communication Technologies.								12
II	IoT Applications Overview of IoT Applications — Smart Home: Smart Lighting, Smart Appliances, Intrusion Detection, Smoke and Gas Detectors — Smart Cities: Smart Parking, Smart Roads, Structural Health Monitoring, Surveillance and Emergency Systems — Environmental Monitoring: Weather Monitoring, Air and Noise Pollution Monitoring, Forest Fire and Flood Detection — Smart Retail: Inventory Management, Smart Payments, Smart Vending Machines — Smart Agriculture: Smart Irrigation and Greenhouse Control — Health and Lifestyle: Fitness Monitoring and Wearable Devices.								12
III	IoT and M2M Communication Introduction to Machine-to-Machine (M2M) Communication — Difference between IoT and M2M — Need for IoT System Management — Simple Network Management Protocol (SNMP) and its Limitations — IoT System Design Methodology: Requirement Specification, Process Design, Domain Model, Information Model, Service Specification, Functional and Operational Views — Device Integration and Application Development — Case Study: IoT-based Weather Monitoring System..								12

IV	IoT Logical Design Using Python Python Basics for IoT — Data Types and Data Structures: Lists, Tuples and Dictionaries — Type Conversion — Packages and Modules — Date and Time Operations — Classes and Object-Oriented Concepts — Python Libraries for IoT: JSON, XML, HTTPLib, URLLib, SMTPLib.	12
V	IoT Devices and Cloud Platforms Introduction to IoT Devices — Components and Building Blocks of IoT Systems — Raspberry Pi: Architecture and Features — Linux Operating System on Raspberry Pi — Other IoT Hardware Platforms — IoT Cloud Services — Cloud Platforms for IoT: Amazon Web Services (AWS) — Amazon EC2, Auto Scaling, Amazon S3, Amazon RDS, Dynamo DB and Kinesis.	12
TOTAL		60
CO	Course Outcomes	
CO1	Explain IoT concepts, architecture, protocols, and functional components	
CO2	Identify IoT applications in smart homes, cities, environment, and healthcare.	
CO3	Analyze IoT system design methodology and compare IoT with M2M systems.	
CO4	Analyze IoT system design methodology and compare IoT with M2M systems.	
CO5	Describe IoT devices, Raspberry Pi platform, and cloud services for IoT solutions.	
Textbooks		
➤	Internet of Things: A Hands-On Approach, ArshdeepBahga& Vijay Madiseti Universities Press, 1st Edition, 2015	
Reference Books		
➤	Internet of Things, Raj Kamal, McGraw Hill Education, 1st Edition, 2017.	
➤	The Internet of Things: Enabling Technologies Platforms and Use Cases, Pethuru Raj &Anupama C. Raman, CRC Press, 1st Edition, 2017.	
➤	Designing the Internet of Things Adrian McEwen & Hakim Cassimally, Wiley 1st Edition, 2014.	

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	1	-	-
CO2	3	2	1	1	-
CO3	3	3	2	1	-
CO4	3	3	2	2	1
CO5	3	3	2	2	2
Weightage of course contributed to each PSO	15	13	8	6	3

ELECTIVE COURSE – III INTRODUCTION TO DATA SCIENCE

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECS32	4	0	0	III	3	4	50	50	100
Learning Objectives									
LO1	To understand fundamental concepts and applications of Data Science.								
LO2	To learn the stages involved in the data science process and data analysis.								
LO3	To study machine learning algorithms and modeling techniques.								
LO4	To understand big data tools such as Hadoop, Spark, and NoSQL databases.								
LO5	To apply data science concepts in real-world case studies.								
Prerequisites:									
Unit	Contents								No. of Hours
I	Introduction to Data Science								12
	Introduction to Data Science — Importance, Benefits and Applications — Types and Sources of Data — Data Science Life Cycle — Data Science Process — Overview of Big Data — Big Data Ecosystem and Tools used in Data Science..								
II	Data Science Process								12
	Steps in Data Science Process — Defining Research Objectives — Data Collection and Retrieval Methods — Data Cleaning and Transformation — Exploratory Data Analysis (EDA) — Data Visualization — Introduction to Model Building Techniques.								
III	Machine Learning Algorithms								12
	Introduction to Machine Learning — Modeling Concepts — Types of Learning — Supervised Learning — Unsupervised Learning — Semi-Supervised Learning — Applications of Machine Learning in Real-world Problems.								
IV	Big Data Technologies								12
	Introduction to Hadoop Framework — Hadoop Architecture — Spark Computing Framework — MapReduce Concept — Introduction to NoSQL Databases — ACID, CAP and BASE Properties — Types of NoSQL Databases and Applications.								
V	Case Study and Applications								12
	Case Study: Disease Prediction System — Setting Research Goals — Data Collection and Preparation — Data Analysis and Exploration — Disease Profiling — Result Presentation and Automation of the System — Real-world Applications of Data Science.								
TOTAL									60

CO	Course Outcomes
CO1	Explain the concepts, process, and applications of data science.
CO2	Perform data preprocessing, transformation, and exploratory analysis.
CO3	Perform data preprocessing, transformation, and exploratory analysis.
CO4	Describe big data technologies like Hadoop, Spark, and NoSQL.
CO5	Analyze real-world problems using data science approaches.
Textbooks	
➤	Data Science for Business, Foster Provost & Tom Fawcett, O'Reilly Media, 1st Edition, 2013.
Reference Books	
1.	Doing Data Science, Cathy O'Neil & Rachel Schutt, O'Reilly Media, 1st Edition, 2013
2.	Introduction to Data Science, Laura Igual & Santi Seguí, Springer, 1st Edition, 2017
3.	Hadoop: The Definitive Guide, Tom White, O'Reilly Media, 4th Edition, 2015

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	1	-	-
CO2	3	3	2	1	-
CO3	3	3	3	2	1
CO4	3	2	1	1	1
CO5	3	3	2	2	2
Weightage of course contributed to each PSO	15	13	9	6	4

ELECTIVE COURSE – III MICRO PROCESSOR AND MICRO CONTROLLER

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECS32	4	0	0	III	3	4	50	50	100
Learning Objectives									
LO1	To understand the basic concepts of microprocessors and microcontrollers.								
LO2	To learn 8085 assembly language programming.								
LO3	To know the architecture and instruction set of 8085.								
LO4	To apply programming techniques like looping and branching								
LO5	To understand counters, time delays, and 8051 microcontroller basics.								
Prerequisites:									
Unit	Contents								No. of Hours
I	Introduction to Microprocessor Systems Organization of a microprocessor-based system – Microprocessor instruction set and programming languages – Evolution from large computers to single-chip microcontrollers – Embedded system concepts – Applications: Microprocessor-based temperature monitoring and control system.								12
II	8085 Assembly Language Programming 8085 programming model – Instruction classification – Instruction format, data representation, and storage techniques – Addressing modes – Steps to write, assemble, and execute a simple assembly language program – Debugging techniques..								12
III	8085 Architecture and Instruction Set Overview of the 8085 instruction set – Microprocessor architecture and operations – Memory organization and classification – Pin diagram and signals – Timing diagram and machine cycles – Detailed architecture of the 8085 MPU.								12
IV	8085 Programming Techniques Data transfer instructions – Arithmetic operations – Logical operations – Branching instructions – Programming techniques: Looping, counting, indexing, subroutines, and stack operations – Applications with sample programs..								12
V	Counters, Time Delays, and Microcontrollers Counters and delay concepts – Time delay using registers and register pairs – Nested loop delay generation – Counter design using delays – Comparison of microprocessor and microcontroller – Introduction to 8051 microcontroller architecture and applications..								12
TOTAL								60	

CO	Course Outcomes
CO1	Explain the organization and working of microprocessor-based systems.
CO2	Develop assembly language programs using the 8085 microprocessor instruction set.
CO3	Analyze the architecture and operational characteristics of the 8085 microprocessor.
CO4	Apply programming techniques for solving computational problems using branching and looping concepts.
CO5	Design delay routines and counters and understand the architecture of 8051 microcontrollers.
Textbooks	
➤	Ramesh S. Gaonkar, Microprocessor Architecture, Programming and Applications with 8085, Penram International Publishing, 6th Edition, 2013.
➤	Muhammad Ali Mazidi, Janice GillispieMazidi, The 8051 Microcontroller and Embedded Systems, Pearson Education, 2nd Edition, 2007.
Reference Books	
1.	D A. K. Ray, K. M. Bhurchandi, Advanced Microprocessors and Peripherals, McGraw Hill Education, 3rd Edition, 2012.
2.	Douglas V. Hall, Microprocessors and Interfacing, Tata McGraw Hill, 2nd Edition, 2006.
3.	Kenneth J. Ayala, The 8051 Microcontroller, Cengage Learning, 3rd Edition, 2004.

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

SKILL ENHANCEMENT COURSE (SEC-4) – PHP PROGRAMMINGLAB

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	To provide the necessary knowledge on basics of PHP.								
LO2	To design and develop dynamic, database-driven web applications using PHP version.								
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 OOPS with PHP								
Prerequisites:									
Contents									
1. Create a simple HTML form and accept the user name and display the name through PHP echo statement.									
2. Write a PHP script to redirect a user to a different page.									
3. Write a PHP function to test whether a number is greater than 30, 20 or 10 using ternary operator.									
4. Create a PHP script which displays the capital and country name from the given array and sort by country name.									
5. Write a PHP script to calculate and display average temperature, five lowest and highest temperatures.									
6. Create a script using a for loop to add all integers between 0 and 30 and display the total.									
7. Write a PHP script using nested for loop that creates a chess board.									
8. Write a PHP function that checks if a string is all lower case.									
9. Write a PHP script to calculate the difference between two dates.									
10 Write a PHP script to display time in a specified time zone.									
						Total Hours: 30			
CO	Course Outcomes								
CO1	Write PHP scripts to handle HTML forms.								
CO2	Write regular expressions including modifiers, operators, and met 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.								
Text Book									
➤	VIKRAM VASHWANI- PHP and MY SQL McHill- 2005 Head First PHP & MySQL: A Brain-Friendly Guide- 2009-Lynn mighley and Michael Morrison								
➤	The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL- Alan Forbes								

Reference Books

1. PHP: The Complete Reference-Steven Holzner.
2. DT Editorial Services (Author), —HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)®, Paperback 2016, 2ndEdition.

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

SKILL ENHANCEMENT COURSE (SEC-V) – MULTIMEDIA USING REACT PRACTICALLAB

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26USCSP3	0	0	2	III	3	2	50	50	100
Learning Objectives									
LO1	To get the knowledge to write programs using React.								
LO2	To understand the usage of functions.								
LO3	To understand the usage of mapping..								
LO4	To understand the application of various components.								
LO5	To understand the usage of audio and video players								
Prerequisites:									
Contents									
1. Create an image gallery component that displays a list of images.									
2. Create a video player component that can play, pause, and control the volume of a video.									
3. Create an audio player component with play, pause, and volume controls.									
4. Create a component that allows users to upload an image and preview it before submission.									
5. Create a component that visualizes audio frequencies using the Web Audio API									
6. Create an image slider that automatically transitions between images.									
7. Create a Picture-in-Picture (PiP) video player that allows users to watch a video in a small overlay window while continuing to browse the page.									
8. Create a component that allows users to draw annotations on an image.									
9. Create an interactive map component using a mapping library like Leaflet.									
10. Create a 3D model viewer using Three.js and React.									
Total Hours: 30									
Course Outcomes									
CO1	Apply the basic elements								
CO2	Implement the components.								
CO3	Use the audio and video players.								
CO4	Play with animations.								
CO5	Display various applications with React.								

Text Book

➤	Fundamental concepts of React, hooks, and component-based architecture 2nd Edition Alex Banks, Eve Porcello
➤	Building real-world React applications and UI components. Anthony Accomazzo, Nathan Murray, Ari Lerner, Clay Allsopp, David Guttman

Reference Books

1.	Covers modern React concepts including hooks, state management, and component design.,O'Reilly 3rd Edition, 2024, Alex Banks, Eve Porcello
2.	Practical approach to building real-world React applications with backend integration, Latest Edition, 2017, Anthony Accomazzo, Nathan Murray, Ari Lerner, Clay Allsopp, David Guttman

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

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								6

	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	
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
26UCCS41	III	Core- VII	Data Structure and Algorithms	4	3	50	50	100	4
26UCCSP4	III	Core -VIII	Practical - Data Structure and Algorithms	6	3	50	50	100	4
26UECS41	III	EC - IV	Resource Management Techniques	4	3	50	50	100	3
26UECS42			Analytics for Service Industry						
26UECS43			Biometrics						
26USCSP5	III	SEC -VI	Practical - Advanced Excel	2	3	50	50	100	2
26USCS41	IV	SEC - VII	Quantitative Aptitude	2	3	50	50	100	2
26UVBE41	V	Common	Value Based Education	2	3	50	50	100	2
Total				30				800	23

CORE COURSE (CC-7)–DATA STRUCTURE AND ALGORITHMS

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCS41	4	0	0	IV	4	4	50	50	100
Learning Objectives									
LO1	To understand the concept of Abstract Data Types (ADTs) and linear data structures.								
LO2	To implement lists, stacks, and queues using array and linked representations.								
LO3	To learn tree structures and their applications in problem solving.								
LO4	To understand graph representations and traversal algorithms.								
LO5	To apply searching, sorting, and hashing techniques for efficient data processing.								
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-linkedlists-applicationsoflists-PolynomialManipulation-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- Heap-Applications of heap.							12	
IV	Definition-Representation of Graph-Types of graph-Breadth first traversal– Depth first traversal. Hashing-Hash functions- Separate chaining- Open Addressing.							12	
V	Graph Algorithms: Definitions – Topological Sort – Shortest path algorithms: UnWeighted shortest paths- Minimum Spanning tree: Prim’s algorithm- Krushkal’s algorithm							12	
TOTAL							60		
CO	Course Outcomes								
CO1	Explain Abstract Data Types and implement list operations using arrays and linked lists.								
CO2	Apply stack and queue operations to solve computational problems such as expression evaluation								
CO3	Implement trees including binary trees, BST, heaps, and their applications.								
CO4	Analyze graphs using traversal algorithms and shortest path techniques								
CO5	Apply searching, sorting, and hashing methods to optimize data organization.								
Textbooks									
1	Weiss, Mark Allen. <i>Data Structures and Algorithm Analysis in C</i> . 2nd ed., Pearson Education, 2007.								
2	Horowitz, Ellis, SartajSahni, and Susan Anderson-Freed. <i>Fundamentals of Data Structures in C</i> . 2nd ed., Universities Press, 2008.								

Reference Books	
1	Cormen, Thomas H., et al. <i>Introduction to Algorithms</i> . 3rd ed., MIT Press, 2009.
2	Tenenbaum, Aaron M., YedidyahLangsam, and Moshe J. Augenstein. <i>Data Structures Using C</i> . 2nd ed., Pearson Education, 2006.
3	Samanta, Debasis. <i>Classic Data Structures</i> . 2nd ed., PHI Learning, 2009.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	2	–	2
CO2	3	3	2	1	2
CO3	3	3	3	2	2
CO4	3	3	2	2	2
CO5	3	3	2	2	2
Weightage of course contributed to each PSO	15	14	11	7	10

CORE (CC 8) –PRACTICAL DATA STRUCTURE AND ALGORITHMS

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCSP4	0	0	6	IV	4	6	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:									
Contents									
1) Search an element in a list using Binary Search. 2) Implementation of Stack- Push and Pop. 3) Implementation of Queue– Enquire and Dequeue 4) Implementation of Binary Tree Traversals using recursion. a) Pre-order b)In-order c)Post-Order 5) Implementation of Breadth First Search algorithm. 6) Implementation of Depth First Search algorithm. 7) Implementation of Merge Sort 8) Implementation of Quick Sort 9)Implementation of bubble sort 10) Implementation of Selection sort.									
Total Hours: 90									
CO	Course Outcomes								
CO1	Understand basic data structures such as List, Linked list.								
CO2	Understand basic data structures such as arrays, linked lists, stacks and queues.								
CO3	Describe the hash function and concepts of collision and Its resolution methods.								
CO4	Solve problem involving graphs, trees and heaps.								
CO5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data.								
Textbooks									

1	Mark Allen Weiss,—Data Structures and Algorithm Analysis in C++I, Pearson Education2014,4thEdition. .
2	ReemaThareja,—DataStructuresUsingCl,OxfordUniversitiesPress2014,2nd Edition .
Reference Books	
1	ThomasH.Cormen,ChalesE.Leiserson,RonaldL.Rivest,CliffordStein,—Introduction to AlgorithmsI, McGraw Hill2009,3rdEdition
2	Aho, Hopcroft andUllman,—DataStructuresandAlgorithmsI,PearsonEducation2003 .

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	1	—	2
CO2	3	3	2	1	2
CO3	3	3	2	2	2
CO4	3	3	3	2	2
CO5	3	3	2	2	2
Weightage of course contributed to each PSO	15	14	10	7	10

ELECTIVE COURSE – IV RESOURCE MANAGEMENT TECHNIQUES

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECS41	4	0	0	IV	3	4	50	50	100
Learning Objectives									
LO1	To understand Linear Programming Problems (LPP) and the Simplex method for optimization.								
LO2	To learn decision-making techniques using Game Theory concepts								
LO3	To analyze replacement and maintenance models in industrial systems.								
LO4	To understand project scheduling techniques such as PERT and CPM.								
LO5	To apply queuing theory models for solving real-world service system problems.								
Prerequisites:									
Unit	Contents								No. of Hours
I	Simplex Method – Forms of LPP – BFS concepts – Degeneracy & Optimality – Slack, Surplus, Restricted & Unrestricted variables – Introductory Sensitivity Analysis – Real-world LPP applications (production, logistics) – Overview of optimization tools (Excel Solver / LINGO).								12
II	Theory of Games – Payoff matrix – Two-person zero-sum games – Maximin–Minimax principle – Graphical solutions – Mixed strategies (introductory) – Decision-making under competition – Applications in business and economics								12
III	Replacement Models – Deteriorating & failing items – Maintenance cost analysis – Time value of money – Individual & Group replacement – Life-cycle cost analysis – Industrial case illustrations – Sustainability perspective								12
IV	PERT / CPM – Network construction – Critical path analysis – Time calculations – PERT probability analysis – Project crashing (introductory) – Modern project management applications (IT, construction).								12
V	Queuing theory – Queuing models – Poisson arrivals & exponential service – Steady-state analysis – Single & multi-server models (M/M/1, M/M/c – intro) – Performance measures (waiting time, utilization) – Applications in telecom, healthcare, networks.								12
TOTAL								60	
CO	Course Outcomes								
CO1	To Understand and solve Linear Programming Problems using optimization methods.								
CO2	To Apply game theory concepts for decision-making in competitive situations..								
CO3	To Analyze replacement and maintenance problems in real-life systems..								
CO4	To Use PERT and CPM techniques for project planning and scheduling								
CO5	To Apply queuing models to analyze waiting line problems in service systems.								

Textbooks

➤	Maxwell, A. & Goldratt, E. – <i>Resource Management: Theory and Practice</i> , Wiley, 1st Edition, 2018.
---	---

Reference Books

➤	Kerzner, H. – <i>Project Management: A Systems Approach to Planning, Scheduling, and Controlling</i> , 12th Edition, Wiley, 2017.
➤	Chase, R. B., Jacobs, F. R. & Aquilano, N. J. – <i>Operations Management for Competitive Advantage</i> , 14th Edition, McGraw-Hill, 2018.
➤	Heizer, J. & Render, B. – <i>Operations Management</i> , 12th Edition, Pearson, 2019.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	2	2	2
CO2	3	3	2	1	1
CO3	3	3	2	2	1
CO4	3	3	3	2	2
CO5	3	3	2	2	2
Weightage of course contributed to each PSO	15	15	11	9	8

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECS42	4	0	0	IV	3	4	50	50	100
Learning Objectives									
LO1	To understand healthcare data sources, data quality, privacy, and ethical issues in healthcare analytics.								
LO2	To learn Electronic Health Records (EHR) systems and their analytical applications.								
LO3	To understand biomedical image analysis and AI/ML applications in healthcare.								
LO4	To analyze healthcare sensor data, wearable data, and time-series patient monitoring systems.								
LO5	To learn biomedical signal processing and public health analytics applications.								
Prerequisites:									
Unit	Contents								No. of Hours
I	Introduction – Healthcare data sources – Data quality, privacy, and ethics in healthcare analytics – Basic & advanced analytics – Introduction to AI/ML in healthcare – Real-world healthcare analytics applications								12
II	Electronic Health Records – Components & standards – Coding systems – Benefits & barriers – Interoperability and data integration – EHR analytics use cases (clinical decision support) – Challenges in large-scale EHR data								12
III	Biomedical Image Analysis – Imaging modalities – Object detection – Image segmentation – Feature extraction – Introduction to deep learning for medical images – Applications in diagnosis and disease detection								12
IV	Mining sensor data in healthcare – Wearable and IoT sensor data – Scope and challenges – Time-series analytics – Predictive analytics for patient monitoring – Clinical & non-clinical applications.								12
V	Biomedical signals – Types and characteristics – Signal preprocessing and feature extraction (introductory) – Social media analytics for healthcare – Epidemic modeling and real-time outbreak analytics – Public health surveillance applications								12
TOTAL								60	
CO	Course Outcomes								
CO1	Explain healthcare data sources, analytics methods, and ethical considerations in healthcare systems								
CO2	Analyze Electronic Health Records and apply analytics for clinical decision support.								
CO3	Apply image processing and AI techniques for biomedical image analysis.								
CO4	Evaluate sensor and wearable healthcare data for predictive monitoring applications.								
CO5	Apply biomedical signal processing and analytics for healthcare and public health problems.								

Textbooks	
➤	Obenshain, D. R. & Jackson, J. C. – <i>Healthcare Analytics for Service Industry Applications</i> , Wiley, 1st Edition, 2020
Reference Books	
1.	Raghupathi, W. & Raghupathi, V. – <i>Big Data Analytics in Healthcare</i> , Springer, 1st Edition, 2014.
2.	Sharda, R., Delen, D. & Turban, E. – <i>Business Intelligence & Analytics: Systems for Decision Support</i> , Pearson, 10th Edition, 2021
3.	Murphy, K. P. – <i>Machine Learning: A Probabilistic Perspective</i> , MIT Press, 1st Edition, 2012.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	1	1	2
CO2	3	3	2	2	2
CO3	3	3	2	2	3
CO4	3	3	3	2	3
CO5	3	3	2	2	2
Weightage of course contributed to each PSO	15	15	10	9	12

ELECTIVE COURSE – IV BIOMETRICS

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECS43	4	0	0	IV	3	4	50	50	100
Learning Objectives									
L01	To Understand the basic concepts and components of biometric systems.								
L02	To Learn different biometric traits such as face, fingerprint, iris, vein, and voice.								
L03	To Understand matching techniques and performance measures (FAR, FRR, EER)..								
L04	To Learn how AI and machine learning are applied in biometric recognition.								
L05	To Understand security, privacy issues, and modern applications in mobile, IoT, and national security.								
Prerequisites:									
Unit	Contents								No. of Hours
I	Introduction – What is biometrics, types of traits, system architecture, matching techniques, errors & performance – AI/ML in biometrics – Design & application – Biometrics vs passwords & tokens – Emerging use cases in mobile &IoT								12
II	Face Biometrics – Recognition methods & challenges, deep learning-based face recognition; Retina & Iris Biometrics – Design, performance, applications – Privacy-aware iris recognition & anti-spoofing techniques								12
III	Vein & Fingerprint Biometrics – Recognition, contactless fingerprint & vein techniques; Privacy – Soft biometrics, differential privacy & encryption in biometrics, comparative analysis								12
IV	Multimodal Biometrics – Face, ear, voice, fusion methods, architecture, advantages – Watermarking – Techniques, robust watermarking for biometric data, applications in secure data transmission								12
V	Scope & Future – Market trends, enterprise & national security, smart cards, RFID, DNA &behavioral biometrics – Integration with blockchain, cloud, and IoT – Comparative study & emerging technologies								12
TOTAL								60	
CO	Course Outcomes								
CO1	Explain the architecture and working of biometric systems								
CO2	Compare different biometric modalities and their advantages..								
CO3	Evaluate biometric system performance using standard metrics.								
CO4	Apply basic AI/ML techniques in biometric applications.								
CO5	Analyze privacy, security challenges, and emerging trends in biometrics.								

Textbooks	
➤	Jain, A. K., Ross, A. &Nandakumar, K. – <i>Introduction to Biometrics</i> , Springer, 2nd Edition, 2011
Reference Books	
1.	Maltoni, D., Maio, D., Jain, A. &Prabhakar, S.– <i>Handbook of Fingerprint Recognition</i> , 2nd Edition, Springer, 2009.
2.	Li, S. Z. & Jain, A. K. – <i>Encyclopedia of Biometrics</i> , 2nd Edition, Springer, 2015.
3.	Ratha, N. &Bolle, R. M. – <i>Automatic Fingerprint Recognition Systems</i> , Springer, 1st Edition, 2004.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	1	1	2
CO2	3	3	2	2	2
CO3	3	3	2	2	3
CO4	2	3	3	2	3
CO5	3	3	2	2	2
Weightage of course contributed to each PSO	14	15	10	9	12

SKILL ENHANCEMENT COURSE (SEC-6) – QUANTITATIVE APTITUDE

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26USCSP41	2	0	0	IV	2	2	50	50	100
Learning Objectives									
LO1	To Handle large amounts of data.								
LO2	To Aggregate numeric data and summarize into categories and subcategories.								
LO3	To Filtering, sorting, and grouping data or subsets of data.								
LO4	To Create pivot tables to consolidate data from multiple files.								
LO5	To Presenting data in the form of charts and graph								
Prerequisites:									
UNIT	Contents							No of Hours	
I	Numbers-HCF and LCM of numbers-Decimal fractions-Simplification- Square root and cube roots - Average-problems on Numbers.							6	
II	Problems on Ages - Surds and Indices - percentage - profits and loss - ratio and proportion-partnership Chain rule.							6	
III	Time and work - pipes and cisterns - Time and Distance - problems on trains - Boats and streams - simple interest - compound interest - Logarithms - Area- Volume and surface area -races and Games of skill.							6	
IV	Permutation and combination-probability-True Discount-Bankers Discount – Height and Distances Odd man out & Series.							6	
V	Calendar - Clocks - stocks and shares - Data representation - Tabulation – Bar Graphs-Pie charts Line graphs.							6	
TOTAL						30			
CO	Course Outcomes								
CO1	To Understand the concepts, application and the problems of numbers								
CO2	To have basic knowledge and understanding about percentage, profit & loss related processing.								
CO3	To understand the concepts of time and work.								
CO4	To Speak about the concepts of probability, discount.								
CO5	To Understanding the concept of problem solving involved in stocks & shares, graphs.								
Textbooks									
➤	“Quantitative Aptitude”, R.S.AGGARWAL, S. Chand & Company Ltd.,								

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

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							6	
	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.								
II	Fundamental Rights and Duties							6	
	Fundamental Rights – Types and significance - Right to Equality, Freedom, Religion, Cultural & Educational Rights - Right to Constitutional Remedies - Fundamental Duties – Meaning and importance.								
III	Directive Principles of State Policy							6	
	Meaning and objectives - Classification of Directive Principles - Relationship between Fundamental Rights and DPSP - Role in governance and welfare state.								
IV	Human Rights – Concepts and Development							6	
	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								
V	Human Rights in India							6	
	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.								
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	
26UCCS51	III	Core-IX	Software Engineering	5	3	50	50	100	4
26UCCS52	III	Core -X	Database Management System	5	3	50	50	100	4
26UCCS53	III	Core -XI	Image Processing	4	3	50	50	100	4
26UCCSP5	III	Core -XII	Practical: Image Processing Lab	6	3	50	50	100	4
26UCCS5P	III	Core -XIII	Mini Project with Viva Voce	4	3	50	50	100	3
26UECS51	III	Elective- V	Cloud Computing	4	3	50	50	100	3
26UECS52			Data Analytics using R						
26UECS53			Natural Language Processing						
26UFIK51	III	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

CORE COURSE (CC-9)–SOFTWARE ENGINEERING

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCS51	5	0	0	V	4	5	50	50	100
Learning Objectives									
LO1	To Understand the fundamentals of software engineering and software life cycle models.								
LO2	To Learn techniques for requirements analysis and software design.								
LO3	To Understand function-oriented design and user interface design principles.								
LO4	To Gain knowledge of coding standards, testing methods, and software quality management.								
LO5	To Understand CASE tools, software maintenance, and object modeling using UML								
Prerequisites:									
Unit	Contents								No. of Hours
I	Introduction: The software engineering discipline, programs vs. software products, why study software engineering, emergence of software engineering, Notable changes in software development practices, computer systems engineering. Software Life Cycle Models: Why use a life cycle model, Classical waterfall model, iterative waterfall model, prototyping model, evolutionary model, spiral model, comparison of different life cycle models.								15
II	Requirements Analysis and Specification: Requirements gathering and analysis, Software requirements specification (SRS) Software Design: Good software design, cohesion and coupling, neat arrangement, software design approaches, object- oriented vs. function-oriented design								15
III	Function-Oriented Software Design: Overview of SA/SD methodology, structured analysis, data flow diagrams (DFD's), structured design, detailed design. User-Interface design: Characteristics of a good interface; basic concepts; types of user interfaces; component based GUI development, a user interface methodology.								15
IV	Coding and Testing: Coding; code review; testing; testing in the large vs testing in the small; unit testing; black-box testing; white-box testing; debugging; program analysis tools; integration testing; system testing; some general issues associated with testing. Software Reliability and Quality Management: Software reliability; statistical testing; software quality; software quality management system; SEI capability maturity model; personal software process.								15
V	Object Modelling Using UML: Basic Object oriented Concepts: Basic Concepts, Class Relationships- How to Identify Class Relationships? – Advantages and Disadvantages of OOD – Unified Modelling Language (UML) – UML diagrams – Use Case Model- Class Diagrams – Interaction Diagrams – Activity diagram – State Chart Diagram.								15
TOTAL								75	
CO	Course Outcomes								
CO1	Explain software engineering principles and compare different life cycle models.								
CO2	Analyze and prepare Software Requirement Specifications (SRS) and design models.								
CO3	Apply structured design techniques and develop UML diagrams..								
CO4	Apply coding standards and perform various software testing techniques..								
CO5	Evaluate software quality, maintenance processes, and CASE tool support.								

Textbooks	
➤	Rajib Mall, Fundamentals of Software Engineering, Fifth Edition, Prentice-Hall of India, 2018
Reference Books	
1	Richard Fairley, Software Engineering Concepts, Tata McGraw-Hill publishing company Ltd, Edition 1997.
2	Roger S. Pressman, Software Engineering, Seventh Edition, McGraw-Hill.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	–	–	–
CO2	3	3	2	–	–
CO3	2	3	3	2	2
CO4	2	2	3	3	2
CO5	2	2	2	2	3
Weightage of course contributed to each PSO	12	12	10	7	7

CORE – 10: DATABASE MANAGEMENT SYSTEM

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCS52	5	0	0	V	4	5	50	50	100
Learning Objectives									
LO1	To Understand basic database concepts and different types of databases.								
LO2	To Learn relational model, ER diagrams, and normalization.								
LO3	To Write SQL queries for creating and managing databases.								
LO4	To Use advanced SQL features like joins, subqueries, and transactions.								
LO5	To Understand PL/SQL, database security, backup, and recovery.								
Prerequisites:									
Unit	Contents								No. of Hours
I	Database Systems – Data vs Information – Introducing the database – File system – Problems with file system – Modern database systems – Centralized and distributed databases – Cloud databases – Data models – Importance – Basic building blocks – Business rules – Evolution of data models – Degrees of data abstraction.								15
II	Relational database model – Logical view of data – Keys – Integrity rules – Relational set operators – Data dictionary and system catalog – Relationships – Data redundancy revisited – Indexes – Codd’s rules – Entity relationship model – ER diagram – Introduction to NoSQL databases – Types of NoSQL models.								15
III	Database tables and normalization – Need for normalization – Normalization process – Higher normal forms – Introduction to SQL – Data definition commands – Data manipulation commands – SELECT queries – Additional data definition commands – Additional SELECT keywords – Joining database tables – Views and constraints – Transactions.								15
IV	Relational set operators – UNION – UNION ALL – INTERSECT – MINUS – SQL join operators – Cross join – Natural join – Join using clause – Join on clause – Outer join – Sub queries and correlated queries – WHERE – IN – HAVING – ANY and ALL – FROM – SQL functions – Window functions – Common table expressions (CTE).								15
V	PL/SQL – Fundamentals – Block structure – Data types – Variable declaration – Assignment operations – Control structures – Embedded SQL – Transaction control statements – Cursors – Exceptions – Triggers – Stored procedures – Database security concepts – Backup and recovery basics								15
TOTAL								75	

CO	Course Outcomes
CO1	To Explain database concepts and data models.
CO2	To Design simple databases using ER diagrams and normalization.
CO3	To Write SQL commands for data definition and data manipulation.
CO4	To Write SQL commands for data definition and data manipulation.
CO5	Develop basic PL/SQL programs and understand database security concepts.
Textbooks	
1	Raghurama Krishnan & Johannes Gehrke, Database Management Systems, 3rd Edition, McGraw-Hill Education.
Reference Books	
1	Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, 7th Edition, McGraw-Hill Education.
2	Ramez Elmasri & Shamkant B. Navathe, <i>Fundamentals of Database Systems</i> , 7th Edition, Pearson Education.
3	C. J. Date, <i>An Introduction to Database Systems</i> , 8th Edition, Pearson Education.

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

CORE – 11 IMAGE PROCESSING

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCS53	4	0	0	V	4	4	50	50	100
Learning Objectives									
LO1	To learn fundamentals of digital image processing.								
LO2	To learn about various 2D Image transformations								
LO3	To learn about various image enhancement processing methods and filters.								
LO4	To learn about various classification of Image segmentation techniques.								
LO5	To learn about various image compression techniques.								
Prerequisites:									
Unit	Contents								No. of Hours
I	Introduction & Fundamentals: Definition of image and Digital image processing - Examples of Digital image processing- Fundamental steps in Digital image processing- Components of image processing system Image acquisition- A simple image model- Zooming and shrinking of digital image.								12
II	Image enhancement in spatial domain: Introduction- Mathematical analysis of enhancement in spatial domain- Basic gray level transformation- Histogram processing- Histogram equalization - Histogram matching- Image enhancement using arithmetic and logical operation- Basic transformation- Basics of spatial filtering- Image enhancement infrequency domain: One dimensional fourier transform and its inverse- Two dimensional fourier transform and its inverse Basics of filtering in frequency domain- Homomorphic filtering.								12
III	Color image processing: Introduction- Advantages of Color image processing- Categories of Color image processing- Color fundamentals Primary colors - Secondary colors- Primary and secondary colors for pigments- Characteristics that are used for differentiating different colors- Color models- conversion between color models- Pseudo color image processing- Color transformation- Color image smoothing and sharpening- Color segmentation.								12
IV	Image Compression: Introduction-Mathematical analysis- Types of data redundancies- Image compression model - Compression strategies Morphological Image processing: Introduction- Basic concept of set theory- Logic operations involving binary images- Dilation and erosion opening and closing.								12
V	Edge detection in Digital Image Processing: Importance of Edge detection in Digital Image Processing, Types of Edge Detection, Mathematical Equation of								12

	each operator. Security in Digital Image Processing : Importance of Digital Image Security, Watermarking, Image encryption in spatial and frequency domain, Steganography	
TOTAL		60
CO	Course Outcomes	
CO1	To Understand the fundamental concepts of digital image processing. .	
CO2	ToUnderstand various 2D Image transformations .	
CO3	To Understand image enhancement processing techniques and filters..	
CO4	To Understand the classification of Image segmentation techniques .	
CO5	To Understand various image compression techniques	
Textbooks		
1	Abhishak Yadav, Poonam Yadav, Digital Image Processing, University Science Press, New Delhi, 2009 S Jayaraman, S Esakkirajan, T Veerakumar, Digital image processing ,Tata McGraw Hill, 2015	
2	Gonzalez Rafel C, Digital Image Processing, Pearson Education, 2009.	
Reference Books		
1	Jain Anil K , Fundamentals of digital image processing: , PHI,1988.	
2	Kenneth R Castleman , Digital image processing:, Pearson Education,2/e,2003.	
3	Pratt William K , Digital Image Processing: , John Wiley,4/e,2007.	

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	–	–	1
CO2	3	3	2	2	2
CO3	3	2	2	1	2
CO4	3	3	2	2	2
CO5	2	2	2	3	2
Weightage of course contributed to each PSO	14	12	8	8	9

CORE – 12IMAGE PROCESSING LAB

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCSP5	0	0	6	V	3	6	50	50	100
Learning Objectives									
LO1	To learn fundamentals of digital image processing.								
LO2	To learn about various 2D Image transformations.								
LO3	To learn about various image enhancement processing methods and filters								
LO4	To learn about various classification of Image segmentation techniques.								
LO5	To learn about various image compression techniques.								
Prerequisites:									
Contents									
1. Perform 2D Linear Convolution, Circular Convolution between two 2D matrices. 2. Perform Discrete Fourier Transform(DFT), Discrete Cosine Transform(DCT) of 4x4 gray scale image 3. Perform Brightness enhancement, Contrast Manipulation, Image negative of an image. 4. Perform threshold operation on an image. 5. Display of bit planes of an Image 6. Perform Edge detection using different edge detectors. 7. Image Compression by DCT,DPCM, HUFFMAN coding 8. Perform Dilation and Erosion operation. 9. Perform Opening and closing operations 10. Implementation of image restoring techniques 11. Read a colour image and separate the image into red, blue and green planes									
									Total Hours: 90
CO	Course Outcomes								
CO1	Apply convolution techniques and frequency transforms such as DFT and DCT for image analysis.								
CO2	Perform image enhancement operations including brightness adjustment, contrast manipulation, thresholding, and bit-plane slicing.								
CO3	Implement edge detection techniques and morphological operations such as dilation, erosion, opening, and closing..								
CO4	Analyze and implement image compression techniques including DCT, DPCM, and Huffman coding.								
CO5	Demonstrate image restoration techniques and color image processing by separating RGB components.								

Textbooks

➤	Gonzalez, Rafael C., and Richard E. Woods. <i>Digital Image Processing</i> . 4th ed., Pearson Education, 2018.
➤	Burger, Wilhelm, and Mark J. Burge. <i>Digital Image Processing: An Algorithmic Introduction Using Java</i> . 2nd ed., Springer, 2016.

Reference Books

1.	Jain, Anil K. <i>Fundamentals of Digital Image Processing</i> . Prentice Hall, 1989.
➤	Pratt, William K. <i>Digital Image Processing: PIKS Scientific Inside</i> . 4th ed., Wiley, 2007.
3.	Sonka, Milan, Vaclav Hlavac, and Roger Boyle. <i>Image Processing, Analysis, and Machine Vision</i> . 4th ed., Cengage Learning, 2014
4.	Castleman, Kenneth R. <i>Digital Image Processing</i> . Prentice Hall, 1996.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	2	2	2
CO2	3	2	2	2	2
CO3	3	3	2	2	2
CO4	3	3	3	2	2
CO5	2	2	3	3	2
Weightage of course contributed to each PSO	14	13	12	11	10

ELECTIVE COURSE (5) – CLOUD COMPUTING

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECS51	4	0	0	V	3	4	50	50	100
Learning Objectives									
LO1	To understand fundamental concepts and service models of cloud computing.								
LO2	To learn cloud technologies such as virtualization, scalability, and distributed processing.								
LO3	To explore cloud platforms, deployment models, and service providers.								
LO4	To design and develop cloud-based applications using modern architectures.								
LO5	To analyze cloud security mechanisms and real-world applications.								
Prerequisites:									
Unit	Contents								No. of Hours
I	Unit I — Introduction to Cloud Computing								12
	Definition and characteristics of cloud computing — Cloud deployment models — Cloud service models (IaaS, PaaS, SaaS) — Cloud applications in healthcare, energy, government, and education — Introduction to edge computing and serverless computing — Overview of cloud providers.								
II	Unit II — Cloud Concepts and Core Technologies								12
	Virtualization and containerization — Load balancing — Scalability and elasticity — Deployment and replication — Monitoring and automation — Software Defined Networking (SDN) — Network Function Virtualization (NFV) — MapReduce and distributed processing — Identity and Access Management (IAM) — Service Level Agreements (SLA) — Cloud billing and cost optimization.								
III	Unit III — Cloud Services and Platforms								12
	Compute services (Amazon EC2, Google Compute Engine, Microsoft Azure VMs) — Storage services — Database services — Application and content delivery services — Analytics services (BigQuery, HDInsight, EMR) — Deployment tools (CloudFormation, Elastic Beanstalk) — Open-source cloud platforms (OpenStack, CloudStack, Eucalyptus) — Introduction to Kubernetes and container orchestration.								
IV	Unit IV — Cloud Application Design and Development								12
	Cloud architecture design principles — Service Oriented Architecture (SOA) — Microservices architecture — MVC architecture — RESTful web services — Data storage approaches (SQL and NoSQL) — DevOps and CI/CD in cloud — Reliability, availability, and performance optimization.								
V	Unit V — Cloud Security and Case Studies								12
	Cloud security fundamentals — CSA architecture — Authentication and authorization — Identity and Access Management — Data security (data at rest and in transit) — Key management — Auditing and compliance — Cloud security tools — Case studies in healthcare and education — Ethical and legal issues in cloud computing.								
TOTAL								60	

CO	Course Outcomes
CO1	Explain cloud computing concepts, architectures, and deployment models.
CO2	Apply cloud technologies such as virtualization, scalability, and distributed computing scenarios
CO3	Evaluate cloud services offered by major providers and open-source platforms..
CO4	Design cloud-based applications using modern development methodologies and architectures..
CO5	Analyze cloud security mechanisms and implement secure cloud solutions for real-applications.
Textbooks	
1	RajkumarBuyya, Christian Vecchiola, and S. ThamaraiSelvi. <i>Mastering Cloud Computing: Foundations and Applications Programming</i> . McGraw Hill Education, 2013.
2.	Thomas Erl, Ricardo Puttini, and Zaigham Mahmood. <i>Cloud Computing: Concepts, Technology & Architecture</i> . Pearson Education, 2014.
Reference Books	
1.	Anthony T. Velte, Toby J. Velte, and Robert Elsenpeter. <i>Cloud Computing: A Practical Approach</i> . McGraw Hill, 2010.
2.	Barrie Sosinsky. <i>Cloud Computing Bible</i> . Wiley Publishing, 2011.
3.	Judith Hurwitz, Robin Bloor, Marcia Kaufman, and Fern Halper. <i>Cloud Computing for Dummies</i> . Wiley, 2010.
4.	Kavis, Michael J. <i>Architecting the Cloud: Design Decisions for Cloud Computing Service Models</i> . Wiley, 2014.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	-	-	1
CO2	3	3	2	2	2
CO3	3	2	2	1	3
CO4	3	3	3	2	3
CO5	2	3	2	3	3
Weightage of course contributed to each PSO	14	13	9	8	12

ELECTIVE COURSE (5) – DATA ANALYTICS USING R

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECS52	4	0	0	V	3	4	50	50	100
Learning Objectives									
LO1	To understand Big Data concepts, architecture, and analytics techniques.								
LO2	To develop programming skills using R for data analysis and visualization.								
LO3	To apply statistical methods and probability models for data-driven decision making.								
LO4	To perform data manipulation, exploration, and modeling using R tools..								
LO5	To analyze real-world datasets using Big Data technologies and advanced R programming.								
Prerequisites:									
Unit	Contents								No. of Hours
I	Introduction to Big Data and Hadoop Ecosystem Evolution of Big Data — Big Data characteristics (5Vs) — Big Data analytics lifecycle — Business value and use cases — Big Data applications — High-performance computing architecture — Distributed systems — Hadoop ecosystem overview — HDFS architecture — MapReduce programming model — YARN resource management — Introduction to Spark and real-time analytics								12
II	R Programming Fundamentals and Data Structures Control structures — Functions and scoping rules — Dates and times — R environment — Vectors and operations — Character strings — Matrices and arrays — Lists — Data frames — Introduction to tidyverse packages — Data importing and exporting — Data preprocessing techniques								12
III	Data Manipulation and Exploratory Data Analysis Lists and data frames operations — Data cleaning and transformation — Applying functions to datasets — Data aggregation — Statistical summaries — Exploratory Data Analysis (EDA) — Data visualization using ggplot2 — Introduction to dashboards								12
IV	Statistical Analysis and Probability using R Factors and categorical data — Tables and contingency analysis — Mathematical and statistical functions — Probability distributions — Hypothesis testing — Regression analysis — Time series basics — Machine learning introduction using R .								12
V	Advanced R Programming and Applications Object-Oriented Programming in R — S3 and S4 classes — Generic functions — Code profiling and performance tuning — Simulation techniques — Data visualization — Statistical modeling — Big Data integration with R (SparkR) — Real-world case studies and applications.								12
TOTAL								60	

CO	Course Outcomes
CO1	Explain Big Data concepts, characteristics, architecture, and Hadoop ecosystem components..
CO2	Apply R programming constructs and data structures for data analysis tasks..
CO3	Perform data manipulation, visualization, and exploratory analysis using R tools.
CO4	Apply statistical and probabilistic models to analyze datasets and derive insights..
CO5	Develop advanced analytical applications using object-oriented programming and Big Data integration tools.
Textbooks	
1	Seema Acharya and SubhasiniChellappan. <i>Big Data Analytics</i> . Wiley India, 2015.
2	Norman Matloff. <i>The Art of R Programming: A Tour of Statistical Software Design</i> . No Starch Press, 2011.
Reference Books	
1.	Jared P. Lander. <i>R for Everyone: Advanced Analytics and Graphics</i> . 2nd ed., Addison-Wesley, 2017.
2.	Hadley Wickham and Garrett Grolemund. <i>R for Data Science</i> . O'Reilly Media, 2017.
3	Tom White. <i>Hadoop: The Definitive Guide</i> . 4th ed., O'Reilly Media, 2015.
4	Nina Zumel and John Mount. <i>Practical Data Science with R</i> . Manning Publications, 2014.
Web Resources	
1.	The R Project for Statistical Computing. <i>R Documentation</i> . https://www.r-project.org
2.	Apache Hadoop. <i>Hadoop Documentation</i> . https://hadoop.apache.org
3.	Apache Spark. <i>Spark Documentation</i> . https://spark.apache.org
4.	Kaggle. <i>Datasets and Tutorials</i> . https://www.kaggle.com
5.	NPTEL. <i>Big Data Analytics Courses</i> . https://nptel.ac.in

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

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECS53	4	0	0	V	3	4	50	50	100
LO1			To understand fundamental concepts and techniques of Natural Language Processing.						
LO2			To learn linguistic processing including syntax, semantics, and discourse analysis.						
LO3			To apply machine learning methods for NLP tasks such as tagging, translation, and retrieval.						
LO4			To develop knowledge of text generation and language modelling techniques.						
LO5			To explore lexical resources and modern NLP applications including multilingual processing.						
Unit			Contents						No. of Hours
I			Introduction to Natural Language Processing Natural Language Processing tasks in syntax, semantics, and pragmatics — NLP challenges and applications — Role of Machine Learning and Deep Learning in NLP — Probability basics — Information theory — Collocations — N-gram language models — Parameter estimation and smoothing — Evaluation of language models — Introduction to transformer models and large language models						12
II			Word Level and Syntactic Analysis Regular expressions — Finite state automata — Morphological parsing — Spelling error detection and correction — Words and word classes — Part-of-speech tagging — Context-free grammar — Constituency parsing — Dependency parsing— Probabilistic parsing — Neural sequence models						12
III			Semantic Analysis and Discourse Processing Meaning representation — Lexical semantics — Ambiguity resolution — Word sense disambiguation — Named entity recognition— Sentiment analysis— Discourse processing — Reference resolution — Discourse coherence — Dialogue systems introduction						12
IV			Natural Language Generation and Machine Translation Architecture of NLG systems — Text generation techniques — Neural text generation — Applications of NLG — Machine translation challenges — Indian language characteristics — Rule-based, statistical, and neural machine translation — Multilingual NLP.						12
V			Information Retrieval and Lexical Resources Information retrieval models — Search engine architecture — Evaluation metrics — Classical and modern retrieval approaches — Lexical resources — WordNet and FrameNet — Stemming and POS tagging tools — Research corpora — Introduction to embeddings (Word2Vec, GloVe) — Ethics and bias in NLP						12
TOTAL								60	
CO			Course Outcomes						
CO1			Explain NLP concepts, language models, and linguistic processing techniques						

C02	Apply syntactic and word-level analysis methods for text processing tasks.
C03	Analyze semantic meaning and discourse structure using NLP techniques.
C04	Develop NLP applications including text generation and machine translation systems.
C05	Evaluate information retrieval systems and utilize lexical resources for NLP applications..

1	Jurafsky, Daniel, and James H. Martin. <i>Speech and Language Processing</i> . 3rd ed., Pearson, 2023.
2	Tanveer Siddiqui and U.S. Tiwary. <i>Natural Language Processing and Information Retrieval</i> . Oxford University Press, 2008..
1.	Steven Bird, Ewan Klein, and Edward Loper. <i>Natural Language Processing with Python</i> . O'Reilly Media, 2009.
2.	Jacob Eisenstein. <i>Introduction to Natural Language Processing</i> . MIT Press, 2019.
3	Breck Baldwin et al. <i>Language Processing with Java</i> . Prentice Hall, 2015.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	-	-	1
CO2	3	3	2	2	2
CO3	3	3	2	2	2
CO4	3	3	3	2	3
CO5	2	3	2	3	3
Weightage of course contributed to each PSO	14	14	9	9	11

CORE -XIII– MINI PROJECT WITH VIVA VOCE- CASE STUDIES RELATED TO DBMS

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCS5P	4	0	0	V	3	4	50	50	100
Learning Objectives									
LO1	To understand software development methodologies and database design principles.								
LO2	To develop real-time applications using programming languages and database systems.								
LO3	To design user-friendly interfaces and integrate frontend with backend technologies.								
LO4	To implement testing, debugging, and deployment techniques for software projects.								
LO5	To develop project management and documentation skills for real-world applications								
Prerequisites:									
TOTAL								60	
CO	Course Outcomes								
CO1	Express their views with ppt illustrations and critical support								
CO2	Organize the views and solutions as modules of the project								
CO3	Analyze the various possible solutions of the chosen problem domain								
CO4	Evaluate the adopted solution with various testing								
CO5	Compile the development of solution as Documentation								
Web Resources									
1	Web resources from NDL Library, E-content from open-source libraries								

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2	2	3	2	2
CO2	3	3	3	2	2
CO3	3	3	2	3	2
CO4	2	3	2	3	3
CO5	2	2	3	3	2
Weightage of course contributed to each PSO	12	13	13	13	11

INTERNSHIP / INDUSTRIAL TRAINING

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCSI51	0	0	0	V	3	-	50	50	100
Learning Objectives									
LO1	To learn and develop new skills relevant to the field of study or career interests.								
LO2	To understand different departments, roles, and functions within the organization to broaden knowledge and explore potential career paths.								
LO3	To apply the knowledge gained in academic studies to real-world scenarios.								
LO4	To bridge the gap between classroom learning and professional life. .								
LO5	To gain exposure to different tasks, projects, and challenges relevant to the chosen field.								
Prerequisites:									
TOTAL								45	
CO	Course Outcomes								
CO1	Identify different career paths within the industry and gain insights into potential future roles.								
CO2	Apply theoretical concepts and academic knowledge to real-world situations and challenges encountered during the internship.								
CO3	Analyze problems, generate innovative solutions, and make informed decisions.								
CO4	Evaluate how to manage time effectively and prioritize tasks to meet deadlines and deliver quality work.								
CO5	Create a portfolio of the work, projects, and achievements during the internship.								

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2	2	3	2	-
CO2	2	1	3	2	2
CO3	3	3	2	2	1
CO4	2	3	2	3	3
CO5	2	2	3	3	2
Weightage of course contributed to each PSO	11	11	13	12	8

ABILITY ENHANCEMENT COURSE – I: EMPOWERED VOCATIONAL ENGLISH

BBA11 PERSONAL MANAGEMENT COURSE – WEAK POWERED VOCATIONALE 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									
L01	To build self- assurance in students by mastering interpersonal, team- management, and leadership abilities.								
L02	To equip aspiring learners with skills that transform them into effective young managers.								
L03	To sharpen communication proficiency for professional and workplace contexts.								
L04	To foster strategic thinking and problem- solving through advanced writing & presentation techniques.								
L05	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.	MaxMarks			
						CIA	ESE	Total	
26UCCS61	III	Core– XIV	Computer Networks	5	3	50	50	100	4
26UCCS62	III	Core -XV	.NET Programming	4	3	50	50	100	4
26UCCS63	III	Core -XVI	Operating System	5	3	50	50	100	4
26UCCSP6	III	Core -XVII	Practical: .NET Programming Lab(ASP.NET)	6	3	50	50	100	4
26UCCS6P	III	Core -XVIII	Major Project with Viva voce	4	3	50	50	100	4
26UECS61	III	Elective- VII	Artificial Intelligence	4	3	50	50	100	3
26UECS62			Artificial Neural Network						
26UECS63			Cyber Forensics						
26UAEC61	IV	AEC-II	Design Thinking	2	3	50	50	100	2
26U5EA61	V	Common	Extension Activity	-				100	1
Total				30				800	26

CORE COURSE 13—COMPUTER NETWORKS

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCA61	5	0	0	VI	4	5	50	50	100
Learning Objectives									
LO1	To understand the fundamentals of computer networks and communication models								
LO2	To learn network protocols across different layers of the OSI and TCP/IP models								
LO3	To analyze routing, congestion control, and data transmission techniques								
LO4	To understand wireless communication and modern networking technologies								
LO5	To explore network security concepts and cryptographic techniques								
Prerequisites:									
Unit	Contents								No. of Hours
I	Introduction and Network Fundamentals								15
	Introduction to computer networks — Network hardware and software — Reference models — OSI and TCP/IP models — Example networks (Internet, Ethernet, Wireless LANs) — Physical layer fundamentals — Data communication theory — Guided transmission media — Introduction to IoT networking								
II	Wireless and Data Link Layer								15
	Wireless transmission — Communication satellites — Telephone system structure — Multiplexing and switching — Data link layer design issues — Error detection and correction — Introduction to 5G and mobile networks								
III	Medium Access and LAN Technologies								15
	Elementary data link protocols — Sliding window protocols — Data link layer in the Internet — Medium access layer — Channel allocation problem — Multiple access protocols — Bluetooth — Wi-Fi standards and wireless security								
IV	Network Layer and Routing								15
	Network layer design issues — Routing algorithms — Congestion control — IP protocol — IPv4 and IPv6 addressing — Internet control protocols — Software Defined Networking (SDN) and Network Virtualization								
V	Transport Layer and Network Security								15
	Transport layer services — Connection management — TCP and UDP protocols — Internet transport protocols — Quality of Service (QoS) — Network security fundamentals — Cryptography — Firewalls, VPN, and intrusion detection systems								
TOTAL								75	
CO	Course Outcomes								
CO1	Explain networking concepts, architectures, and communication models								

CO2	Apply data link and medium access protocols for reliable data communication.
CO3	Analyze routing algorithms, IP addressing, and network layer protocols
CO4	Evaluate transport layer protocols and network performance techniques
CO5	Understand network security mechanisms and cryptographic methods
Textbooks	
1	Tanenbaum, Andrew S., and David J. Wetherall. <i>Computer Networks</i> . 5th ed., Pearson Education, 2011
2	Kurose, James F., and Keith W. Ross. <i>Computer Networking: A Top-Down Approach</i> . 8th ed., Pearson, 2021
Reference Books	
1	Forouzan, Behrouz A. <i>Data Communications and Networking</i> . 5th ed., McGraw-Hill Education, 2013
2	Stallings, William. <i>Data and Computer Communications</i> . 10th ed., Pearson, 2014.
3	Comer, Douglas E. <i>Internetworking with TCP/IP: Principles, Protocols, and Architecture</i> . 6th ed., Pearson, 2015.
4	Peterson, Larry L., and Bruce S. Davie. <i>Computer Networks: A Systems Approach</i> . 5th ed., Morgan Kaufmann, 2011

Core Course 14 - .NET PROGRAMMING

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCS62	4	0	0	VI	4	4	50	50	100
Learning Objectives									
LO1	To understand the architecture and components of the .NET framework								
LO2	To develop programming skills using VB.NET and C# languages.								
LO3	To design and implement web applications using ASP.NET technologies								
LO4	To apply validation, state management, and security mechanisms in web development								
LO5	To explore modern .NET technologies and deployment environments.								
Prerequisites:									
Unit	Contents							No. of Hours	
I	Introduction to .NET Framework and Programming Basics The .NET framework architecture — .NET languages (VB.NET, C#) — Evolution from VB6 and VBScript — Common Language Runtime (CLR) — .NET Class Library — Introduction to ASP.NET — Visual Studio environment — Data types, variables, scope, operators — Conditional and looping structures — Introduction to .NET Core and .NET 6/7							12	
II	Object-Oriented Programming and Namespaces Classes and objects — Value types and reference types — Advanced class programming — Namespaces and assemblies — Exception handling — Introduction to object-oriented principles (encapsulation, inheritance, polymorphism) — Setting up ASP.NET environment — IIS configuration — Migration concepts — Introduction to dependency injection							12	
III	ASP.NET Applications and Web Forms ASP.NET application architecture — Code-behind model — Global.asax file — ASP.NET configuration — Web form fundamentals — HTML server controls — Event-driven programming — Introduction to MVC architecture— Introduction to Razor Pages							12	
IV	Web Controls and Development Tools Web control classes — AutoPostBack — Event handling — Creating dynamic web pages — Visual Studio project development — Web form designer — Debugging techniques — Introduction to Web APIs and REST services (New) — Client-side integration with JavaScript frameworks							12	

V	Validation, State Management and Modern Web Features Validation controls — Regular expressions — State management techniques (ViewState, Session, Application) — Cookies — Authentication and authorization — Security best practices — Introduction to cloud deployment of .NET applications (New) — Introduction to Blazor framework	12
TOTAL		60
CO	Course Outcomes	
CO1	Explain the architecture and components of the .NET framework and ASP.NET environment	
CO2	Apply object-oriented programming concepts using .NET languages	
CO3	Develop web applications using ASP.NET controls and event-driven programming	
CO4	Implement validation, state management, and security techniques in web applications.	
CO5	Analyze modern .NET technologies and deploy web applications in real environments.	
Textbooks		
1	MacDonald, Matthew. <i>Beginning ASP.NET 4.5 in C#</i> . Apress, 2012.	
2	Balagurusamy, E. <i>Programming in VB.NET</i> . Tata McGraw-Hill, 2004	
Reference Books		
1.	Liberty, Jesse. <i>Programming C#</i> . 8th ed., O'Reilly Media, 2015.	
2.	Freeman, Adam. <i>Pro ASP.NET MVC 5</i> . Apress, 2014	
3.	Esposito, Dino. <i>Programming ASP.NET</i> . Microsoft Press, 2011	
4	Nagel, Christian, et al. <i>Professional C# and .NET</i> . Wiley, 2021.	

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	-	-	1
CO2	3	3	2	2	2
CO3	3	3	3	2	3
CO4	2	3	2	3	3
CO5	2	2	3	3	3
Weightage of course contributed to each PSO	15	12	5	11	10

Core Course 15 - .NET Programming Lab (26UCCS6P)

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCAP 6	6	0	0	VI	4	6	50	50	100
Learning Objectives									
LO1	To develop ASP.NET Web application using standard controls								
LO2	To create rich database applications								
LO3	To implement file handling operations								
LO4	To implement XML classes.								
LO 5	To implement controls								
Prerequisites:									
Contents									
1. Create an exposure of web applications and tools 2. Implement the HTML controls 3. Implement the server controls 4. Web application using web controls 5. Web application using list controls 6. Web page design using rich control. Validate user input using validation controls. 7. Web application using data controls 8. Data base application to perform insert, update and delete operations. 9. Data base application using data controls to perform insert, delete, edit operation 10. Data base application using data controls to perform paging and sorting operation 11. Implement the XML classes 12. Online examination using ASP.NET controls									
Total Hours: 90									
CO	Course Outcomes								
CO1	To create web applications and implement various controls								
CO2	Create web pages in Rich control								
CO3	Develop knowledge about file handling operations								
CO4	An ability to design XML classes								
CO5	An ability to design controls								

Textbooks	
➤	SvetlinNakov, VeselinKolev& Co, Fundamentals of Computer Programming with C#, Faber publication,2019.
➤	Mathew, Mac Donald, The Complete Reference ASP.NET, Tata McGraw Hill,2015.
Reference Books	
1.	Herbert Schildt, The Complete Reference C#.NET, TataMcGraw-Hill,2017.
2.	Kogent Learning Solutions, C# 2012 Programming Covers .NET 4.5 Black Book, Dreamtech pres,2013.
3.	Anne Boehm, Joel Murach, Murach's C# 2015, Mike Murach& Associates Inc.2016.
4.	DenielleOtey, Michael Otey, ADO.NET: The Complete reference, McGrawHill,2008.
5.	Matthew MacDonald, Beginning ASP.NET 4 in C# 2010, APRESS,2010.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	1	1	2
CO2	3	3	2	3	3
CO3	3	3	2	3	2
CO4	3	2	3	2	3
CO5	3	2	2	3	3
Weightage of course contributed to each PSO	15	12	10	12	13

Core Course 16 - OPERATING SYSTEM

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCS63	4	0	0	VI	4	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 and System Structures							12	
	Introduction to Operating Systems — Functions of an Operating System — Computer system organization and architecture — Operating system structures — OS operations — System services — System calls — System programs — OS design and implementation — System boot process — Introduction to virtualization and cloud-based operating systems								
II	Process Management and Scheduling							12	
	Process concept — Process scheduling — Operations on processes — Interprocess communication — Client-server communication — CPU scheduling criteria and algorithms — Thread scheduling — Multicore processor scheduling — Real-time scheduling — Case studies of modern operating systems (Linux/Windows)								
III	Process Synchronization and Deadlocks							12	
	Synchronization concepts — Critical section problem — Peterson's solution — Semaphores — Classical synchronization problems — Deadlock system model — Deadlock characterization — Prevention, avoidance, detection, and recovery — Resource allocation in distributed systems								
IV	Memory Management and Virtualization							12	
	Memory management techniques — Swapping — Contiguous allocation — Paging — Segmentation — Virtual memory concepts — Demand paging — Page replacement algorithms — Frame allocation — Thrashing — Introduction to memory virtualization and containerization								
V	File Systems and Mass Storage							12	
	File system concepts — File access methods — Directory structures — File sharing and protection — File system implementation — Allocation methods — Free space management — Disk structure and scheduling — Disk management — Storage virtualization and cloud storage concepts								
	TOTAL							60	
CO	Course Outcomes								
CO1	Explain operating system concepts, structures, and services.								
CO2	Apply process scheduling and synchronization techniques for resource management.								
CO3	Analyze deadlock handling and interprocess communication mechanisms.								

CO4	Evaluate memory management and virtual memory techniques.
CO5	Understand file system implementation and storage management concepts.
	Textbooks
1.	Silberschatz, Abraham, Peter B. Galvin, and Greg Gagne. <i>Operating System Concepts</i> . 10th ed., Wiley, 2018.
2.	Tanenbaum, Andrew S., and Herbert Bos. <i>Modern Operating Systems</i> . 4th ed., Pearson, 2015.
	Reference Books
1.	Stallings, William. <i>Operating Systems: Internals and Design Principles</i> . 9th ed., Pearson, 2018.
2.	Dhamdhere, D. M. <i>Operating Systems: A Concept-Based Approach</i> . 3rd ed., McGraw-Hill Education, 2012.
3.	Deitel, Harvey M., Paul J. Deitel, and David R. Choffnes. <i>Operating Systems</i> . 3rd ed., Pearson, 2004.
4.	Love, Robert. <i>Linux Kernel Development</i> . 3rd ed., Addison-Wesley, 2010.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	-	-	1
CO2	3	3	2	2	2
CO3	3	3	2	3	2
CO4	3	3	2	3	2
CO5	2	3	3	2	3
Weightage of course contributed to each PSO	14	14	9	10	10

ELECTIVE COURSE (7) – ARTIFICIAL INTELLIGENCE

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECS61	4	0	0	VI	4	4	50	50	100
Learning Objectives									
LO1	To understand fundamental concepts and techniques of Natural Language Processing.								
LO2	To learn linguistic processing including syntax, semantics, and discourse analysis.								
LO3	To apply machine learning methods for NLP tasks such as tagging, translation, and retrieval.								
LO4	To develop knowledge of text generation and language modeling techniques.								
LO5	To explore lexical resources and modern NLP applications including multilingual processing..								
Prerequisites:									
Unit	Contents								No. of Hours
I	Introduction: What is AI – Foundations of Artificial Intelligence – History of Artificial Intelligence – State of the Art – Risks and Benefits of AI. Intelligent Agents: Agents and Environments – Nature of Environments – Specifying Task Environment – Properties of Task Environments. Ethical AI, Responsible AI concepts, AI in real-world applications.								12
II	Solving Problems by Searching: Problem Solving Agents – Example Problems – Search Algorithms – Uninformed Search Strategies (BFS, DFS, Uniform Cost Search) – Informed Search Strategies (Greedy Best First Search, A* Search). Introduction to Optimization Problems and AI in Games.								12
III	Learning from Examples: Forms of Learning – Supervised Learning – Decision Trees – Learning from Examples. Deep Learning: Feedforward Networks – Gradients and Learning – Applications (Vision and NLP). Introduction to Neural Network Libraries and AI Tools.								12
IV	Computer Vision: Image Formation – Image Features – Edge Detection – Segmentation – Image Classification – CNN – Object Detection – Applications of Computer Vision.AI in Healthcare and Smart Surveillance.)								12
V	Robotics: Robot Hardware – Types of Robots – Sensors – Motion – Human-Robot Interaction – Applications of Robotics. Autonomous Systems and Industry 4.0 Robotics.								12
TOTAL								60	
CO	Course Outcomes								
CO1	Explain AI concepts, intelligent agents, and their environments								
CO2	Apply search algorithms for solving computational problems.								
CO3	Analyze machine learning and deep learning techniques								
CO4	Demonstrate understanding of computer vision and robotics systems.								
CO5	Evaluate AI applications and ethical implications in real-world scenarios.								
Textbooks									
1	Artificial Intelligence: A Modern Approach Russell, Stuart, and Peter Norvig. <i>Artificial Intelligence: A Modern Approach</i> . 4th ed., Pearson, 2021.								

	Artificial Intelligence Rich, Elaine, Kevin Knight, and Shivashankar B. Nair. <i>Artificial Intelligence</i> . 3rd ed., McGraw-Hill, 2009.
Reference Books	
1.	Deep Learning Goodfellow, Ian, YoshuaBengio, and Aaron Courville. <i>Deep Learning</i> . MIT Press, 2016.
2.	Pattern Recognition and Machine Learning Bishop, Christopher M. <i>Pattern Recognition and Machine Learning</i> . Springer, 2006.
3	Machine Learning Mitchell, Tom M. <i>Machine Learning</i> . McGraw-Hill, 1997.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	-	-	1	3
CO2	3	3	2	-	1	3
CO3	3	3	2	1	2	3
CO4	2	3	2	2	2	3
CO5	2	2	1	2	3	3
Weightage of course contributed to each PSO	13	13	7	5	9	15

ELECTIVE COURSE (8) – ARTIFICIAL NEURAL NETWORK

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECS62	4	0	0	VI	4	4	50	50	100
Learning Objectives									
LO1	To understand the biological inspiration and mathematical models of neural networks.								
LO2	To learn perceptron models and various neural learning algorithms.								
LO3	To analyze multilayer neural networks and backpropagation training								
LO4	To develop knowledge of text generation and language modeling techniques.								
LO5	To explore lexical resources and modern NLP applications including multilingual processing.								
Prerequisites:									
Unit	Contents								No. of Hours
I	Artificial Neural Model – Activation Functions – Feedforward and Feedback Networks – Convex Sets – Convex Hull – Linear Separability – Non-Linear Separable Problems – Multilayer Networks – Learning Algorithms – Error Correction – Gradient Descent Rule – Perceptron Learning Algorithm – Perceptron Convergence Theorem.Modern activation functions such as ReLU, Leaky ReLU, and Softmax..								12
II	Introduction – Error Correction Learning – Memory-Based Learning – Hebbian Learning – Competitive Learning – Boltzmann Learning – Credit Assignment Problem – Learning with and without Teacher – Learning Tasks – Memory and Adaptation.Reinforcement learning basics and real-world AI training datasets..								12
III	Single Layer Perceptron: Pattern Recognition – Linear Classifier – Perceptron Learning Algorithm – Modified Perceptron – Adaptive Linear Combiner – Continuous Perceptron – Learning in Continuous Perceptron – Limitations of Perceptron. Applications in classification problems using modern tools.								12
IV	Multilayer Perceptron Networks: MLP Architecture – Hidden Layers – Delta Learning Rule – Multilayer Feedforward Networks – Generalized Delta Rule – Backpropagation Algorithm. Optimization techniques like Adam optimizer and regularization methods.								12
V	Deep Learning: Introduction – Neuro Architecture – Deep Convolutional Neural Networks – Recurrent Neural Networks – Feature Extraction – Deep Belief Networks – Restricted Boltzmann Machines – Training Deep Neural Networks – Applications.Transfer learning, pretrained models, and AI applications in industry..								12
TOTAL								60	
CO	Course Outcomes								
CO1	Explain neural network models, activation functions, and learning rules.								
CO2	Apply various neural learning algorithms for pattern recognition problems.								
CO3	Analyse perceptron and multilayer neural network architectures								
CO4	Implement backpropagation and deep learning models.								

CO5	Evaluate deep learning techniques for practical applications.
Textbooks	
➤	Neural Networks: A Comprehensive Foundation Haykin, Simon. <i>Neural Networks: A Comprehensive Foundation</i> . 2nd ed., Pearson, 2008.
➤	Artificial Neural Networks Yegnanarayana, B. <i>Artificial Neural Networks</i> . PHI Learning, 2009.
Reference Books	
1.	Deep Learning Goodfellow, Ian, Yoshua Bengio, and Aaron Courville. <i>Deep Learning</i> . MIT Press, 2016.
2.	Pattern Recognition and Machine Learning Bishop, Christopher M. <i>Pattern Recognition and Machine Learning</i> . Springer, 2006.
3	Neural Networks and Learning Machines Haykin, Simon. <i>Neural Networks and Learning Machines</i> . 3rd ed., Pearson, 2009.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	-	-	1
CO2	3	3	2	1	2
CO3	3	3	2	2	2
CO4	3	3	3	2	3
CO5	2	3	2	3	3
Weightage of course contributed to each PSO	14	14	9	8	11

ELECTIVE COURSE (9) – CYBER FORENSICS

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UECS63	4	0	0	VI	4	4	50	50	100
Learning Objectives									
LO1	To understand the fundamentals and importance of computer forensics.								
LO2	To learn techniques for digital evidence collection and preservation.								
LO3	To analyze digital data using forensic tools and methodologies.								
LO4	To understand legal and ethical issues related to digital investigations.								
LO5	To apply forensic techniques in cybercrime and network investigations								
Prerequisites:									
Unit	Contents							No. of Hours	
I	Overview of Computer Forensics Technology Computer Forensics Fundamentals – Definition and Scope – Use of Computer Forensics in Law Enforcement – Role in HR/Employment Proceedings – Computer Forensic Services – Benefits of Professional Methodology – Steps followed by Forensic Specialists – Types of Computer Forensics Technology (Business, Military, Law Enforcement). Introduction to cybercrime trends, digital evidence challenges, and cloud forensics basics.							12	
II	Computer Forensics Evidence and Capture Data Recovery Concepts – Backup and Recovery Methods – Role of Backup in Recovery – Recovery Solutions – Evidence Collection and Data Seizure – Evidence Collection Options – Obstacles – Types of Evidence. Live forensics, mobile device evidence acquisition, and IoT data sources.							12	
III	Duplication and Preservation of Digital Evidence Processing Steps – Legal Aspects of Evidence Collection – Preservation Techniques – Chain of Custody – Computer Image Verification and Authentication – Evidential Authentication Requirements – Practical Considerations and Implementation. Hashing algorithms (MD5, SHA) and forensic imaging tools.using modern tools.							12	
IV	Computer Forensics Analysis Discovery of Electronic Evidence – Electronic Document Discovery – Identification of Data – Timeline Analysis – Forensic Identification and Analysis of Surveillance Devices. Malware forensics basics and memory forensics introduction.							12	
V	Reconstructing Past Events and Network Forensics Digital Investigation Process – File Formats (Usable and Unusable) – File Conversion – Network Forensics Scenarios – Technical Investigation Approach – Email Destruction – Evidence Tampering – Documenting Intrusions – Data Destruction Analysis – System Testing. Incident response frameworks and cloud/network log analysis.							12	
TOTAL								60	
CO	Course Outcomes								
CO1	Explain the concepts and applications of computer forensics.								

CO2	Demonstrate methods for evidence acquisition and preservation.
CO3	Analyse digital evidence using forensic investigation techniques.
CO4	Evaluate legal requirements and authentication procedures for evidence.
CO5	Apply forensic techniques in network and cybercrime investigations.
Textbooks	
➤	Computer Forensics: Computer Crime Scene Investigation Vacca, John R. <i>Computer Forensics: Computer Crime Scene Investigation</i> . 2nd ed., Charles River Media, 2005.
➤	Guide to Computer Forensics and Investigations Nelson, Bill, Amelia Phillips, and Christopher Steuart. <i>Guide to Computer Forensics and Investigations</i> . Cengage Learning, 2018
Reference Books	
1.	Digital Forensics and Incident ResponseLuttgens, Jason T., Matthew Pepe, and Kevin Mandia. <i>Incident Response and Computer Forensics</i> . McGraw-Hill, 2014.
2.	File System Forensic AnalysisCarrier, Brian. <i>File System Forensic Analysis</i> . Addison-Wesley, 2005.
3	Network Forensics Davidoff, Sherri, and Jonathan Ham. <i>Network Forensics: Tracking Hackers through Cyberspace</i> . Prentice Hall, 2012.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	-	-	1
CO2	3	3	2	1	2
CO3	3	3	3	2	2
CO4	2	3	2	3	1
CO5	2	3	3	3	2
Weightage of course contributed to each PSO	13	14	10	9	8

CORE -18– MAJOR PROJECT WITH VIVA VOCE

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCCS6P	0	0	5	V	4	5	50	50	100
Learning Objectives									
LO1	To understand software development methodologies and database design principles.								
LO2	To develop real-time applications using programming languages and database systems.								
LO3	To design user-friendly interfaces and integrate frontend with backend technologies.								
LO4	To implement testing, debugging, and deployment techniques for software projects.								
LO5	To develop project management and documentation skills for real-world applications								
Prerequisites:									
TOTAL								75	
CO	Course Outcomes								
CO1	Express their views with ppt illustrations and critical support								
CO2	Organize the views and solutions as modules of the project								
CO3	Analyze the various possible solutions of the chosen problem domain								
CO4	Evaluate the adopted solution with various testing								
CO5	Compile the development of solution as Documentation								

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2	2	3	2	2
CO2	3	3	3	2	2
CO3	3	3	2	3	2
CO4	2	3	2	3	3
CO5	2	2	3	3	2
Weightage of course contributed to each PSO	12	14	13	13	11

EXTENSION ACTIVITY

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26U5EA61	0	0	0	VI	1	1	-	100	100
Learning Objectives									
LO1	To promote community involvement, encourage civic participation, and foster a sense of ownership and responsibility.								
LO2	To involve the learners in organizing campaigns, seminars, or public events to educate the public, promote understanding, and advocate for positive change.								
LO3	To create platforms for knowledge sharing, partnership development, and collective action.								
LO4	To encourage environmental conservation, promote responsible resource management, or foster sustainable livelihoods								
LO5	To raise awareness about social issues, advocate for marginalized groups, or implement programs that promote inclusivity and equal opportunities.								
Prerequisites:									
TOTAL									
CO	Course Outcomes								
CO1	Recognize the importance of community service through training and education								
CO2	Interpret ecological concerns, consumer rights, gender issues & legal protection								
CO3	Develop team spirit, verbal/nonverbal communication and organizational ethics by participating in community service								
CO4	Examine the necessity of professional skills & community-oriented services for a holistic development								
CO5	Create awareness on human rights, legal rights, First Aid, Physical fitness and wellbeing								

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	6

	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	
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

➤	B. K. Chakravarthy, Design Technology and Innovation, SWAYAM NPTEL (Online)
➤	B. K. Chakravarthy, Innovation by Design, SWAYAM NPTEL (Online)
➤	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	
➤	Brainstorm and explore various problems in IT field. Select an appropriate problem, draft a Problem Statement and get it approved for performing further activities.
➤	Design AEIOU canvas
➤	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