Holy Cross College (Autonomous), Nagercoil

Kanyakumari District, Tamil Nadu.

Accredited with A^{++} by NAAC - V Cycle (CGPA 3.53)

Affiliated to

Manonmaniam Sundaranar University, Tirunelveli

Semester I - VI

Guidelines & Syllabus

DEPARTMENT OF COMPUTER SCIENCE

2023-2026

(With effect from the academic year 2025-2026)

Issued from

THE DEANS' OFFICE

SU 1

Vision

To provide a high-quality undergraduate education in computer science that prepares students for productive careers and life-long learning.

Mission

1. To demonstrate proficiency in problem-solving techniques using the computer.
2. To demonstrate proficiency in at least two high-level programming languages and two operating systems
3. To show the ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.
4. To show the ability to function effectively on teams to accomplish a common goal.
5. To sensitize the students to the social realities around them with the vision of making them responsible citizen.

Graduate Attributes

Graduates of our College develop the following attributes during the course of their studies.

- **Creative thinking:**
  Equipping students with hands-on-training through skill-based courses and promote startup.
- **Personality development:**
  Coping with increasing pace and change of modern life through value education, awareness on human rights, gender issues and giving counselling for the needful.
- **Environmental consciousness and social understanding:**
  Reflecting upon green initiatives and understanding the responsibility to contribute to the society; promoting social and cultural diversity through student training and service-learning programmes.
- **Communicative competence:**
  Offering effective communication skills in both professional and social contexts through bridge courses and activities of clubs and committees.
- **Aesthetic skills:**
  Engaging mind, body and emotions for transformation through fine arts, meditation and exercise; enriching skills through certificate courses offered by Holy Cross Academy.
- **Research and knowledge enrichment:**
  Getting in-depth knowledge in the specific area of study through relevant core papers; ability to create new understanding through the process of critical analysis and problem solving.
- **Professional ethics:**
  Valuing honesty, fairness, respect, compassion and professional ethics among students. The students of social work adhere to the *National Association of Social Workers Code of Ethics*
- **Student engagement in the learning process:**
  Obtaining extensive and varied opportunities to utilize and build upon the theoretical and empirical knowledge gained through workshops, seminars, conferences, industrial visits and summer internship programmes.
- **Employability:**
  Enhancing students in their professional life through Entrepreneur development, Placement & Career guidance cell.
- **Women empowerment and leadership:**
  Developing the capacity of self-management, team work, leadership and decision making through gender sensitization programmes.

Programme Educational Objectives (PEOs)

PEOs	Upon completion of B.A/B.Sc. degree programme, the graduates will be able to	Mission addressed
PEO1	apply appropriate theory and scientific knowledge to participate in activities that support humanity and economic development nationally and globally, developing as leaders in their fields of expertise.	**M1& M2**
PEO2	inculcate practical knowledge for developing professional empowerment and entrepreneurship and societal services.	**M2, M3, M4 & M5**
PEO3	pursue lifelong learning and continuous improvement of the knowledge and skills with the highest professional and ethical standards.	**M3, M4, M5 & M6**

Programme Outcomes (POs)

POs	Upon completion of B.Sc. Degree Programme, the graduates will be able to:	Mapping with PEOs
PO1	obtain comprehensive knowledge and skills to pursue higher studies in the relevant field of science.	**PEO1**
PO2	create innovative ideas to enhance entrepreneurial skills for economic independence.	**PEO2**
PO3	reflect upon green initiatives and take responsible steps to build a sustainable environment.	**PEO2**
PO4	enhance leadership qualities, team spirit and communication skills to face challenging competitive examinations for a better developmental career.	**PEO1 & PEO3**
PO5	communicate effectively and collaborate successfully with peers to become competent professionals.	**PEO2 & PEO3**
PO6	absorb ethical, moral and social values in personal and social life leading to highly cultured and civilized personality	**PEO2 & PEO3**
PO7	participate in learning activities throughout life, through self-paced and self-directed learning to develop knowledge and skills.	**PEO1 & PEO3**

Programme Specific Outcomes (**PSOs**)

PSOs	Upon completion of the B.Sc. Computer Science Programme, the graduates will be able to:	Mapping with POs
PSO1	obtain sufficient knowledge and skills enabling them to undertake further studies in Computer Science and its allied areas on multiple disciplines linked with Computer Science.	**PO1**
PSO2	evaluate and apply emerging technologies in computer science to develop innovative solutions for real-world problems	**PO2**
PSO3	develop a range of generic skills helpful in team building, problem solving, technical ability, employment, internships, communication and societal activities.	**PO4 & PO7**
PSO4	communicate effectively, work collaboratively, and demonstrate ethical and professional attitudes in diverse settings.	**PO5 & PO6**
PSO5	sensitize various economic issues related to Development, Growth, International Economics, Sustainable Development and Environment	**PO3**

Mapping of POs and PSOs

POs	PSO1	PSO2	PSO3	PSO4	PSO5
PO1	M	S	S	S	S
PO2	S	M	S	S	S
PO3	M	S	S	S	M
PO4	S	S	M	S	S
PO5	S	M	S	M	S
PO6	M	S	S	M	S
PO7	S	S	M	S	S

Eligibility Norms for Admission

Those who seek admission to B.Sc. Computer Science must have passed the Higher Secondary Examination (10+2) (Academic / Vocational Stream) conducted by the Government of Tamil Nadu **with Computer Science or Mathematics as one of the subjects** or an examination accepted as equivalent thereto by the syndicate of Manonmaniam Sundaranar University, Tirunelveli, is eligible for admission and the medium of instruction is English.

Duration of the Programme: 3 years

Medium of Instruction: English

Passing Minimum

A minimum of 40% in the external examination and an aggregate of 40% is required. There is no minimum pass mark for the Continuous Internal Assessment.

Components of the B.Sc Computer Science Programme

Part III (Core and Elective Courses)

Core Courses	Core – Theory papers	8 x100	800
	Core Lab Course	7 x100	700
	Discipline Specific Elective - Theory papers	4 x 100	400
	Core Research Project	1 x 100	100
	Total marks		**2000**
Elective Courses	Theory	4x100	400
	Elective Lab Course	1x100	100
	Total marks		**500**
Part III - Total marks			**2500**

- **Core Lab Courses carry 100 marks each.**
- **Practical examination will be conducted at the end of each semester.**

Course Structure

Distribution of Hours and Credits

Curricular Courses:

Course	S I	S II	S III	S IV	S V	S VI	Total	
							H	C
Part I Language	6 (3)	6 (3)	6 (3)	6 (3)			24	**12**
Part II English	6 (3)	6 (3)	6 (3)	6 (3)			24	**12**
Part III Core Course Core Lab Course Core Research Project	5(5) 5(5)	5(5) 5(5)	5(5) 3(3)	5(5) 5(5)	5(4) + 5(4) 5(4) 5(4)	5(4)+ 5(4) 4(3)+ 4(3)	76	**68**
Elective /Discipline Specific Elective Courses	4 (3)	4 (3)	4 (3) 2(2)	4 (3)	4 (3)+ 4 (3)	5 (3)+ 5(3)	36	**26**
Part IV								
Non-major Elective	2 (2)	2 (2)					4	**4**
Skill Enhancement Course		2 (2)	2(2) + 2 (2)	2 (2)			8	**8**
Foundation Course	2 (2)						2	**2**
Environmental Studies				2 (2)			2	**2**
Internship					(2)		-	**2**
Professional Competency Skill					2 (2)	2 (2)	4	**4**
Total	**30 (23)**	**30 (23)**	**30 (23)**	**30 (23)**	**30 (26)**	**30 (22)**	**180**	**140**

Total number of Hours = 180

Co-curricular Courses

Course	S I	S II	S III	S IV	S V	S VI	Total
LST (Life Skill Training)	-	(1)	-	(1)			2
Skill Development Training (Certificate Course)	(1)						1
Field Project		(1)					1
Specific Value-added Course	(1)		(1)				2
Generic Value-added Course				(1)		(1)	2
MOOC	(2)						2
Student Training Activity: Clubs & Committees / NSS				(1)			1
Community Engagement Activity: RUN				(1)			1
Human Rights, Justice and Ethics					(1)		1
Gender Equity and Inclusivity						(1)	1
Total							**14**

COURSES OFFERED

SEMESTER I

Course	Course Code	Title of the Course	Credits	Hours/ Week
Part I	TU231TL1 FU231FL1	Language: Tamil French	3	6
Part II	EU241EL1	English: A Stream	3	6
	EU241EL2	English: B Stream		
	EU241EL3	English: C Stream		
Part III	SU241CC1	Core Course I: Python Programming	5	5
	SU231CP1	Core Lab Course I: Python Programming Lab	5	5
	SU231EC1	Elective Course I: Numerical Methods	3	4
Part IV	SU231NM1 SU241NM1	Non Major Elective NME I: Office Automation	2	2
	SU231FC1	Foundation Course: Problem Solving Techniques	2	2
		Total	**23**	**30**

SEMESTER II

Course	Course Code	Title of the Course	Credits	Hours/ Week
Part I	TU232TL1 FU232FL1	Language: Tamil French	3	6
Part II	EU242EL1	English: A Stream	3	6
	EU242EL2	English: B Stream		
	EU242EL3	English: C Stream		
Part III	SU242CC1	Core Course II: Data Structure and Algorithms	5	5
	SU232CP1	Core Lab Course II: Data Structure and Algorithms Lab	5	5
	SU232EC1	Elective Course II: Discrete Mathematics	3	4
Part IV	SU232NM1/ SU242NM1	Non Major Elective NME II: Introduction to HTML	2	2
	SU232SE1	Skill Enhancement Course SEC - I: Advanced Excel	2	2
		Total	**23**	**30**

SEMESTER III

Course	Course Code	Title of the Course	Credits	Hours /Week
Part I	TU233TL1 FU233FL1	Language: Tamil French	3	6
Part II	EU243EL1	English: A Stream	3	6
	EU243EL2	English: B Stream		
	EU243EL3	English: C Stream		
Part III	SU233CC1	Core Course III: Programming in Java	5	5

	SU233CP1	Core Lab Course III: Programming in Java Lab	3	3
	SU233EC1	Elective Course III: Web Technology	3	4
	SU233EP1	Elective Lab Course I: Web Technology Lab	2	2
Part IV	SU233SE1	Skill Enhancement Course SEC-II: Programming in PHP	2	2
	UG23CSE1	Skill Enhancement Course SEC-III: Fitness for Wellbeing	2	2
		Total	**23**	**30**

SEMESTER IV

Course	Course Code	Title of the Course	Credits	Hours /Week
Part I	TU234TL1 FU234FL1	Language: Tamil French	3	6
Part II	EU244EL1	English: A Stream	3	6
	EU244EL2	English: B Stream		
	EU244EL3	English: C Stream		
Part III	SU234CC1	Core Course IV: .Net Programming	5	5
	SU234CP1	Core Lab Course IV: .Net Programming Lab	5	5
	SU234EC1	Elective Course IV: Software Engineering	3	4
Part IV	UG23CSE2	Skill Enhancement Course SEC-IV: Digital Fluency	2	2
	UG234EV1	Environmental Studies (EVS)	2	2
		Total	**23**	**30**

SEMESTER V

Course	Course Code	Title of the Course	Credits	Hours /Week
Part III	SU235CC1	Core Course V: Relational Database Management System	4	5
	SU235CC2	Core Course VI: Operating System	4	5
	SU235CP1	Core Lab Course V: Relational Database Management System Lab	4	5
	SU235RP1	Core Research Project	4	5
	SU235DE1 SU235DE2 SU235DE3	Discipline Specific Elective I: a) Computer Networks b) Cloud Computing c) Internet of Things	3	4
	SU235DE4 SU235DE5 SU235DE6	Discipline Specific Elective II: a) Virtual and Augmented Reality b) Image Processing c) Artificial Intelligence	3	4
Part IV	UG235PS1	Professional Competency Skill I: Career Skills	2	2
	SU235IS1	Internship	2	-
		Total	**26**	**30**

SEMESTER VI

Course	Course Code	Title of the Course	Credits	Hours /Week
Part III	SU236CC1	Core Course VII: Computer Graphics	4	5
	SU236CC2	Core Course VIII: Machine Learning	3	4
	SU236CP1	Core Lab Course VI: Computer Graphics Lab	4	5
	SU236CP2	Core Lab Course VII: Machine Learning Lab	3	4
	SU236DE1 SU236DE2 SU236DE3	Discipline Specific Elective III: a) Cryptography b) Network security c) Data Science Essentials	3	5
	SU236DE4 SU236DE5 SU236DE6	Discipline Specific Elective IV: a) Cybersecurity b) Blockchain Technologies c) Ethical Hacking	3	5
	UG236PS1	Professional Competency Skill: Unix and Shell Programming Lab	2	2
		Total	**22**	**30**
TOTAL			**140**	**180**

Co-curricular Courses

Part	Semester	Course Code	Title of the Course	Credit
Part V	I & II	UG232LC1	Life Skill Training I: Catechism	1
		UG232LM1	Life Skill Training I: Moral	
	I	UG231C01 –	Skill Development Training (SDT) - Certificate Course	1
	II	SU232FP1	Field Project	1
	I & III	SU231V01 -	Specific Value-added Course	1+1
	VI	UG236OC1 & UG236OC2	MOOC	2
	III & IV	UG234LC1	Life Skill Training II: Catechism	1
		UG234LM1	Life Skill Training II: Moral	
	IV & VI	GVAC2401 -	Generic Value-added Course	1 +1
	I - IV	UG234ST1	Student Training Activity – Clubs & Committees / NSS	1
	IV	UG234CE1	Community Engagement Activity – RUN	1
	V	UG235HR1	Human Rights, Justice and Ethics	1
	VI	UG236GE1	Gender Equity and Inclusivity	1
Total				**14**

Specific Value-added Course

Semester	Course Code	Title of the Course	Credit	Total hours
I	SU231V01	Procedural Language	1	30
I	SU231V02	Upgrading and Repairing PCS	1	30
I	SU231V03	Robotics and its applications	1	30
III	SU233V01	Adobe InDesign CS4	1	30
III	SU233V02	Flutter	1	30
III	SU233V03	2D Animation using Pivot Animator	1	30

Self-Learning Course

Semester	Course code	Title of the course	Credit
III/V	SU233SL1/ SU235SL1	Adobe Illustrator CS4	1
IV/VI	SU234SL1/ SU236SL1	Web Animation	1

Examination Pattern

Each paper carries an internal component. There is a passing minimum for external component. A minimum of 40% in the external examination and an aggregate of 40% is required.

i. Part I – Tamil, Part II – English, Part III - (Core Course/ Elective Course)

Ratio of Internal and External= 25:75

Continuous Internal Assessment (CIA)

Internal Components and Distribution of Marks

Components	Marks
Internal test (2) - 40 marks	10
Quiz (2) - 20 marks	5
Assignment: (Model Making, Exhibition, Role Play, Seminar, Group Discussion, Problem Solving, Class Test, Open Book Test etc. (Minimum three items per course should be included in the syllabus & teaching plan) (30 marks)	10
Total	**25**

Question Pattern

Internal Test	Marks	External Exam	Marks
Part A 4 x 1(No choice)	4	Part A 10 x 1 (No choice)	10
Part B 2 x 6 (Internal choice)	12	Part B 5 x 6 (Internal choice)	30
Part C 2 x 12 (Internal choice)	24	Part C 5x 12 (Internal choice)	60
Total	**40**	**Total**	**100**

ii. Lab Course:

Ratio of Internal and External= 25:75

Total: 100 marks

Internal Components and Distribution of Marks

Internal Components	Marks
Performance of the Experiments	10
Regularity in attending practical and submission of records	5
Record	5
Model exam	5
Total	**25**

Question pattern

External Exam	Marks
Major Practical	75
Minor Practical / Spotters /Record	
Total	**75**

iii. Core Research Project

Ratio of Internal and External = 25:75

Components	Marks
Internal	25
External	
Core Research Project Report	40

Viva voce	35
Total	**100**

Part IV

i. Non-major Elective, Skill Enhancement Course I & II, Foundation Course and Professional Competency Skill

Ratio of Internal and External = 2**5: 75**

Internal Components and Distribution of Marks

Components	**Marks**
Internal test (2) – 25 marks	10
Quiz (2) – 20 marks	5
Assignment: (Model Making, Exhibition, Role Play, Album, Group Activity, etc. (Minimum three items per course)	10
Total	**25**

Question Pattern

Internal Test	**Marks**	**External Exam**	**Marks**
Part A 2 x 2 (No Choice)	4	Part A 5 x 2 (No Choice)	10
Part B 3 x 4 (Open choice **Three** out of **Five**)	12	Part B 5 x 4 (Open choice any **Five** out of **Eight**)	20
Part C 1 x 9 (Open choice O**ne** out of **Three**)	9	Part C 5 x 9 (Open choice any **Five** out of **Eight**)	45
Total	**25**	**Total**	**75**

ii. Skill Enhancement Course III & IV

Digital Fluency

Components	**Marks**
Internal	
Quiz (15 x 1)	15
Lab Assessment (5 x 2)	10
Total	**25**
External	
Practical (2 x 25)	50
Procedure	25
Total	**75**

Fitness and Wellbeing

Components	**Marks**
Internal	
Quiz (15 x 1)	15
Exercise (2 x 5)	10
Total	**25**
External	
Written Test: Part A: Open choice – 5 out of 8 questions (5 x 5) Part B: Open choice – 5 out of 8 questions (5 x 10)	25 50
Total	**75**

iii. Environmental Studies

Internal Components	**Marks**
Project Report	15
Viva voce	10
Total	**25**

External Exam	Marks
Part A 5 x 2 (No Choice)	10
Part B 5 x 4 (Open choice any **Five** out of **Eight**)	20
Part C 5 x 9 (Open choice any **Five** out of **Eight**)	45
Total	**75**

iv. Internship

Components	Marks
Industry Contribution	50
Report & Viva-voce	50
Total	**100**

v. Professional Competency Skill

Internal Components	Marks
Test – 20 marks	5
Individual Activity	10
Group Activity	10
Total	**25**
External Exam	**Marks**
Part A 5 x 2 (No Choice)	10
Part B 5 x 4 (Open choice any **Five** out of **Eight**)	20
Part C 5 x 9 (Open choice any **Five** out of **Eight**)	45
Total	**75**

Co-Curricular Courses:

i. Life Skill Training: Catechism & Moral
Human Rights,Justice and Ethics
Gender Equity and Inclusivity
Internal Components

Component	Marks
Project - Album on current issues	25
Group Activity	25
Total	**50**

External Components

Component	Marks
Written Test: Open choice – 5 out of 8 questions (5 x 10)	50
Total	**50**

ii. Skill Development Training - Certificate Course:

Components	Marks
Attendance & Participation	50
Skill Test	50
Total	**100**

iii. Field Project:

Components	Marks
Field Work	50
Field Project Report & Viva-voce	50

Total	**100**

iv. Specific Value-Added Courses & Generic Value-Added Courses:

Components	**Marks**
Internal	25
External	75
Total	**100**

v. Student Training Activity: Clubs and Committees

Compulsory for all I & II year students (1 credit).

Component	**Marks**
Attendance	25
Participation	75
Total	**100**

vi. Community Engagement Activity: Reaching the Unreached Neighbourhood (RUN)

Components	**Marks**
Attendance & Participation	50
Field Project	50
Total	**100**

vii. Self-Learning Course

Internal Test	**Marks**	**External Exam**	**Marks**
Part A 2 x 2 (No Choice)	4	Part A 5 x 2 (No Choice)	10
Part B 3 x 4 (Open choice **Three** out of **Five**)	12	Part B 5 x 4 (Open choice any **Five** out of **Eight**)	20
Part C 1 x 9 (Open choice O**ne** out of **Three**)	9	Part C 5 x 9 (Open choice any **Five** out of **Eight**)	45
Total	**25**	**Total**	**75**

Outcome Based Education (OBE)

(i) Knowledge levels for assessment of Outcomes based on Blooms Taxonomy

S. No.	**Level**	**Parameter**	**Description**
1	KI	Knowledge/Remembering	It is the ability to remember the previously learned
2	K2	Comprehension/Understanding	The learner explains ideas or concepts
3	K3	Application/Applying	The learner uses information in a new way
4	K4	Analysis/Analysing	The learner distinguishes among different parts
5	K5	Evaluation/Evaluating	The learner justifies a stand or decision
6	K6	Synthesis /Creating	The learner creates a new product or point of view

(ii) Weightage of K – Levels in Question Paper

Number of questions for each cognitive level:

Programme	**Assessment**	**Lower Order Thinking**									**Higher order thinking**			**Total number of questions**
		K1			**K2**			**K3**			**K4, K5, K6**			
	Part	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**	
I UG	Internal	2	1	-	1	1	1	1	-	1	-	-	-	**8**
	External	5	2	1	3	2	2	2	1	2	-	-	-	**20**

II UG	Internal	1	1	-	1	1	1	1	-	1	1	-	-	**8**
	External	5	1	1	4	1	1	-	3	1	1	-	2	**20**
III UG	Internal	1	-	-	1	-	1	1	1	1	1	1	-	**8**
	External	5	1	1	4	1	1	-	3	1	1	-	2	**20**

The levels of assessment are flexible and it should assess the cognitive levels and outcome attainment.

Evaluation

i. The performance of a student in each course is evaluated in terms of percentage of marks with a provision for conversion to grade points.

ii. Evaluation of each course shall be done by Continuous Internal Assessment (CIA) by the course teacher as well as by an end semester examination and will be consolidated at the end of the semester.

iii. There shall be examinations at the end of each semester, for odd semesters in October/November; for even semesters in April/ May.

iv. A candidate who does not pass the examination in any course(s) shall be permitted to reappear in such failed course(s) in the subsequent examinations to be held in October/ November or April/May. However, candidates who have arrears in practical examination shall be permitted to reappear for their areas only along with regular practical examinations in the respective semester.

v. Viva-voce: Each project group shall be required to appear for Viva -voce examination in defence of the project.

vi. The results of all the examinations will be published in the college website.

Conferment of Bachelor's Degree

A candidate shall be eligible for the conferment of the Degree of Bachelor of Arts / Science / Commerce only if the minimum required credits for the programme thereof (140 + 18 credits) is earned.

Grading System

For the Semester Examination:

Calculation of Grade Point Average for End Semester Examination:

$$\textbf{GPA} = \frac{\text{Sum of the multiplication of grade points by the credits of the course}}{\text{Sum of the credits of the courses (passed) in a semester}}$$

For the entire programme:

Cumulative Grade Point Average (CGPA) $\Sigma_n\Sigma_i C_{ni}G_{ni} / \Sigma_{ni}\Sigma_i C_{ni}$

$$\text{CGPA} = \frac{\text{Sum of the multiplication of grade points by the credits of the entire programme}}{\text{Sum of the credits of the courses of the entire programme}}$$

Where ,

C_i - Credits earned for course i in any semester

G_i - Grade point obtained for course i in any semester

n - semester in which such courses were credited

Final Result

Conversion of Marks to Grade Points and Letter Grade

Range of Marks	Grade Points	Letter Grade	Description
90-100	9.0-10.0	O	Outstanding
80-89	8.0-8.9	D+	Excellent
75-79	7.5-7.9	D	Distinction
70-74	7.0-7.4	A+	Very Good
60-69	6.0-6.9	A	Good

50-59	5.0-5.9	B	Average
40-49	4.0-4.9	C	Satisfactory
00-39	0.0	U	Re-appear
ABSENT	0.0	AAA	ABSENT

Overall Performance

CGPA	**Grade**	**Classification of Final Result**
9.5-10.0	O+	First Class – Exemplary*
9.0 and above but below 9.5	O	
8.5 and above but below 9.0	D++	First Class with Distinction*
8.0 and above but below 8.5	D+	
7.5 and above but below 8.0	D	
7.0 and above but below 7.5	A++	First Class
6.5 and above but below 7.0	A+	
6.0 and above but below 6.5	A	
5.5 and above but below 6.0	B+	Second Class
5.0 and above but below 5.5	B	
4.0 and above but below 5.0	C	Third Class
0.0 and above but below 4.0	U	Re-appear

*The candidates who have passed in the first appearance and within the prescribed semester are eligible for the same.

SEMESTER I

CORE COURSE I: PYTHON PROGRAMMING

Course Code	L	T	P	S	Credits	Inst. Hours	Total	Marks		
								CIA	External	Total
SU241CC1	4	1	-	-	5	5	75	25	75	100

Prerequisite:

Basic Knowledge of Programming Concept.

Learning Objectives:

1. To understand the syntax and semantics of Python programming language.
2. To know the usage of usage of modules and files

Course Outcomes

On the successful completion of the course, student will be able to:		
1.	recall python syntax, basic structures and control flow statements	**K1**
2.	understand to analyze and debug python code	**K2**
3.	write python scripts to solve specific problems	**K3**
4.	apply python in creating simple applications or scripts for automation	**K3**
5.	create reusable python modules or packages for broader use	**K6**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K6**-Create

Units	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. Python Arrays: Defining and Processing Arrays – Array methods.	**15**
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.	**15**
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.	**15**
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. Oops Concepts: Class - Object – Constructors - Types of Variables - Types of Methods. Inheritance: Single Inheritance -Multiple Inheritance - Multi-level Inheritance - Hierarchical and Hybrid Inheritance. Polymorphism: With Functions and Objects - With Class Methods. Abstraction: Abstract Classes.	**15**
V	Python File Handling: Types of files in Python - Opening and Closing Files - Reading and Writing Files: write() and writelines() Methods - append() Method – read() and readlines() Methods – with keyword –	**15**

	Splitting words – File methods - File Positions - Renaming and Deleting Files.	
	Total	**75**

Self Study	Operators

Textbooks

1. ReemaThareja, 2017. *Python Programming using Problem Solving Approach*, (1st Edition), Oxford University Press.
2. Dr. R. NageswaraRao, 2017. *Core Python Programming*, (1st Edition), Dream Tech Publishers.
3. Micheal T. Goodrich, 2023. *Data Structures and Algorithms in Python*, (1st Edition), DreamTech Press.

Reference Books

1. VamsiKurama, 2018. *Python Programming: A Modern Approach*, (Kindle Edition), Pearson Education.
2. Mark Lutz, 2013. *Learning Python*, (5th Edition), O' Reilly Media, Inc.
3. Adam Stewarts, 2017. *Python Programming*, CreateSpace Independent Publishing Platform.
4. Fabio Nelli, 2015. *Python Data Analytics*, (1st Edition), Apress Publication.
5. Kenneth A. Lambert, 2024. *Fundamentals of Python: First Programs*, (3rd Edition), CENGAGE Publication.

Web Resources

1. https://www.programiz.com/python-programming
2. https://www.guru99.com/python-tutorials.html
3. https://www.w3schools.com/python/python_intro.asp
4. https://www.geeksforgeeks.org/python-programming-language/
5. https://en.wikipedia.org/wiki/Python_(programming_language)

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2	2	2	3	2	2	2	2
CO2	3	3	2	3	2	2	3	3	3	3	2	2
CO3	3	3	2	3	2	2	2	3	3	3	3	2
CO4	3	3	2	3	2	2	2	3	3	3	2	2
CO5	3	3	3	3	3	3	2	3	3	2	3	3
TOTAL	**15**	**14**	**11**	**14**	**11**	**11**	**11**	**15**	**14**	**13**	**12**	**11**
AVERAGE	**3**	**2.8**	**2.2**	**2.8**	**2.2**	**2.2**	**2.2**	**3**	**2.8**	**2.7**	**2.4**	**2.2**

3 – Strong, 2- Medium, 1- Low

SEMESTER I

CORE LAB COURSE I: PYTHON PROGRAMMING LAB

Course Code	L	T	P	S	Credits	Inst. Hours	Total	Marks		
								CIA	External	Total
SU231CP1	-	1	4	-	5	5	75	25	75	100

Prerequisite:

Basic Knowledge of Programming skill.

Learning Objectives:

1. To acquire programming skills in core Python.
2. To develop the ability to write database applications in Python.

Course Outcomes

On the successful completion of the course, student will be able to:		
1.	remember fundamental python syntax and basic data types , and understand the concepts.	**K1 & K2**
2.	understand the functionality and purpose of control structures and apply the concepts to identify patterns and relationships.	**K2 & K3**
3.	understand the purpose of functions , database and apply this to solve problems.	**K2 & K3**

K1 - Remember; **K2** - Understand; **K3** – Apply

List of Exercises	No. of Hours
Implement the following exercises using Python Programming language: 1. Program using variables, constants, I/O statements in Python. 2. Program using Operators in Python. 3. Program using Conditional Statements. 4. Program using Loops. 5. Program using Jump Statements. 6. Program using Functions. 7. Program using Recursion. 8. Program using Arrays. 9. Program using Strings. 10. Program using Modules. 11. Program using Lists. 12. Program using Tuples. 13. Program using Dictionaries. 14. Program for File Handling.	**75**

Textbooks

1. Reema Thareja, (2017). *Python Programming using problem solving approach*. (1st edition). Oxford University Press.
2. Dr. R. Nageswara Rao, (2017). *Core Python Programming*. (1st edition). Dream tech Publishers.

Reference Books

1. Vamsi Kurama, *Python Programming: A Modern Approach*, Pearson Education.
2. Mark Lutz, *Learning Python*, Orielly.
3. Adam Stewarts, *Python Programming*, online.
4. Fabio Nelli, *Python Data Analytics*, APress.

5. Kenneth A. Lambert, *Fundamentals of Python – First Programs*, CENGAGE Publication.

Web Resources

1. https://www.programiz.com/python-programming
2. https://www.guru99.com/python-tutorials.html
3. https://www.w3schools.com/python/python_intro.asp

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2	2	2	3	2	2	2	2
CO2	3	3	2	3	2	2	3	3	3	3	2	2
CO3	3	3	2	3	2	2	2	3	3	3	2	2
TOTAL	**9**	**8**	**6**	**7**	**6**	**6**	**7**	**9**	**8**	**8**	**6**	**6**
AVERAGE	**3**	**2.7**	**2**	**2.3**	**2**	**2**	**2.3**	**3**	**2.7**	**2.7**	**2**	**2**

3 – Strong, 2- Medium, 1- Low

SEMESTER I

ELECTIVE COURSE I: NUMERICAL METHODS

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU231EC1	3	1	-	-	3	4	60	25	75	100

Pre-requisite:

Students should know the basic knowledge of programming concept.

Learning Objectives:

1. To realize the basic understanding of numerical algorithms.
2. To implement algorithms to solve mathematical problems on the computer.

Course Outcomes

On the successful completion of the course, student will be able to:		
1.	remember the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for computer problems.	**K1& K2**
2.	understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.	**K2 & K4**
3.	apply this to solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with software applications.	**K3 & K5**
4.	analyze direct methods for solving linear systems.	**K4 & K5**
5.	evaluate methods for solving first and second order ordinary differential equations.	**K3 & K5**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

Units	Contents	No. of Hours
I	**Fundamentals of Algebraic Equation**: Solution of Algebraic and Transcendental Equations - Bisection Method – Fixed Point Iteration Method – Newton Raphson Method – Linear System of Equations – Gauss Elimination Method. **Chapter 1:** 1.0, 1.3,1.4, 1.6, 2.3	**12**
II	**Iterative, Interpolation and Approximation:** Iterative Methods - Gauss Jacobi and Gauss Seidel – Interpolation with Unequal Intervals – Lagrange's Interpolation – Newton's Divided Difference Interpolation. **Chapter 2:** 2.5 - 2.7, 4.3 - 4.5	**12**
III	**Interpolation with Equal Interval:** Difference Operators and Relations. - Interpolation with equal Intervals – Newton's Forward and Backward Difference Formulae. **Chapter 4:** 4.6 **Chapter 5:** 5.1 – 5.2	**12**
IV	**Numerical Differentiation And Integration:** Approximation of Derivatives using Interpolation Polynomials – Numerical Integration using Trapezoidal, Simpson's 1/3 Rule, Simpson's 1/3 Rule. **Chapter 5:** 5.3 **Chapter 6:** 6.3 - 6.4	**12**
V	**Initial Value Problems for Ordinary Differential Equations:** Single Step Methods – Taylor's Series Method – Euler's Method – Modified Euler's Method - Runge Kutta Method for solving (first, second, Third) Order Equations. **Chapter 7:** 7.1 -7.4	**12**
	Total	**60**

Self study	Gauss elimination method Newton's divided difference interpolation Trapezoidal, Simpson's 1/3 rule Runge Kutta method

Textbook

1.Arumugam, S., Thangapandi Isaac, S., Soma Sundaram, A. (2013). *Numerical Analysis with Programming in C*. (4th edition). Bombay: New Gamma Publishing House.

Reference Books

1. Arumugam, S., Thangapandi Isaac, S., Soma Sundaram, A. (2012). *Numerical Methods* (2nd edition). Scitech Publications(India) Pvt Ltd
2. Sastry, S.S. (2003). *Introduction Methods of Numerical Analysis*. (3rd edition). India: Prentice Hall Publication.
3. Gupta, P.P., Malik, G.S., Sanjay Gupta, (1992). *Calculus of Finite Differences and Numerical Analysis*. (16th edition). Bombay: Krishna Prakashan Mandir.

Web Resources

1. https://gdcboysang.ac.in
2. https://www.math.hkust.edu.hk/~machas/numerical-methods.pdf
3. https://perhuaman.files.wordpress.com/2014/07/metodos-numericos.pdf
4. https://www.math.science.cmu.ac.th/docs/qNA2556/ref_na/Katkinson.pdf

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	3	2	2	2	3	2	3	2	2
CO2	3	3	2	2	3	2	3	3	2	3	2	2
CO3	3	3	2	3	3	2	2	3	3	3	2	2
CO4	3	2	2	3	2	3	2	3	2	2	2	2
CO5	3	2	2	3	3	2	2	3	2	2	2	2
TOTAL	**15**	**12**	**10**	**14**	**13**	**11**	**11**	**15**	**11**	**13**	**10**	**10**
AVERAGE	**3**	**2.4**	**2**	**2.8**	**2.6**	**2.2**	**2.2**	**3**	**2.2**	**2.6**	**2**	**2**

3 – Strong, 2- Medium, 1- Low

SEMESTER I

NON-MAJOR ELECTIVE NME I: OFFICE AUTOMATION

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU231NM1/SU241NM1	1	1	-	-	2	2	30	25	75	100

Pre-requisite:

Basic skills in Computer operations.

Learning Objectives:

1. To impart training for students in Microsoft Office which has different components like MS Word, MS Excel, MS Access and Power point.
2. To acquire knowledge on editor, spread sheet and presentation software.

Course Outcomes

On the successful completion of the course, student will be able to:		
1.	remember the fundamentals and understand the concepts.	**K1 & K2**
2.	understand the functionality and purpose of commands and apply the concepts.	**K2 & K3**
3.	understand the purpose of functions, database and apply this to solve problems.	**K2 & K3**

K1 - Remember; **K2** - Understand; **K3** – Apply

Units	Contents	No. of Hours
I	**Introductory concepts:** Memory Unit - CPU - Input Devices: Keyboard, Mouse and Scanner. Output Devices: Monitor, Printer. Introduction to Operating Systems & its Features: DOS – UNIX – Windows. Introduction to Programming Languages.	6
II	**Word Processing:** Open, Save and Close Word Document; Editing Text – Tools, Formatting, Bullets; Spell Checker - Document Formatting – Paragraph Alignment, Indentation, Headers and Footers, Numbering; Printing – Preview, Options, Merge.	6
III	**Spreadsheets:** Excel – Opening, Entering Text and Data, Formatting, Navigating; Formulas – Entering, Handling and Copying; Charts – Creating, Formatting and Printing, Analysis Tables, Preparation of Financial Statements, Introduction to Data Analytics.	6
IV	**Database Concepts:** The Concept of Database Management System; Data Field, Records, and Files, Sorting and Indexing Data; Searching Records. Designing Queries, and Reports; Linking of Data Files; Understanding Programming Environment in DBMS; Developing Menu Drive Applications in Query Language (MS – Access).	6
V	**Power point:** Introduction to Power Point - Features – Understanding Slide Typecasting & Viewing Slides – Creating Slide Shows. Applying Special Object – Including Objects & Pictures – Slide Transition – Animation Effects, Audio Inclusion, Timers.	6
	Total	30

Self study	Keyboard, Monitor

Textbook

1.Peter Norton, (2015). *Introduction to Computers.* Tata McGraw-Hill.

Reference Book

1.Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons. (2003). *Microsoft 2003*. Tata McGraw-Hill.

Web Resources

1. Web content from NDL / SWAYAM or open source web resources
2. https://collegedunia.com/courses/diploma-in-office-automation
3. https://nielit.gov.in/sites/default/files/Ranchi/160512_OfficeAutomation.pdf

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2	2	2	3	2	2	2	2
CO2	3	3	2	3	2	2	3	3	3	3	2	2
CO3	3	3	2	3	2	2	2	3	3	3	2	2
TOTAL	**9**	**8**	**6**	**7**	**6**	**6**	**7**	**9**	**8**	**8**	**6**	**6**
AVERAGE	**3**	**2.7**	**2**	**2.3**	**2**	**2**	**2.3**	**3**	**2.7**	**2.7**	**2**	**2**

3 – Strong, 2- Medium, 1- Low

SEMESTER I

FOUNDATION COURSE: PROBLEM SOLVING TECHNIQUES

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU231FC1	1	1	-	-	2	2	30	25	75	100

Pre-requisite:

Students should know the basic of Problem-solving skills.

Learning Objectives:

1. To understand the importance of algorithms and programs, and to know of the basic problem solving strategies.
2. To learn efficient strategies and algorithms to solve standard problems, thus laying a firm foundation for designing algorithmic solutions to problems.

Course Outcomes

On the successful completion of the course, student will be able to:		
1	know the approach and algorithms to solve specific fundamental problems.	**K1**
2	understand the systematic approach to problem solving.	**K2**
3	apply the efficient methods to solve specific problems related to text processing	**K3**

K1 - Remember; **K2** - Understand; **K3** - Apply

Units	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. Programming Languages: Machine Language, Assembly Language, High-level Language, 4GL and 5GL - Features of Good Programming Language. Translators: Interpreters and Compilers.	**6**
II	Data: Data Types, Input, Processing of Data, Arithmetic Operators, Hierarchy of Operations and Output. Different Phases in Program Development Cycle (PDC). Structured Programming: Algorithm: Features of Good Algorithm, Benefits and Drawbacks of Algorithm. Flowcharts: Advantages and Limitations of Flowcharts, When to use Flowcharts, Flowchart Symbols and Types of Flowcharts. Pseudocode: Writing a Pseudocode. Coding, Documenting and Testing a Program: Comment Lines and Types of Errors. Program design: Modular Programming.	**6**
III	Selection Structures: Relational and Logical Operators - Selecting from Several Alternatives – Applications of Selection Structures. Repetition Structures: Counter Controlled Loops –Nested Loops – Applications of Repetition Structures.	**6**
IV	Data: Numeric Data and Character Based Data. Arrays: One Dimensional Array - Two Dimensional Arrays – Strings as Arrays of Characters.	**6**
V	Data Flow Diagrams: Definition, DFD Symbols and Types of DFDs. Program Modules: Subprograms - Value and Reference Parameters - Scope of a Variable - Functions – Recursion. Files: File Basics - Creating and Reading a Sequential File - Modifying Sequential Files.	**6**
	Total	**30**

Self study	DFD symbols and types of DFDs

Textbook

1.Stewart Venit, (2010). *Introduction to Programming: Concepts and Design*. (4th edition). Dream Tech Publishers.

Reference Books

1. Greg W. Scragg, *Problem Solving with Computers*, Jones & Bartlett 1st edition, 1996.
2. George Polya, Jeremy Kilpatrick, *The Stanford Mathematics Problem Book: With Hints and Solutions*, Dover Publications, 2009 (Kindle Edition 2013).

Web Resources

1. https://www.codesansar.com/computer-basics/problem-solving-using-computer.htm
2. http://www.nptel.iitm.ac.in/video.php?subjectId=106102067
3. http://utubersity.com/?page_id=876
4. https://www.creative-biolabs.com/drug-discovery/diagnostics/array-technique.Htm #:~:text=Among%20all%20kinds%20of%20in,most%20important%20detection%20technology%20modules.
5. https://www.geeksforgeeks.org/algorithms-gq/pattern-searching/

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	2	2	3	3	3	2	3	2
CO2	3	2	3	3	2	2	3	3	2	2	2	2
CO3	3	3	2	3	2	3	2	2	3	2	2	3
TOTAL	**9**	**8**	**7**	**8**	**6**	**7**	**8**	**8**	**8**	**6**	**7**	**7**
AVERAGE	**3**	**2.6**	**2.3**	**2.6**	**2**	**2.3**	**2.6**	**2.6**	**2.6**	**2**	**2.3**	**2.3**

3 – Strong, 2- Medium, 1- Low

SEMESTER I

SPECIFIC VALUE-ADDED COURSE I: PROCEDURAL LANGUAGE

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU231V01	2	-	-	-	1	2	30	25	75	100

Prerequisite:

Basic knowledge of programming concept.

Learning Objectives:

1. To familiarize the students with basic concepts of computer programming and developer tools.
2. To develop the skill of programming by learning the basic structure and methods.

Course Outcomes

On the successful completion of the course, student will be able to:		
1.	remember the basic fundamentals of C and understand theconcepts.	**K1& K2**
2.	understand the functionality and purpose of control structures and apply the concepts in programming.	**K2 & K3**
3.	understand the various programming constructs and implement it to perform specific task.	**K2 & K3**

K1 - Remember; **K2** - Understand; **K3** – Apply

Units	Contents	No. of Hours
I	**Introduction to Computing:** Introduction – Components of a Computer – Concept of Hardware and Software – Art of Programming through Algorithms and Flowcharts. **Overview of C:** History of C – Importance of C – Sample Programs 1, 2, 3, 4, 5 – Basic Structure – Programming Style – Executing a C Program**.**	**6**
II	**Control Statements:** Conditional execution – Iterations – Multiple Selection. Expressing Computations. **Basic Values and Data:** The abstract state machine – Basic types – Specifying values – Implicit conversions – Binary representations.	**6**
III	**Derived Data Types:** Arrays – Structures. **Functions:** Simple functions – main is special – Recursion. **C Library Functions:** General properties of the C library and its functions – String processing and conversion – Runtime environment settings – Program termination and assertions.	**6**
IV	**Pointers:** Pointer operations – Pointers and Structures – Pointers and arrays – Function pointers. **Function – Like Macros:** Working of function-like macros – Argument checking – Accessing the calling context – Default arguments.	**6**
V	**Files:** Introduction - Defining and opening a file – Closing a file – Input/Output operations on files – Error handling during I/O operations – Random access to files.	**6**
	Total	**30**

Textbooks

1. Jens Gustedt (2019), *Modern C*. (2nd Edition). Publisher(s): Manning Publications. ISBN: 9781617295812.
2. Balagurusamy, E. (2019). Programming in ANSI C. (8th edition). New Delhi: Tata McGraw Hill Education Private Limited.

Reference Books

1. King, K.N. (2008). *C Programming: A Modern Approach.* (2nd edition). New York: W.W. Norton & Company.
2. Stephen Prata, (2004). *C Primer Plus.* (5th edition). New York: Addison-Wesley Publication.
3. Paul Deitel, & Harvey Deitel, (2009). *How to Program C.* (6th edition). New Delhi: PHI Learning Private Limited.

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2	2	2	3	2	2	2	2
CO2	3	3	2	3	2	2	3	3	3	3	2	2
CO3	3	3	2	3	2	2	2	3	3	3	3	2
CO4	3	3	2	3	2	2	2	3	3	3	2	2
CO5	3	3	3	3	3	3	2	3	3	2	3	3
TOTAL	**15**	**14**	**11**	**14**	**11**	**11**	**11**	**15**	**14**	**13**	**12**	**11**
AVERAGE	**3**	**2.8**	**2.2**	**2.8**	**2.2**	**2.2**	**2.2**	**3**	**2.8**	**2.7**	**2.4**	**2.2**

3 – Strong, 2- Medium, 1- Low

SEMESTER I

SPECIFIC VALUE -ADDED COURSE II: UPGRADING AND REPAIRING PCS

Course Code	L	T	P	S	Credit	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU231V02	2	-	-	-	1	2	30	25	75	100

Prerequisite:

Basic understanding of computer hardware and operating systems.

Learning Objectives:

1. To understand fundamental concepts of computer hardware, software, and networking.
2. To learn practical skills for troubleshooting and maintaining computer systems.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	understand PC development, components, and system design principles comprehensively.	**K1&K2**
2.	apply skills in building, upgrading, diagnosing, and maintaining PC systems adeptly.	**K3**
3.	analyze processor types, specifications, upgrades, and troubleshooting methods effectively.	**K4**
4.	evaluate motherboard components, buses, BIOS, and selection criteria proficiently.	**K5**
5.	examine memory types, performance, upgrades, and troubleshooting techniques thoroughly.	**K5**

K1 - Remember; **K2** - Understand; **K3** – Apply; K4 – Analyze; **K5** - Evaluate

Units	Contents	No. of Hours
I	Development of the PC: Computer History: Before Personal Computers - Modern Computers - History of the PC. PC Components, Features and System Design: Define PC - System Types – System Components.	**6**
II	Processor Types and Specifications: PC Processor Evolution – Processor Specifications – Processor Features - Processor Manufacturing – Processor Socket and Slot Types – Processor Code Names – Intel P6(686) Processors – Processor Upgrades – Processor Troubleshooting Techniques.	**6**
III	Motherboard and Buses: Motherboard Connectors - Types of I/O Buses – Motherboard Selection Criteria. BIOS Basics: Motherboard ROM BIOS – Upgrading the BIOS – Preboot Environment – BIOS Setup.	**6**
IV	Memory: Memory Basics – Speed and Performance – Memory Modules – RAM Upgrades - Troubleshooting Memory. Video Hardware: Display Adapters and Monitors – Video Display Adapters. Audio Hardware: Audio Hardware Concepts and Terms – Audio Hardware Features – Motherboard Chipsets with Integrated Audio – Speakers – Microphones.	**6**

V	Building or Upgrading System: System Components - Hardware and Software Resources – System Assembly and Disassembly – Installing the OS – Troubleshooting New Installations. PC Diagnostics, Testing and Maintenance: Diagnostics Software - The Boot Process – PC Maintenance Tools – Troubleshooting Tips and Techniques.	**6**
	Total	**30**

Textbook:

1. Scott Mueller's, 2022. *Upgrading and Repairing PCs*, (22nd Edition), Pearson Publishing.

Reference Books:

1. Stuart Yarnold, 2008. *Upgrading and Fixing a PC in Easy Steps*, (8th Edition), In Easy Steps Limited Publisher.
2. Professor of Philosophy John Preston, Scott Mueller, 1996. *Upgrading and Repairing PCs: Academic Edition*, (Academic Edition), Que Education & Training.
3. Marcia Press, Barry Press, 2004. *PC Upgrade and Repair Bible*, (7th Edition), Wiley Publishing.
4. Robert Bruce Thonpson, Barbara Fritchman Thompson, 2003. *PC Hardware in a Nutshell: A Desktop Quick Reference*, (3rd Edition), O'Reilly Media.
5. Scott Mueller, 2009. *Upgrading and Repairing PCs*, (19th Edition), Pearson Education.

Web Resources:

1. Website: Tom's Hardware
2. Website: iFixit
3. Website: PCPartPicker
4. Website: Overclock.net
5. Website: Techspot

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	2	2	2	2	2	2	3	2	2	2	2
CO2	3	3	2	3	2	2	3	3	3	3	2	2
CO3	3	3	2	3	2	2	2	3	3	3	3	2
CO4	3	3	2	3	2	2	2	3	3	3	2	2
CO5	3	3	3	3	3	3	2	3	3	2	3	3
TOTAL	**15**	**14**	**11**	**14**	**11**	**11**	**11**	**15**	**14**	**13**	**12**	**11**
AVERAGE	**3**	**2.8**	**2.2**	**2.8**	**2.2**	**2.2**	**2.2**	**3**	**2.8**	**2.7**	**2.4**	**2.2**

3 – Strong, 2- Medium, 1- Low

SEMESTER-I

SPECIFIC VALUE-ADDED COURSE III: ROBOTICS AND ITS APPLICATIONS

Course Code	L	T	P	S	Credit	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU231V03	2	-	-	-	1	2	30	25	75	100

Prerequisite:

Fundamental for designing physical parts of robots and understanding motion.

Learning Objectives:

1. To understand the basic concepts of robotics, including definitions and terminologies.
2. To gain an introductory knowledge of machine vision and its integration into robotic systems.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	classify the various sensors used in robots for better performance.	**K1**
2.	summarize various industrial and non-industrial applications of robots.	**K2**
3.	list and explain the basic elements of industrial robots4.	**K2**
4.	utilize sensors and actuators to develop robotic systems capable of interacting with the environment and responding to stimuli.	**K3**
5.	analyse robot kinematics and its control methods.	**K4**

K1 - Remember; **K2 -** Understand; **K3** – Apply; **K4 -** Analyze

Units	Contents	No. of Hours
I	Introduction: Definition of 'robo' and 'robotics' – Connection between robotics and some related subjects. Geometric Configuration of Robots: The distinction between arms and vehicles – Degrees of freedom and number of joints – Types of joint – Arm Configuration – Tension structure – Wrists – End effectors.	**6**
II	Operation, programming and control of industrial robots: Type of industrial robot and their methods of operations – Methods of teaching and programming – Types of controller and program memory – Analysis and control – Programming languages for industrial robots.	**6**
III	Actuators of robots: Pneumatic actuation – Hydraulic actuation – Hydrostatic circuits – Electric actuation – Mechanical transmission methods. Sensing for robots: Touch sensing – Vision – Types of computer vision.	**6**
IV	Performance specifications of industrial robots: Geometric configuration: number of axes – Positioning accuracy and repeatability – Angular accuracy and repeatability – Speed – Speed and acceleration accuracy – Control-related specifications.	**6**
V	Applications of industrial robots: Machine loading – Pallet loading and unloading – Investment casting – Spot welding – Arc welding – Robots in assembly – Integration of industrial robots into the workplace.	**6**
	Total	**30**

Textbooks:

1. D. J. Todd, 1986. *Fundamentals of Robot Technology*, (1st Edition), McGraw-Hill Publications.

2. Deb.S.R and Sankha Deb, 2010. *Robotics Technology and Flexible Automation*, (2nd Edition), Tata McGraw Hill Publishing Company Limited.

Reference Books:

1. Klafter.R.D, Chmielewski.T.A, and Noggin's., 1994. *Robot Engineering: An Integrated Approach*, (5th Edition), Prentice Hall of India Pvt. Ltd.
2. Fu.K.S, Gonzalez.R.C&Lee.C.S.G, 2008. Robotics control, sensing, vision and intelligence, (2nd Edition), Tata- McGraw Hill Publications.
3. Yu, 1985. *Industrial Robotics*, (3rd Edition), MIR Publishers Moscow.
4. Thomas R. Kurfess, 2018. *Robotics and Automation Handbook*, (5th Edition), CRC Press.
5. Bruno Siciliano, Oussama Khatib, 2016. *Springer Handbook of Robotics*, (2nd Edition), Springer International Publishing.

Web Resources:

1. Website: Robotics Online
2. Website: IEEE RAS
3. Website: ROS wiki
4. Website: Robotshop Community
5. Website: RPA Academy.

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2	2	2	3	2	2	2	2
CO2	3	3	2	3	2	2	3	3	3	3	2	2
CO3	3	3	2	3	2	2	2	3	3	3	3	2
CO4	3	3	2	3	2	2	2	3	3	3	2	2
CO5	3	3	3	3	3	3	2	3	3	2	3	3
TOTAL	**15**	**14**	**11**	**14**	**11**	**11**	**11**	**15**	**14**	**13**	**12**	**11**
AVERAGE	**3**	**2.8**	**2.2**	**2.8**	**2.2**	**2.2**	**2.2**	**3**	**2.8**	**2.7**	**2.4**	**2.2**

3 – Strong, 2- Medium, 1- Low

SEMESTER II

CORE COURSE II: DATA STRUCTURE AND ALGORITHM S

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU242CC1	5	-	-	-	5	5	75	25	75	100

Pre-requisite:

Basic understanding of programming fundamentals and problem solving skills.

Learning Objectives:

1. To understand the fundamentals of data structure including linked lists, trees, binary search trees, stacks, queues and priority queues.
2. To understand the various algorithm techniques.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	define data structure and algorithms	**K1**
2.	describe data structures like stack, queue, tree and graph	**K2**
3.	apply data structures in solving the problems	**K2&K3**
4.	use algorithm techniques for solving problems and analyze the time complexity of algorithms.	**K3&K4**
5.	assess various algorithmic techniques and analyze the applications of the algorithm.	**K4&K5**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyze; **K5** - Evaluate

Units	Contents	No. of Hours
I	Introduction: History of Algorithms – Definitions – Structure and Properties of Algorithms – Development of an algorithm – Data Structures and Algorithms – Data Structure Definition and Classification. Analysis of Algorithms: Efficiency of Algorithms – A priori Analysis – Asymptotic Notations – Time complexity of an Algorithm using O notation – Polynomial versus Exponential Algorithms – Average, Best- and Worst-Case complexities – Analyzing recursive programs. Arrays: Introduction – Array Operations – Number of elements in an array – Representation of arrays in memory – Applications.	**15**
II	Stacks: Introduction – Stack operations – Applications. Queues: Introduction – operations on Queues – Circular Queues – Other Types of Queues – Applications. Linked Lists: Introduction – Singly linked list – Circularly linked list – Doubly linked list –Multiply linked list – Applications.	**15**
III	Trees and Binary Trees: Introduction – Trees: Definition and basic terminology – Representation of Trees – Binary Trees: Basic Terminology and types – Representation of Binary Trees – Binary Tree Traversal – Threaded Binary Tree – Applications. Graphs: Introduction – Definition and Basic Terminology – Representation of Graphs – Graph Traversals – Application.	**15**
IV	Divide and Conquer: General method- Binary Search- Finding the Maximum and Minimum- Merge Sort- Quick Sort. The Greedy Method: General Method – Knapsack Problem – Tree Vertex Splitting-Job	**15**

	Sequencing with Deadlines – Minimum Cost Spanning Trees – Single Source Shortest Paths.	
V	Dynamic Programming: General Method – Multi Stage Graph – All Pairs Shortest Paths – Single Source Shortest Paths– 0/1 Knapsack – Reliability Design – Travelling Salesperson Problem – Flow Shop Scheduling.	**15**
	Total	**75**

Self-study	Data Structure Definition and Classification

Textbooks:

1. G. A.Vijayalakshmi Pai, 2008. Bradley N Miller and David L.Ranum, *Problem Solving with Algorithms and Data Structure*.
2. *Data Structures and Algorithms Concepts, Techniques and Applications*, (1st Edition), Tata McGraw Hill Publishing Company Limited, New Delhi.
3. Ellis Horowitz, Sartaj Sahni, and Sanguthevar Rajasekaran, 2018. *Fundamentals of Computer Algorithms*, (5th Edition), Universities Press (India) Private Limited,

Reference Books:

1. Ellis Horowitz and SartajSahani, 2006. *Fundamentals of Data Structures*, (2nd Edition), Computer Science Press Inc, Galgotia Book Sources Publishers, New Delhi.
2. Dr. Basant Agarwal, Benjamin Baka, 2018. *Hands-On Data Structures and Algorithms*, (2nd Edition), Packt Publishing.
3. Kent D. Lee and Steve Hubbard, 2015. *Data Structures and Algorithms with Python*. (2015th Edition), Springer Nature Publisher.
4. R. Nageswara Rao, 2018. *Core Python Programming*, (2nd Edition), Dreamtech Press.
5. Narasimha Karumanchi, 2015. Data Structure and Algorithmic Thinking with Python, (5th Edition), Tata McGraw Hill.

Web Resources:

1. https://www.programiz.com/python-programming
2. https://www.guru99.com/python-tutorials.html
3. https://www.w3schools.com/python/python_intro.asp
4. https://www.geeksforgeeks.org/python-programming-language/
5. https: https://en.wikipedia.org/wiki/Python_(programming_language)

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2	2	2	3	2	2	2	2
CO2	3	3	2	3	2	2	3	3	3	3	2	2
CO3	3	3	2	3	2	2	2	3	3	3	3	2
CO4	3	3	2	3	2	2	2	3	3	3	2	2
CO5	3	3	3	3	3	3	2	3	3	2	3	3
TOTAL	**15**	**14**	**11**	**14**	**11**	**11**	**11**	**15**	**14**	**13**	**12**	**11**
AVERAGE	**3**	**2.8**	**2.2**	**2.8**	**2.2**	**2.2**	**2.2**	**3**	**2.8**	**2.7**	**2.4**	**2.2**

3 – Strong, 2- Medium, 1- Low

SEMESTER II

CORE LAB COURSE II: DATA STRUCTURE AND ALGORITHMS LAB

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU232CP1	-	-	5	-	5	5	75	25	75	100

Pre-requisite:

Students should know the basic skills in problem solving.

Learning Objectives:

1. To understand and implement basic data structures.
2. To apply linear and non-linear data structures in problem solving.

Course Outcomes

On the successful completion of the course, student will be able to:		
1.	remember and implement basic data structures linked lists, stacks, queues, trees, graphs.	**K1 & K3**
2.	understand and implement sorting algorithms like bubble, merge, quick sort	**K2 & K3**
3.	applying hash tables and resolving collisions.	**K3**

K1 - Remember; **K2** - Understand; **K3** - Apply

Units	Contents	No. of Hours
	1. Write a program to implement the List ADT using arrays and linked lists. 2. Write a programs to implement the following using a singly linked list. Stack ADT Queue ADT 3. Write a program that reads an infix expression, converts the expression to postfix form and then evaluates the postfix expression (use stack ADT). 4. Write a program to implement priority queue ADT. 5. Write a program to perform the following operations: Insert an element into a binary search tree. Delete an element from a binary search tree. Search for a key element in a binary search tree. 6. Write a program to perform the following operations Insertion into an AVL-tree Deletion from an AVL-tree **7.** Write a programs for the implementation of BFS and DFS for a given graph. 8. Write a program for implementing the following searching methods: Linear search Binary search. 9. Write a program for implementing the following sorting methods: Bubble sort Selection sort Insertion sort Radix sort	**75**

Textbooks

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

Reference Books

1. Sharma A. K, 2011. *Data Structures using C, (3rd Edition),* Pearson Education India.
2. Mark Allen Weiss, 2018. *Data Structures and Algorithms Analysis in Java, (3rd E*dition), Pearson, Boston, USA.
3. Brassard G. and Bratley P, 2014. *Fundamentals of Algorithms*, (3rd Edition), PHI, New Delhi.
4. Thomas H. Cormen, Chales E. Leiserson, Ronald L. Rivest, Clifford Stein, 2009. *Introduction to Algorithms*, (3rd Edition). McGraw Hill.
5. Aho, Hopcroft and Ullman, 2003. *Data Structures and Algorithms*, (2nd Edition), Pearson Education.

Web Resources

1. https://onlinelibrary.wiley.com/doi/pdf/10.1002/0470029757.app1
2. https://www.javatpoint.com/travelling-sales-person-problem
3. https://www.programiz.com/dsa
4. https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/
5. https://www.gatevidyalay.com/fractional-knapsack-problem-using-greedy-approach/

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	2	2	3	3	3	2	3	2
CO2	3	2	3	3	2	2	3	3	2	2	2	2
CO3	3	3	2	3	2	3	2	2	3	2	2	3
TOTAL	**9**	**8**	**7**	**8**	**6**	**7**	**8**	**8**	**8**	**6**	**7**	**7**
AVERAGE	**3**	**2.6**	**2.3**	**2.6**	**2**	**2.3**	**2.6**	**2.6**	**2.6**	**2**	**2.3**	**2.3**

3 – Strong, 2- Medium, 1- Low

SEMESTER II

ELECTIVE COURSE II: DISCRETE MATHEMATICS

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU232EC1	3	1	-	-	3	4	60	25	75	100

Pre-requisite:

Basic Concepts in Algebra and Set Theory

Learning Objectives:

1. To learn the concepts of Logic, Functions, Permutations, Combinations and Graph models
2. To motivate the students to solve practical problems using Discrete Mathematics.

Course Outcomes

On the successful completion of the course, student will be able to:		
1.	remember the basic concepts of permutations, combinations, relations and graphs	**K1 & K2**
2.	understand the basic concepts of functions and relations.	**K2**
3.	apply basic counting techniques to solve combinatorial problems.	**K3 & K5**
4.	represent discrete objects and relationships using abstract mathematical structures	**K4 & K5**
5.	apply graphs in a wide variety of models	**K3 & K5**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

Units	Contents	No. of Hours
I	**Logic:** Propositional logic – Propositions - Conditional Statements – Truth Tables of Compound Propositions - Logical Equivalence - Constructing New Logical Equivalences. **Chapter 1:** Section 1.1 (Pages 1-10 & 16-21) Section 1.2 (Pages 21-29)	**12**
II	**Functions:** One-to-one and onto Functions - Inverse Functions and Composition of Functions - The Graphs of Functions - Some Important Functions. **Chapter 2:** Section 2.3 (Pages 142-157)	**12**
III	**Counting**: The basics of Counting - Basic Counting Principles - Permutations and Combinations. **Chapter 5:** Section 5.1 (Pages 335-340 & 344-347) Section 5.3 (Pages 354-362)	**12**
IV	**Relations**: Relations and their Properties – Functions as Relations - Relation on a Set - Properties of Relation - Combining Relations. **Chapter 7:** Section 7.1 (Pages 459-469)	**12**
V	**Graphs**: Graph - Undirected Graph - Directed Graph – Multigraph - Pseudo Graph - Simple Graph - General Graph - Degree of Vertex – Theorems - Finite Graph - Order of a Graph - Size of a Graph - Null Graph - Isolated Graph - Isomorphic Graphs. Chapter 11: Section 11.1,11.2	**12**
	Total	**60**

Self study	Truth Table , Functions

Textbooks

1. Kenneth H. Rosen, 2012. *Discrete Mathematics and Its Applications*, (7th Edition), McGraw Hill.
2. Geetha P, 2023. *Discrete Mathematics*, (2nd Edition), SciTech Publications (India) PVT . LTD.

Reference Books

1. C L Liu, 2018. *Elements of Discrete Mathematics*, (2nd Edition), McGraw Hill. Norman L Biggs, 2011. *Discrete Mathematics*, (1st Edition), Pearson, USA.
2. Kenneth Bogart and Robert L Drysdale, 2014. *Discrete Mathematics for Computer Science*, (3rd Edition), Addison-Wesley.
3. Kenneth H. Rosen, 2011. *Discrete Mathematics and its Applications*, (7th Edition), McGraw-Hill.
4. Gupta P.P, Malik G.S, Sanjay Gupta, 1992. *Calculus of Finite Differences and Numerical Analysis*, (16th Edition), Bombay: Krishna Prakashan Mandir.
5. Kenneth H. Rosen, 2022. *Discrete Mathematics and its Applications*, (8th Edition), McGraw-Hill.

Web Resources

1. https://www.slideshare.net/asadfaraz4/intro-to-discrete-mathematics
2. https://slideplayer.com/slide/13589862/
3. https://onlinecourses.nptel.ac.in/noc23_cs109/preview
4. https://www.youtube.com/watch?v=amaH38_mXK4
5. https://www.brilliant.org

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2	2	2	3	2	2	2	2
CO2	3	2	2	2	2	2	2	3	2	2	2	2
CO3	2	3	2	2	2	2	2	3	3	2	2	2
CO4	2	2	2	2	3	2	2	3	2	2	2	3
CO5	3	2	2	2	2	2	2	3	2	2	3	2
TOTAL	**13**	**11**	**10**	**10**	**11**	**10**	**10**	**15**	**11**	**10**	**11**	**11**
AVERAGE	**2.6**	**2.2**	**2**	**2**	**2.2**	**2**	**2**	**3**	**2.2**	**2**	**2.2**	**2.2**

3 – Strong, 2- Medium, 1- Low

SEMESTER II

NON-MAJOR ELECTIVE NME II: INTRODUCTION TO HTML

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU232NM1/ SU242NM1	1	1	-	-	2	2	30	25	75	100

Prerequisite:

Basic knowledge in creating websites.

Learning Objectives:

1. To create a web page, insert a graphic, link, table within a web page.
2. To insert ordered and unordered lists within a web page.

Course Outcomes

On the successful completion of the course, student will be able to:		
1.	recall and recognize HTML tags and their syntax.	**K1& K2**
2.	understand the use of HTML elements like headings, paragraphs, lists and links.	**K2**
3.	apply the concepts in creating web pages and formatting it.	**K3**

K1 - Remember; **K2** - Understand; **K3** – Apply

Units	Contents	No. of Hours
I	**Introduction: Web Basics:** Define Internet – Web Browsers – Define Webpage – **HTML Basics:** Understanding Tags.	**6**
II	Tags for Document Structure (HTML, Head, BodyTag). **Block Level Text Elements:** Headings Paragraph (<p> tag) – Font Style Elements: (bold, italic, font, small, strong, strike, big tags).	**6**
III	**Lists: Types of Lists:** Ordered, Unordered – Nesting Lists – **Other Tags:** Marquee, HR, BR – Using Images – Creating Hyperlinks.	**6**
IV	**Tables:** Creating Basic Table, Table Elements, Caption – Table and Cell Alignment – Rowspan, Colspan – Cellpadding.	**6**
V	**Frames:** Frameset – Targeted Links – Noframe – Forms: Input, Textarea, Select, Option.	**6**
	Total	**30**

Self Study	HTML Basics , Tables

Textbooks

1. Smashing Magazine, 2014. *Mastering HTML5 and CSS3 Made Easy*, Teach U Comp Inc.
2. Thomas Michaud, 2013. *Foundations of Web Design: Introduction to HTML & CSS*, Pearson Education.

Reference Books

1. Jon Duckett, 2010. Beginning HTML, XHTML, CSS and Java Script, (2nd Edition), Wiley Publishing.
2. Jennifer Niederst Robbins, 2013. HTML5 Pocket Reference, (5th Edition), O'Reilly Media.

3. Jennifer Niederst Robbins, 2018. Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics, (5th Edition), O'Reilly Media.
4. Mark Pilgrim, 2010. HTML5: Up and Running, (1st Edition), O'Reilly Media.
5. Elisabeth Robson, Eric Freeman, 2012. Head First HTML and CSS, (2nd Edition), O'Reilly Media.

Web Resources

1. https://www.placementpreparation.io/blog/best-books-to-learn-quantitative-aptitude/
2. https://www.exambazaar.com/blogpost/quantitative-aptitude-books
3. https://www.amazon.in/Quantitative-Aptitude-Competitive-Examinations-Aggarwal/dp/9352534026
4. https://www.w3schools
5. https://www.Learn-HTML.org

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2	2	2	3	2	2	2	2
CO2	3	3	2	3	2	2	3	3	3	3	2	2
CO3	3	3	2	3	2	2	2	3	3	3	2	2
TOTAL	**9**	**8**	**6**	**7**	**6**	**6**	**7**	**9**	**8**	**8**	**6**	**6**
AVERAGE	**3**	**2.7**	**2**	**2.3**	**2**	**2**	**2.3**	**3**	**2.7**	**2.7**	**2**	**2**

3 – Strong, 2- Medium, 1- Low

SEMESTER II

SKILL ENHANCEMENT COURSE SEC - I: ADVANCED EXCEL

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU232SE1	1	-	1	-	2	2	30	25	75	100

Pre-requisite:

Students should know the basic knowledge in office automation / Excel.

Learning Objectives:

1. To learn the advanced features of Excel.
2. To summarise, analyse, explore, and present visualisations of data in the form of charts, graphs.

Course Outcomes

On the successful completion of the course, student will be able to:		
1.	use a wide range of advanced excel functions.	**K1**
2.	understand data validation rules to control data entry	**K2**
3.	presenting data in the form of charts and graphs.	**K3**

K1 - Remember; **K2** - Understand; **K3** - Apply

Units	Contents	No. of Hours
I	Basics of Excel - Customizing Common Options - Absolute and Relative Cells- Protecting and Un-protecting Worksheets and Cells - Working with Functions - Writing Conditional Expressions - Logical Functions - Lookup and Reference Functions - VlookUP with Exact Match, Approximate Match - Nested VlookUP with Exact Match - VlookUP with Tables, Dynamic Ranges - Nested VlookUP with Exact Match - Using VLookUP to Consolidate Data from Multiple Sheets.	**6**
II	Data Validations - Specifying a Valid Range of Values - Specifying a List of Valid Values- Specifying Custom Validations based on Formula - Working with Templates - Designing the Structure of a Template - Templates for Standardization of Worksheets - Sorting and Filtering Data -Sorting Tables - Multiple-level Sorting - Custom Sorting - Filtering Data for Selected View - Advanced Filter Options - Working with Reports Creating Subtotals - Multiple-level Subtotal.	**6**
III	Creating Pivot Tables: Formatting and Customizing Pivot Tables - Advanced Options of Pivot Tables - Pivot Charts - Consolidating Data from Multiple Sheets and Files using Pivot Tables - External Data Sources - Data Consolidation Feature to Consolidate Data - Show Value as % of Row, % of Column, Running Total, Compare with Specific Field - Viewing Subtotal Under Pivot - Creating Slicers.	**6**
IV	More Functions: Date and Time Functions - Text Functions - Database Functions - Power Functions – Formatting using Auto Formatting Option for Worksheets - Using Conditional Formatting Option for Rows, Columns and Cells - WhatIf Analysis - Goal Seek - Data Tables - Scenario Manager.	**6**

V	Charts - Formatting Charts - 3D Graphs - Bar and Line Chart Together - Secondary Axis in Graphs - Sharing Charts with PowerPoint / MS Word, Dynamically - New Features of Excel Sparklines, Inline Charts, Data Charts - Overview of all the New Features.	**6**
	Total	**30**

Self study	Formatting Charts

Textbook

1. Greg Harvey, 2018. *Excel 2019 All-in-One For Dummies*, (1st Edition), For Dummies.

Reference Book

1. Bill Jelen and Michael Alexander, 2019. *Microsoft Excel 2019 Pivot Table Data Crunching*, (1st Edition), McGraw-Hill.
2. Michael Alexander and Richard Kusleika, 2018. *Excel 2019 Bible*, (1st Edition), Wiley.
3. Paul McFedries, 2019. *Excel 2019 Formulas and Functions*, (1st Edition), Microsoft Press.
4. Curtis Frye, 2019. *Microsoft Excel 2019 Step by Step*, (1st Edition). Microsoft Press.
5. Ken Bluttman, 2015. *Excel Formulas and Functions for Dummies*. (1st Edition), For Dummies.

Web Resources

1. https://www.shastacoe.org/uploaded/Dept/it/training_docs/Excel/Excel_Advanced_Training_Packet.pdf
2. https://sscstudy.com/advance-excel-notes-pdf-download/
3. https://www.tutorialspoint.com/advanced_excel/advanced_excel_tutorial.pdf
4. http://www.mcrhrdi.gov.in/group1-2019/Reading%20Material/IT/Adv.Excel%20-%20Handbook(7-6-17).pdf
5. https://www.guru99.com/introduction-to-microsoft-excel.html

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	2	2	3	3	3	2	3	2
CO2	3	2	3	3	2	2	3	3	2	3	2	2
CO3	3	2	2	3	2	3	2	2	3	3	2	3
TOTAL	**9**	**7**	**8**	**8**	**6**	**7**	**8**	**8**	**8**	**8**	**7**	**7**
AVERAGE	**3**	**2.3**	**2.6**	**2.6**	**2**	**2.3**	**2.6**	**2.6**	**2.6**	**2.8**	**2.3**	**2.3**

3 – Strong, 2- Medium, 1- Low

SEMESTER I & II

LIFE SKILL TRAINING I: CATECHISM

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
UG232LC1	1	-	-	-	1	1	15	50	50	100

Learning Objectives:

1. To develop human values through value education
2. To understand the significance of humane and values to lead a moral life
3. To make the students realize how values lead to success

Course Outcome

On the successful completion of the course, student will be able to:		
1	understand the aim and significance of value education	**K1,K2**
2	develop individual skills and act confidently in the society	**K3**
3	learn how to live lovingly through family values	**K3**
4	enhance spiritual values through strong faith in God	**K6**
5	learn good behaviours through social values	**K6**

K1 - Remember **K2**-Understand; **K3**-Apply; **K6**- Create

Units	Contents	No. of Hours
I	**Value Education:** Human Values – Types of Values – Growth – Components – Need and Importance - Bible Reference: Matthew: 5:3-16	**3**
II	**Individual Values: Esther** Vanishing Humanity – Components of Humanity – Crisis – Balanced Emotion – Values of Life - Bible Reference: Esther 8:3-6	**3**
III	**Family Values: Ruth the Moabite** Respecting Parents – Loving Everyone – Confession – True Love Bible Reference: Ruth 2:10-13 **Spiritual Values: Hannah** Faith in God – Wisdom – Spiritual Discipline – Fear in God – Spiritually Good Deeds -Bible Reference: 1 Samuel 1:24-28	**3**
IV	**Social Values: Deborah** Good Behaviour – Devotion to Teachers – Save Nature – Positive Thoughts –The Role of Youth in Social Welfare - Bible Reference: Judges 4:4-9	**3**
V	**Cultural Values**: **Mary of Bethany** Traditional Culture – Changing Culture – Food – Dress – Habit – Relationship – Media – The Role of Youth - Bible Reference: Luke 10:38-42	**3**
	Total	**15**

Textbook:

1. Humane and Values. Holy Cross College (Autonomous), Nagercoil
2. The Holy Bible

SEMESTER I & II
LIFE SKILL TRAINING I: MORAL

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
UG232LM1	1	-	-	-	1	1	15	50	50	100

Learning Objectives:

1. To develop human values through value education
2. To understand the significance of humane and values to lead a moral life
3. To make the students realize how values lead to success

Course Outcomes

On the successful completion of the course, student will be able to:		
1	understand the aim and significance of value education	**K1,K2**
2	develop individual skills and act confidently in the society	**K3**
3	learn how to live lovingly through family values	**K3**
4	enhance spiritual values through strong faith in God	**K6**
5	learn good behaviours through social values	**K6**

K1 - Remember **K2**-Understand; **K3**-Apply; **K6**- Create

Units	Contents	No. of Hours
I	**Value Education:** Introduction – Limitations – Human Values – Types of Values – Aim of Value Education – Growth – Components – Need and Importance	**3**
II	**Individual Values:** Individual Assessment – Vanishing Humanity – Components of Humanity – Crisis – Balanced Emotion – Values of Life.	**3**
III	**Family Values:** Life Assessment – Respecting Parents – Loving Everyone – Confession – True Love.	**3**
IV	**Spiritual Values:** Faith in God – Wisdom – Spiritual Discipline – Fear in God – Spiritually Good Deeds.	**3**
V	**Social Values:** Good Behaviour – Devotion to Teachers – Save Nature – Positive Thoughts – Drug Free Path – The Role of Youth in Social Welfare. **Cultural Values**: Traditional Culture – Changing Culture – Food – Dress – Habit – Relationship – Media – The Role of Youth.	**3**
	Total	**15**

Textbook:

1. Humane and Values. Holy Cross College (Autonomous), Nagercoil

SEMESTER III

CORE COURSE III: PROGRAMMING IN JAVA

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU233CC1	5	-	-	-	5	5	75	25	75	100

Prerequisite:

Basic knowledge of programming concept.

Learning Objectives:

1. To understand the basic object-oriented programming concepts and apply them in problem solving.
2. To demonstrate multitasking by using multiple threads and event handling.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	demonstrate the implementation of inheritance (multilevel, hierarchical and multiple) by using extend and implement keywords	**K1&K2**
2.	understand the process of graphical user interface design and implementation using AWT or swings	**K1&K4**
3.	use multithreading concepts to develop inter process communication.	**K2&K3**
4.	demonstrate the behaviour of programs involving the basic programming constructs like control structures, constructors, string handling and garbage collection.	**K2&K4**
5.	develop applets that interact abundantly with the client environment and deploy on the server.	**K6**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyze; **K6** – Create

Units	Contents	No. of Hours
I	Object Oriented Thinking and Java Basics: Need for OOP Paradigm - Summary of OOP Concept - Java Buzzwords - Data Types - Variables - Scope and lifetime of Variables - Type Conversion and Casting - Arrays - Operators and Expressions - Control Statements - Simple Java Program -Concepts of Classes and Objects - Constructors - Methods - this keyword - Overloading Methods and Constructors - Parameter Passing -Recursion.	**15**
II	Inheritance, Packages and Interfaces: Benefits of Inheritance – Member Access - Types of Inheritance – Method Overriding – Using Super keyword - Using final with Inheritance – Using Abstract Classes. Packages: Defining, Creating and Accessing a Package - Understanding CLASSPATH - Importing Packages – Access Protection. Interfaces: Differences between Classes and Interfaces - Defining an Interface - Implementing Interface - Applying Interfaces -Variables in Interface and Extending Interfaces.	**15**
III	Exception Handling, Multithreading and String Handling: Concepts of Exception Handling - Benefits of Exception Handling - Exception Hierarchy - Usage of try, catch, throw, throws and finally-Built-in Exceptions - Creating own Exception Subclasses. Multithreading:	**15**

	Differences between Multithreading and Multitasking - Thread Life Cycle - Creating Threads - Thread Priorities - Synchronizing Threads - Inter thread Communication- String Handling	
IV	Event Handling and AWT: Events - Event Sources - Event Classes - Event Listeners - Delegation Event Model - Handling Mouse and Keyboard Events - Adapter Classes. AWT: AWT Classes - Working with Frames Windows – AWT Controls – Working with Graphics - Layout Manager – Layout Manager Types.	**15**
V	I/O and Applets: I/O Basics – Reading Console Input – Writing Console Output – Scanner Class – PrintWriter Class. Applets: Two Types of Applets – Applets Architecture - Differences between Applets and Applications – An Applet Skeleton – Simple Applet Display Methods - Creating Applets - Passing Parameters to Applets.	**15**
	Total	**75**

Self-study	OOPS Concept: Inheritance, Abstraction, Encapsulation and Polymorphism

Textbooks

1. Herbert Schildt, 2007. *Java The Complete Reference* (7th Edition), TMH.
2. T. Budd, 2000. *Understanding OOP with Java,* (updated Edition), Pearson Education.

Reference Books

1. J.Nino and F.A. Hosch, 2008. *An Introduction to Programming and OO Design Using Java*, (3rd Edition), John Wiley & Sons.
2. T. Budd, 2002. *An Introduction to OOP*, (3rd Edition), Pearson Education.
3. Y. Daniel Liang, 2018. *Introduction to Java programming*, (10th edition), Pearson Education.
4. R.A. Johnson, 2016. *An Introduction to Java Programming and Object-Oriented Application Development*, (5th Edition), Cengage Learning India Pvt.Ltd
5. Cay.S. Horstmann and Gary Cornell, 2002. *Core Java 2, Vol 1, Fundamentals*, (6th Edition), Pearson Education.

Web Resources

1.https://www.programiz.com/JAVA-programming
2.https://www.javatutorialpoints.com
3.https://www.w3schools.com
4.https://www.geeksforgeeks.org/java-programming-language/
5.https://en.wikipedia.org/wiki/java_(programming_language)

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	2	2	2	2	2	2	3	2	2	2	2
CO2	3	3	2	3	2	2	3	3	3	3	2	2
CO3	3	3	2	3	2	2	2	3	3	3	3	2
CO4	3	3	2	3	2	2	2	3	3	3	2	2
CO5	3	3	3	3	3	3	2	3	3	2	3	3
TOTAL	**15**	**14**	**11**	**14**	**11**	**11**	**11**	**15**	**14**	**13**	**12**	**11**
AVERAGE	**3**	**2.8**	**2.2**	**2.8**	**2.2**	**2.2**	**2.2**	**3**	**2.8**	**2.7**	**2.4**	**2.2**

3 – Strong, 2- Medium, 1- Low

SEMESTER III

CORE LAB COURSE III: PROGRAMMING IN JAVA LAB

Course Code	L	T	P	S	Credits	Inst. Hours	Total	Marks		
								CIA	External	Total
SU233CP1	-	1	2	-	3	3	45	25	75	100

Prerequisite:

Basic knowledge of programming skill.

Learning Objectives:

1. To gain knowledge about Java syntax and semantics to be able to successfully read and write Java computer programs.
2. To implement interfaces, inheritance, and polymorphism as programming techniques and apply exceptions handling.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	recall the concepts of object oriented programming such as inheritance, encapsulation and polymorphism in java	**K1**
2.	describe the purpose -and usage of exception handling mechanisms in java.	**K2**
3.	develop and analyse java programs to solve specific problems or implement algorithms using appropriate data structures.	**K3, K4**
4.	evaluate java program using Error handling technique	**K5**
5.	create applet program to implement window based activities	**K6**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyze; **K5-** Evaluate**, K6** – Create

List of Exercises	No. of Hours
1. Define a class called Student with the attributes name, register_number and marks obtained in four subjects (m1, m2, m3, m4). Write a suitable constructor and methods to find the total mark obtained by the student and display the details of the student. 2. Write a Java program to find the area of a square, rectangle and triangle by (i) Overloading Constructor (ii) Overloading Method. 3. Write a java program to add two complex numbers. [Use passing object as argument and return object]. 4. Derive another class Student from Student super with data members height and weight. Write a constructor and a method output () to display the details which overrides the super class method output().[Apply method Overriding concept]. 5. Write a java program to create an interface called Demo, which contains a double type constant, and a method called area () with one double type argument. Implement the interface to find the area of a circle. 6. Write a java program to create a thread using Thread class. 7. Demonstrate Java inheritance using extends keyword. 8. Create an applet with four Checkboxes with labels MARUTI-800, ZEN, ALTO and ESTEEM and a Text area object. The program must	**45**

display the details of the car while clicking a particular Checkbox. 9. Write a Java program to throw the following exception, 1) Negative Array Size 2) Array Index out of Bounds 10. Write a java program to create a file menu with option New, Save and Close, Edit menu with option cut, copy, and paste 11. Write a java programming to illustrate Mouse Event Handling	

Textbooks

1. Herbert Schildt, 2007. *Java The Complete Reference* (7th Edition), TMH.
2. T. Budd, 2000. *Understanding OOP with Java,* (updated Edition), Pearson Education.

Reference Books

1. J.Nino and F.A. Hosch, 2008. *An Introduction to Programming and OO Design Using Java*, (3rd Edition), John Wiley & Sons.
2. T. Budd, 2002. *An Introduction to OOP*, (3rd Edition), Pearson Education.
3. Y. Daniel Liang, 2018. *Introduction to Java programming*, (10th edition), Pearson Education.
4. R.A. Johnson, 2016. *An Introduction to Java Programming and Object-Oriented Application Development*, (5th Edition), Cengage Learning India Pvt.Ltd
5. Cay.S. Horstmann and Gary Cornell, 2002. *Core Java 2, Vol 1, Fundamentals*, (6th Edition), Pearson Education.

Web Resources

1. https://www.programiz.com/JAVA-programming
2. https://www.javatutorialpoints.com
3. https://www.w3schools.com
4. https://www.geeksforgeeks.org/java-programming-language/
5. https://en.wikipedia.org/wiki/java_(programming_language)

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2	2	2	3	2	2	2	2
CO2	3	3	2	3	2	2	3	3	3	3	2	2
CO3	3	3	2	3	2	2	2	3	3	3	3	2
CO4	3	3	2	3	2	2	2	3	3	3	2	2
CO5	3	3	3	3	3	3	2	3	3	2	3	3
TOTAL	**15**	**14**	**11**	**14**	**11**	**11**	**11**	**15**	**14**	**13**	**12**	**11**
AVERAGE	**3**	**2.8**	**2.2**	**2.8**	**2.2**	**2.2**	**2.2**	**3**	**2.8**	**2.7**	**2.4**	**2.2**

3 – Strong, 2- Medium, 1- Low

SEMESTER III

ELECTIVE COURSE III: WEB TECHNOLOGY

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU233EC1	3	1	-	-	3	4	60	25	75	100

Prerequisite:

Understanding HTML, CSS, and JavaScript forms

Learning Objectives:

1. To understand server-side technologies like databases and server frameworks.
2. To mastering HTML, CSS and JavaScript for webpage creation.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	recall html tags, css properties, and javascript syntax	**K1**
2.	explain the relationship between html, css and javascript in web development.	**K2**
3.	create well-structured web pages using html and css	**K3**
4.	analyse and evaluate different frameworks and libraries for specific project requirements	**K4, K5**
5.	design and implement responsive web layouts that adopt to various screen sizes and devices	**K6**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Units	Contents	No. of Hours
I	Introduction to Web Technologies: History of the Web – Understanding Web System Architecture – Understanding 3-Tier Web Architecture – Web Browsers – Overview of HTTP – Exploring Web Technologies. HTML and JavaScript Programming: Introducing HTML Document Structure: The <!DOCTYPE> Element, The <html> Element, The <title> Element, The <body> Element – Creating Headings on a Web Page – Working with Links: Creating a Hyperlink, Setting the Hyperlink Colors, Linking Different Sections of a Web Page.	**12**
II	Working with Images: Inserting an Image on a Web page, Displaying Alternate text for an Image, Adding a Border to an Image, Aligning an Image, Creating Images as Links, Creating Image Maps. Working with Table: Creating a Table, Specifying a Caption to a Table, Adding a Table Heading, Setting the Table Border, Aligning a Table and Cell Content, Setting the Width of a Table and Table Columns, Setting Cell Padding and Cell Spacing, Spanning Rows and Columns, Nesting Tables. Working with Frames: Creating a Frame, Creating Vertical and Horizontal Frames, Setting the Frame Border Thickness, Applying Hyperlink Targets to a Frame.	**12**
III	Introduction to Forms and HTML Controls: Creating an HTML Form, Specifying the Action URL and Methods to Send the Form, Using the HTML Controls. Introducing Cascading Style Sheets: Inline Style, External Style Sheets, Internal Style Sheets, Style Classes, Multiple Styles.	**12**
IV	Introducing JavaScript: Handling Events – Using Variables in JavaScript –	**12**

	Using Array in JavaScript – Creating Objects in JavaScript – Using Operators – Working with Control Flow Statements – Working with Functions.	
V	JavaScript Objects: Window Object - Document object - Browser Object - Form Object - Navigator object - Screen object – Events - Event Handlers – Forms Validations.	**12**
	Total	**60**

Self-study	Form Object, Navigator Object

Textbooks

1. Kogent Learning Solutions Inc, 2012 . *Web Technologies Black Book*. (New Edition). New Delhi: DreamTech Press Publishers.
2. Jon Duckett, 2010. *Beginning HTML, XHTML, CSS and Java Script*, (2nd Edition), Wiley Publishing.

Reference Books

1. Achyut S.Godbole & Atul Kahate, 2008.*Web Technologies TCP/IP to Internet Application Architecture*. (2nd Edition). Tata McGraw Hill Publications, New Delhi.
2. Uttam K.Roy, 2010. *Web Technologies*. (2nd Edition). Oxford University Press, Pune.
3. Craig Grannell, 2008. *The Essential Guide to CSS and Html Web Design*. (2nd Edition). Apress Publication, Bombay.
4. Jennifer Niederst Robbins, 2012. *Learning Web Design*. (4th Edition). O' Reilly Publication, Bombay.
5. David Pitt, 2014. *Modern Web Essential Javascript & Html5*. (2nd Edition), Infoq Publication, New Delhi.

Web Resources

1. https://www.programiz.com/JAVA-programming
2. https://www.javatutorialpoints.com
3. https://www.w3schools.com
4. https://www.geeksforgeeks.org/java-programming-language/
5. https://en.wikipedia.org/wiki/java_(programming_language)

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2	2	2	3	2	2	2	2
CO2	3	3	2	3	2	2	3	3	3	3	2	2
CO3	3	3	2	3	2	2	2	3	3	3	3	2
CO4	3	3	2	3	2	2	2	3	3	3	2	2
CO5	3	3	3	3	3	3	2	3	3	2	3	3
TOTAL	**15**	**14**	**11**	**14**	**11**	**11**	**11**	**15**	**14**	**13**	**12**	**11**
AVERAGE	**3**	**2.8**	**2.2**	**2.8**	**2.2**	**2.2**	**2.2**	**3**	**2.8**	**2.7**	**2.4**	**2.2**

3 – Strong, 2- Medium, 1- Low

SEMESTER III

ELECTIVE LAB COURSE I: WEB TECHNOLOGY LAB

Course Code	L	T	P	S	Credits	Inst. Hours	Total	Marks		
								CIA	External	Total
SU233EP1	-	1	1	-	2	2	30	25	75	100

Prerequisite:

Basic Knowledge of Programming skill.

Learning Objectives:

1. Design web pages using various tags.
2. Write programs using Java Script.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	recall the basic components and technologies used in web development, such as html, css and javascript.	**K1**
2.	understand and apply css definitions for document presentation.	**K2**
3.	build interactive page using html	**K3**
4.	identify, formulate and analyze problems as well as identify the computing requirements appropriate to their solutions.	**K4**
5.	develop dynamic web pages using client side programming and server side programming.	**K6**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyze; **K6** – Create

List of Exercises	No. of Hours
HTML 1. Program using tags 2. Program using anchor tag 3. Program using image loading 4. Program using table 5. Program using nested table 6. Program using frames 7. Program using CSS rule 8. Program to create resume 9. Program using controls **JavaScript** 1. Program using operators 2. Program using control statements 3. Program using functions	**30**

Textbooks

1. Kogent Learning Solutions Inc, 2012 . *Web Technologies Black Book*. (New Edition). New Delhi: DreamTech Press Publishers.
2. Jon Duckett, 2010. *Beginning HTML, XHTML, CSS and Java Script*, (2nd Edition), Wiley Publishing.

Reference Books

1. Achyut S.Godbole & Atul Kahate, 2008.*Web Technologies TCP/IP to Internet Application Architecture*. (2nd Edition). Tata McGraw Hill Publications, New Delhi.
2. Uttam K.Roy, 2010. *Web Technologies*. (2nd Edition). Oxford University Press, Pune.

3. Craig Grannell, 2008. *The Essential Guide to CSS and Html Web Design*. (2nd Edition). Apress Publication, Bombay.
4. Jennifer Niederst Robbins, 2012. *Learning Web Design*. (4th Edition). O' Reilly Publication, Bombay.
5. David Pitt, 2014. *Modern Web Essential Javascript & Html5*. (2nd Edition), Infoq Publication, New Delhi.

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2. https://www.javatutorialpoints.com
3. https://www.w3schools.com
4. https://www.geeksforgeeks.org/java-programming-language/
5. https://en.wikipedia.org/wiki/java_(programming_language)

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2	2	2	3	2	2	2	2
CO2	3	3	2	3	2	2	3	3	3	3	2	2
CO3	3	3	2	3	2	2	2	3	3	3	3	2
CO4	3	3	2	3	2	2	2	3	3	3	2	2
CO5	3	3	3	3	3	3	2	3	3	2	3	3
TOTAL	**15**	**14**	**11**	**14**	**11**	**11**	**11**	**15**	**14**	**13**	**12**	**11**
AVERAGE	**3**	**2.8**	**2.2**	**2.8**	**2.2**	**2.2**	**2.2**	**3**	**2.8**	**2.7**	**2.4**	**2.2**

3 – Strong, 2- Medium, 1- Low

SEMESTER III

SKILL ENHANCEMENT COURSE II: PROGRAMMING IN PHP

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU233SE1	-	-	2	-	2	2	30	25	75	100

Pre-requisite:

Basic Knowledge on Web

Learning Objectives:

1. To design and develop dynamic, database-driven web applications using PHP version.
2. To get an experience on various web application development techniques

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	recall and apply PHP syntax to solve programming problems.	**K1, K3**
2.	interpret and analyze PHP code and explain its behaviour.	**K2, K4**
3.	apply PHP scripts to perform specific tasks, such as form processing or database manipulation.	**K3**
4.	manipulate files, sessions and cookies deploy	**K3**
5.	create PHP programs that use various PHP library functions	**K6**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyse; **K6** - Create

Units	Contents	No. of Hours
I	Introduction to PHP - Basic Knowledge of Websites - Introduction of Dynamic Website - Introduction to PHP - Scope of PHP - XAMPP and WAMP Installation	**6**
II	PHP Programming Basics - Syntax of PHP - Embedding PHP in HTML -Embedding HTML in PHP. Introduction to PHP Variable - Understanding Data Types - Using Operators - Using Conditional Statements - if(), else if() and else if condition Statement	**6**
III	switch() Statements -Using the while() Loop - Using the for() Loop - PHP Functions - PHP Functions - Creating an Array - Modifying Array Elements - Processing Arrays with Loops - Grouping Form Selections with Arrays - Using Array Functions	**6**
IV	PHP Advanced Concepts - Reading and Writing Files - Reading Data from a File	**6**
V	Managing Sessions and Using Session Variables - Destroying a Session -Storing Data in Cookies - Setting Cookies	**6**
	Total	**30**

Self-study	Variable and Data Types

Assessment-Internal test and External End Semester Examinations will be conducted as Practical Exams.

Textbooks:

1. Vikram Vaswani, 2017. *PHP A Beginner's Guide*, (Indian Edition), Tata McGraw-Hill, New Delhi.
2. Lynn Beighley, Michael Morrison, 2009. *Head First PHP & MySQL: A Brain-Friendly Guide*, (First Edition), O'Reilly Media, United States of America.

Reference Books:

1. Alan Forbes, 2015. *The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL*, (3rd Edition), CreateSpace Independent Publishing Platform.
2. Andy Harris, 2015. *PHP5/MYSQL Programming for the Absolute Beginner*, (5th Edition), Thomson Course Technology.
3. Robin Nixon, 2009. *Learning PHP, MySQL and JavaScript*, (2nd Edition), O'reilly Publishers.
4. K.Meena, R.Sivakumar and A.B.Karthick Anand Babu, 2012. *Web Programming Using PHP and MySQL*, (5th Edition), Himalaya Publishing House.
5. Paul Hudson, 2005. *PHP in a Nutshell*, (1st Edition), O' Reilly Publications.

Web Resources:

1. Web resources from NDL Library, E-content from open-source libraries
2. Opensource digital libraries: PHP Programming
3. https://www.w3schools.com/php/default.asp
4. Website: PHP Manual
5. Website: PHP.net

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	2	2	2	3	3	3	2	2
CO2	3	3	2	2	2	2	2	3	3	3	2	2
CO3	3	3	2	1	2	2	2	3	3	3	2	2
CO4	3	3	2	1	2	2	2	3	3	3	2	2
CO5	3	3	2	1	2	2	2	3	3	3	2	2
TOTAL	**15**	**15**	**10**	**7**	**10**	**10**	**10**	**15**	**15**	**15**	**10**	**10**
AVERAGE	**3**	**3**	**2**	**1.4**	**2**	**2**	**2**	**3**	**3**	**3**	**2**	**2**

3 – Strong, 2- Medium, 1- Low

SEMESTER III / IV

SKILL ENHANCEMENT COURSE SEC III: FITNESS FOR WELLBEING

Course Code	L	T	P	S	Credits	Total Hours	Marks		
							CIA	External	Total
UG23CSE1	1	-	1	-	2	30	25	75	100

Pre-requisites: Basic understanding of health and wellness concepts

Learning Objectives

1. To understand the interconnectedness of physical, mental, and social aspects of well-being, and recognize the importance of physical fitness in achieving holistic health.
2. To develop proficiency in mindfulness techniques, yoga practices, nutritional awareness, and personal hygiene practices to promote overall wellness and healthy lifestyle.

Course Outcomes

On the successful completion of the course, student will be able to:		
1	know physical, mental, and social aspects of health	**K1**
2	understand holistic health and the role of physical fitness.	**K2**
3	apply mindfulness and yoga for stress management and mental clarity.	**K3**
4	implement proper personal hygiene practices for cleanliness and disease prevention.	**K3**
5	evaluate and implement right nutritional choices.	**K5**

K1-Remember; **K2**-Understand; **K3**-Apply; **K5**-Evaluate

Unit	Contents	No. of Hours
I	**Understanding Health and Physical Fitness** Health – definition- holistic concept of well-being encompassing physical, mental, and social aspects. Physical fitness and its components- muscular strength- flexibility, and body composition. Benefits of Physical Activity- its impact on health and well-being.	**6**
II	**Techniques of Mindfulness** Mind – Mental frequency, analysis of thought, eradication of worries Breathing Exercises – types and its importance Mindfulness –pain management - techniques for practicing mindfulness - mindfulness and daily physical activities.	**6**
III	**Foundations of Fitness** Stretching techniques to improve flexibility. Yoga-Definition, yoga poses (asanas) for beginners, Sun Salutations (Surya Namaskar), Yoga Nidra – benefits of yoga nidra.	**6**
IV	**Nutrition and Wellness** Role of nutrition in fitness - macronutrients, micronutrients - mindful eating practices, balanced diet - consequences of overeating. Components of healthy food. Food ethics.	**6**
V	**Personal Hygiene Practices** Handwashing- techniques, timing, and importance, oral hygiene- brushing,	**6**

	flossing, and dental care, bathing and showering- proper techniques and frequency, hair care- washing, grooming, and maintaining cleanliness, maintaining personal hygiene, dangers of excessive cosmetic use.	
	Total	**30**

Self-study	Balance diet and basic excercises

Textbook:

1. Bojaxa A. Rosy and Virgin Nithya Veena. V. 2024. *Fitness for Wellbeing*.

Reference Books:

1. Arul Raja Selvan S. R, 2022. *Yogasanam and Health Science*. Self publisher.
2. Vision for Wisdom. 2016. *Value Education*. The World Community Service Centre Vethathiri Publications.
3. WCSC – Vision for Wisdom. 2016. *Paper 1: Yoga and Empowerment*. Vazhga Valamudan Offset Printers Pvt Ltd 29, Nachiappa St, Erode.
4. Lachlan Sleigh. 2023. *Stronger Together the Family's Guide to Fitness and Wellbeing*. Self Publisher.
5. William P. Morgan, Stephen E. Goldston. 2013. *Exercise And Mental Health*. Taylor & Francis.

Web Resources:

1. https://www.google.co.in/books/edition/Psychology_of_Health_and_Fitness/1lYOAwAABAJ?hl=en&gbpv=1&dq=fitness+for+wellbeing&printsec=frontcover
2. https://www.google.co.in/books/edition/The_Little_Book_of_Active_Wellbeing/aA6SzgEACAAJ?hl=en
3. https://www.google.co.in/books/edition/Physical_Activity_and_Mental_Health/yu96DwAAQBAJ?hl=en&gbpv=1&dq=fitness+for+wellbeing&printsec=frontcover
4. https://www.google.co.in/books/edition/The_Complete_Manual_of_Fitness_and_Well/pLPAXPLIMv0C?hl=en&gbpv=1&bsq=fitness+for+wellbeing&dq=fitness+for+wellbeing&printsec=frontcover
5. https://www.google.co.in/books/edition/The_Wellness_Code/4QGZtwAACAAJ?hl=en

SEMESTER III

SPECIFIC VALUE-ADDED COURSE I: ADOBE INDESIGN CS4

Course Code	L	T	P	S	Credit	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU233V01	2	-	-	-	1	2	30	25	75	100

Prerequisite:

Basic familiarity with graphic design principles and computer operations.

Learning Objectives:

1. To understand and utilize InDesign CS4 workspace efficiently.
2. To create, format, and publish documents effectively using InDesign CS4.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	master indesign CS4 interface for efficient document creation.	**K1 & K2**
2.	create, format, and publish documents using advanced features.	**K2**
3.	apply text formatting, styles, and alignment techniques effectively.	**K3 & K4**
4.	prepare documents for printing and export to PDF.	**K3 & K6**
5.	use drawing tools, transform objects, and manage document layout.	**K4**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyze; **K6** - Create

Units	Contents	No. of Hours
I	Introducing InDesign CS4: Exploring the InDesign CS4 Workspace: The Application Bar – The Menu Bar - The Control Panel – The Tools Panel – The Document Window – The Work Area - The Panel Groups. Working with Custom Workspaces: Creating a Workspace – Saving a Workspace – Deleting a Workspace. Creating a New Document – Saving a Document – Closing the Document and Quitting the Application.	**6**
II	Working with Documents: Opening an Existing Document - Introducing Master Pages: Creating a Master Page – Deleting a Master Page. Working with Text: Creating a Text frame – Adding Text to the Document. Working with the Type on a Path Tool: Creating Type on a Path – Removing Text from the Path.	**6**
III	Performing Basic Formatting Tasks: Changing the Font Size of the Text – Changing the Font Color of the Text – Aligning the text in a Document. Performing Advance Formatting Tasks: Working with Character Styles – Working with paragraph Styles.	**6**
IV	Working with Drawing Tools and Object: Using Shape Tools: Working with Rectangle Tool – Working with Ellipse Tool – Working with Polygon Tool. Using Pencil Tool: Drawing a Freeform Path – Drawing a Closed Path – Editing a Path. Using Pen Tool: Drawing Straight Lines – Drawing Curves. Transforming Objects: Flipping an Object - Rotating an Object – Cropping an Object – Shearing an Object.	**6**
V	Publishing the Document: Creating a Table of Contents: Creating and Applying Styles in a TOC – Importing Styles. Printing a Document:	**6**

	Print-previewing a Document – Exploring the Types of Print Options – Saving the Document as a PDF File.	
	Total	**30**

Self-study	Creating a Text frame and Adding Text to the Document

Textbook:

1. Vikas Gupta, 2010. *Comdex DTP Course Kit*, (3rd Edition), Dreamtech Press.

Reference Books:

1. Christopher Smith & the AGI Creative Team, 2011. *InDesign CS4 Digital Classroom.* (3rd Edition). Wiley Publication.
2. Galen Gruman, 2009. *Adobe In Design Cs4 Bible*, (Wiley-India Edition), Kay Kay Publication, Delhi.
3. Olav Martin Kvern, David Blatner, Bob Bringhurst, 2012. *Real World Adobe InDesign CS6*, Peachpit Press, California.
4. Michael Murphy, 2010. *Adobe InDesgn CS4 Styles: How to Create Better, FasterText*, (3rd Edition), Pearson Education.
5. Steve Jhonson, Perspection Inc, 2008. *Adobe InDesign CS4 on Demand*, (5th Edition), Pearson Education.

Web Resources:

1. https://helpx.adobe.com/support/indesign.html
2. https://community.adobe.com/
3. https://www.linkedin.com/learning/
4. https://www.udemy.com/
5. https://www.youtube.com/

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	2	2	2	3	3	3	2	2
CO2	3	3	2	2	2	2	2	3	3	3	2	2
CO3	3	3	2	1	2	2	2	3	3	3	2	2
CO4	3	3	2	1	2	2	2	3	3	3	2	2
CO5	3	3	2	1	2	2	2	3	3	3	2	2
TOTAL	**15**	**15**	**10**	**7**	**10**	**10**	**10**	**15**	**15**	**15**	**10**	**10**
AVERAGE	**3**	**3**	**2**	**1.4**	**2**	**2**	**2**	**3**	**3**	**3**	**2**	**2**

3 – Strong, 2- Medium, 1- Low

SEMESTER III

SPECIFIC VALUE-ADDED COURSE II: FLUTTER

Course Code	L	T	P	S	Credit	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU233V02	2	-	-	-	1	2	30	25	75	100

Prerequisite:

Basic knowledge of programming concepts.

Learning Objectives:

1. To learn about the features and installation of Flutter
2. To develop simple mobile applications in Flutter using Dart language

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	build simple flutter application using simple widgets and layouts	**K1 & K4**
2.	explain flutter applications using dart packages	**K2**
3.	install flutter in android studio.	**K3**
4.	construct flutter application using database	**K6**
5.	build animation on flutter	**K6**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** – Analyze;**K6** - Create

Units	Contents	No. of Hours
I	Introduction to Flutter: Features of Flutter - Advantages of Flutter - Disadvantages of Flutter. Flutter Installation - Installation in Windows - Installation in Mac OS - Creating Simple Application in Android Studio - Architecture of Flutter Applications.	**6**
II	Flutter Basics: Widgets – Gestures - Concept of State – Layers - Introduction to Dart Programming - Variables and Data types - Decision Making and Loops. Functions - Object Oriented Programming. Introduction to Widgets - Widget Build Visualization.	**6**
III	Introduction to Layouts: Type of Layout Widgets - Single Child Widgets - Multiple Child Widgets - Advanced Layout Application - Introduction to Gestures - Statement Management in Flutter. Ephemeral State Management - Application State - Scoped Model - Navigation and Routing.	**6**
IV	Animation on Flutter: Introduction to Animation Based Classes - Work flow of the Flutter Animation - Working Application - Android Specific Code on Flutter - Introduction to Package - Types of Packages - Using a Dart Package - Develop a Flutter Plugin Package - Accessing Rest API - Basic Concepts - Accessing Product service API	**6**
V	Database Concepts: SQLite- Cloud Fire Store - Internalization on Flutter - Using intl Package - Testing on Flutter - Types of Testing - Widget Testing - Steps Involved - Working Example – Deployment – Android Application - IOS Application - Development Tools - Widget Sets - Flutter Development with Visual Studio Code - Dart DevTools- Flutter SDK	**6**
	Total	**30**

Self-study	Advantages of Flutter and Type of Layout Widgets

Textbooks

1. Marco L. Napoli, 2019. *Beginning Flutter Paperback – Illustrated Paperback* (1st Edition), Wrox Publisher.
2. Deepti Chopra & Roopal Khurana, 2023. *Flutter & Dart: Up & Running: Build Native Apps for both iOS and Android using a Single Codebase Paperback*. (3rd Edition), BPB Publications.

Reference Books

1. Deven Joshi, 2023. *Building Cross-Platform Apps with Flutter and Dart: Build scalable apps for Android, iOS, and web from a single codebase*, (1st Edition), BPB Publications.
2. Hans Kokx, 2023, *Flutter for Jobseekers: Learn Flutter and take your cross-platform app development skills to the next level*, (3rd Edition), Wrox Publishing.
3. Simone Alessandria, Brian Kayfitz, 2021. *Flutter Cookbook: Over 100 proven techniques and solutions*, (Kindle Edition), Packt Publishing.
4. Alberto Miola, 2023. *Flutter Complete Reference 2.0: The ultimate reference for Dart and Flutter*, (4th Edition), Alberto Miola Publisher.
5. Eric Windmill, 2020. *Flutter in Action*, (5th Edition), Manning Publisher.

Web Resources:

1. Website: Flutter.dev
2. Channel: Flutter
3. Flutter GitHub
4. Flutter Weekly
5. Stack Overflow

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	2	2	2	3	3	3	2	2
CO2	3	3	2	2	2	2	2	3	3	3	2	2
CO3	3	3	2	1	2	2	2	3	3	3	2	2
CO4	3	3	2	1	2	2	2	3	3	3	2	2
CO5	3	3	2	1	2	2	2	3	3	3	2	2
TOTAL	**15**	**15**	**10**	**7**	**10**	**10**	**10**	**15**	**15**	**15**	**10**	**10**
AVERAGE	**3**	**3**	**2**	**1.4**	**2**	**2**	**2**	**3**	**3**	**3**	**2**	**2**

3 – Strong, 2- Medium, 1- Low

SEMESTER III

SPECIFIC VALUE-ADDED COURESE III: 2D ANIMATION USING PIVOT ANIMATOR

Course Code	L	T	P	S	Credit	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU233V03	2	-	-	-	1	2	30	25	75	100

Prerequisite:

Understanding of basic animation principles.

Learning Objectives:

1. To understand the basic 2D animation skills
2. To demonstrate animation using pivot animator.

Course Outcomes

On the successful completion of the course, students will be able to:		
1	understand the software layout and controls.	**K1 & K2**
2	learn to create and modify figures for animation.	**K2**
3	master in between, onion skinning, and auto-easing.	**K3 & K4**
4	utilize multi-figure selection, backgrounds, and text objects.	**K4**
5	learn to export animations in various formats.	**K3 & K6**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyze; **K6** – Create

Units	Contents	No. of Hours
I	Getting Started - Interface at a Glance - Positioning Figure - Canvas Zoom - Figure Controls - Animation Frame Controls - Saving & Opening Animations.	**6**
II	Playing an Animation - Creating Figure Types - Edit Mode - Polygon Fill - Segment Gradients.	**6**
III	Figure Outlines - Adding Sprite Images - Modifying Existing Figure Types - STK Files - Window Transparency	**6**
IV	Onion Skins - Frame Inbetweening - Creating a Basic Inbetweening Sequence - Auto-Easing - Adding Inbetween Frames to the Timeline -Multi-figure Selection -Joining Figures - Backgrounds - Sprites - Text Objects.	**6**
V	Speech Bubbles - Virtual Camera - Options - Exporting an Animation -Animated GIF - Animated PNG Video - Separate Images.	**6**
	Total	**30**

Self-study	Edit Mode and Polygon Fill

Textbooks

2. Pivot_Animator_Help_5-1.pdf (pivotanimator.net)
3. Richard Williams, 2012. *The Animator's Survival Kit*, (3rd Edition), Farrar, Straus and Giroux Publisher.

Reference Books

1. Les Pardew, ross S. Wolfley, 2005. *The Animator's Reference Book*, (1st Edition), Thomson Course Technology.
2. Steve Roberts, 2012, *Character Animation Fundamentals: Developing Skills for 2D*, (Kindle Edition), CRC Press.

3. Harold Whitaker, John Halas, 2013. *Timing for Animation*, (5th Edition), Focal Press.
4. Morr Meroz, 2021. *Animation for Beginners: Getting Started with Animation Filmmaking*, (3rd Edition), Bloop Animation Studios LLC.
5. Francis Glebas, 2012. *Directing the Story*, (2nd Edition), CRC Press.

Web Resources

1. Website: Pivot Animator
2. Websites Reddit
3. Website Droidz.org
4. GitHub
5. PivotAnimation.org

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	2	2	2	3	3	3	2	2
CO2	3	3	2	2	2	2	2	3	3	3	2	2
CO3	3	3	2	1	2	2	2	3	3	3	2	2
CO4	3	3	2	1	2	2	2	3	3	3	2	2
CO5	3	3	2	1	2	2	2	3	3	3	2	2
TOTAL	**15**	**15**	**10**	**7**	**10**	**10**	**10**	**15**	**15**	**15**	**10**	**10**
AVERAGE	**3**	**3**	**2**	**1.4**	**2**	**2**	**2**	**3**	**3**	**3**	**2**	**2**

3 – Strong, 2- Medium, 1- Low

SEMESTER III / V

SELF LEARNING COURSE I: ADOBE ILLUSTRATOR CS4

Course Code	L	T	P	S	Credit	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU233SL1/ SU235SL1		-	-	-	1	-	-	**25**	**75**	**100**

Prerequisite:

Familiarity with vector graphics concepts and basic computer skills.

Learning Objectives:

1. To master the tools and techniques for creating and manipulating vector graphics in Adobe Illustrator CS4.
2. To develop proficiency in designing Illustrations, logos, and other graphic elements using advanced features and workflows of adobe Illustrator CS4.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	recall key features and tools of adobe illustrator and explain the purpose and significance of vector graphics in design.	**K1 & K2**
2.	apply color theory principles to create visually appealing illustrations and designs	**K3**
3.	analyze and troubleshoot common issues encountered during illustrator project	**K4**
4.	assess personal growth and skill development in using adobe illustrator	**K4**
5.	synthesis design concepts and ideas into cohesive and visually appealing compositions using adobe illustrator	**K6**

K1 - Remember; **K2 -** Understand; **K3** – Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6** – Create

Units	Contents
I	Introduction to Illustrator CS4: The Illustrator CS4 Workspace: The Application Bar – The Control Panel – The Tools Panel – The Document Window – The Panel Groups. Creating New Illustrator Documents.
II	Customizing the Workspace: Creating a New Workspace – Navigating to a Different Workspace – Managing a Workspace. Saving a Document and Quitting the Application. Getting Started with Drawing Tools: Understanding the Basics of Drawing: About Vector Images – About paths.
III	Line Tools in Illustrator: Using Line Segment Tool – Using the Arc Tool – Using the Spiral Tool – Using the Spiral Tool – Using the Rectangular Grid Tool – Using the Polar Grid Tool. Shape Tools in Illustrator: Using the Rectangle Tool – Using the Rounded Rectangle Tool – Using the Ellipse Tool – Using the Polygon Tool – Using the Star Tool – Using the Flare Tool.
IV	Drawing Tools in Illustrator: Using the Pencil Tool – Using the Pen Tool – Using the Blob Brush Tool. Editing Tools in Illustrator: Using the Smooth Tool – Using the Path Eraser Tool – Using the Eraser Tool. Cutting Tools in Illustrator: Using the Scissors Tool – Using the Knife Tool.

V	Working with Objects: Selecting Objects in Illustrator: Using Selection Tool – Using Direct Selection Tool – Using Group Selection Tool – Using Magic Wand Tool – Using Lasso Tool. Editing Objects: Transforming Objects – Aligning Objects – Duplicating Objects.

Textbook

1. Vikas Gupta, 2010. *Comdex DTP Course Kit*, (3rd Edition), Dreamtech Press.

Reference Books

1. Ted Alspach, 2011. *Illustrator CS4 for Dummies.* (3rd Edition). Wiley Publication.
2. Chris Botello, 2009. *Adobe Illustrator CS4 Revealed*, (2nd Edition), Cengage Learning, Delhi.
3. Mordy Golding, 2008. *Real World Adobe Illustrator CS4*, (5th Edition), Pearson Education.
4. Elaine Weinmann, Peter Lourekas, 2009. *Illustrator CS4 for Windows and Macintosh: Visual QuickStart*, (3rd Edition), Pearson Education.
5. Sue Jenkins, 2009. How to Do Everything Adobe Illustrator, (2nd Edition), McGraw-Hill Education.

Web Resources

1. Website: Adobe Help Center Archives
2. Lynda.com
3. Websites: Tuts+
4. Websites: vectips
5. Websites: Adobe Community forums

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	2	2	2	3	3	3	2	2
CO2	3	3	2	2	2	2	2	3	3	3	2	2
CO3	3	3	2	1	2	2	2	3	3	3	2	2
CO4	3	3	2	1	2	2	2	3	3	3	2	2
CO5	3	3	2	1	2	2	2	3	3	3	2	2
TOTAL	**15**	**15**	**10**	**7**	**10**	**10**	**10**	**15**	**15**	**15**	**10**	**10**
AVERAGE	**3**	**3**	**2**	**1.4**	**2**	**2**	**2**	**3**	**3**	**3**	**2**	**2**

3 – Strong, 2- Medium, 1- Low

SEMESTER IV

CORE COURSE IV: .NET PROGRAMMING

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU234CC1	5	-	-	-	5	5	75	25	75	100

Pre-requisite:

Basic Knowledge on .NET Framework

Learning Objectives:

1. To develop ASP.NET Web application using standard controls.
2. To enable the students to understand the programming features of .Net Framework using ASP.NET and C#.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	identify and understand the basic syntax and language constructs of C# and .NET framework	**K1 & K2**
2.	develop console applications using C# to solve simple programming problems.	**K3**
3.	analyze existing .NET codebases to understand their structure, dependencies, and design patterns.	**K4**
4.	analyze C# programming techniques in developing web applications.	**K4**
5.	create web application using various controls.	**K6**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyze; **K6** – Create

Units	Contents	No. of Hours
I	ASP.Net 3.5 Essentials: New Features in ASP.Net 3.5 - The ASP.Net Life Cycle - Overview of Visual Studio 2008 - Exploring a sample ASP.Net - Creating a sample ASP.Net Website. Web Forms: Standard Control: The Label Control - The Button Control - The Textbox - The Hidden Field Control - File Upload Control - The Image Control - The ImageMap Control - The ListBox Control - The Drop - Down List Control - The Checkbox Control - The Radio Button Control.	**15**
II	Navigation Control: The TreeView Control - Creating the TreeView Control - Generating TreeView from a Database - Using the Menu Class - The Menu Control - Creating Static Menus - Creating Dynamic Menus. Validation Control: Introduction - The Required Field Validation Control - The Range Validator Control - The Regular Expression Validator Control - The Compare Validator Control - The Custom Validator Control - The Validation Summary Control.	**15**
III	Working with Database Controls: The GridView Control - The DataList Control - The DetailsView Control - The FormView Control - The ListView Control - The SqlDataSource Control - The AccessDataSource Control - The ObjectDataSource Control - The XmlDataSource Control. Introducing Login Controls: The Login Control - The LoginView Control - The LoginStatus Control - The LoginName Control - The Password Recovery Control.	**15**

IV	Introducing C# 2008: Need of C# - C# Preprocessor Directives - New Features of 2008 - Creating A Simple C# 2008 Console Application - Identifiers and Keywords - Data Types, Variables, and Constants - Expressions and Operators. Namespace, Classes, Objects, and Structs: Namespaces - Classes and Objects - Constructors and Destructors – Properties – Indexers -Structs.	**15**
V	Object Oriented Programming: Encapsulation – Inheritance – Polymorphism – Abstraction - Interfaces. Pointers, Delegates and Events: Delegates, Events. Flow Control and Exceptional Handling: Control Flow Statements - Exceptional handling.	**15**
	Total	**75**

Self-study	Inheritance and Constructors

Textbook:

1. Kogent Learning Solutions Inc, 2011. *NET 3.5 Programming - Black Book.* (New Edition). DreamTech Press Publication, New Delhi.Chapters: 26, 29, 30,31,33,39.

Reference Books:

1. Kogent Learning Solutions Inc., 2010. *C# 2008 Programming - Black Book.* (Platinum Edition). DreamTech Press Publications, New Delhi.
2. Reynald Adolphe, 2016. *Expert Programming In C# and .Net*. (2nd Edition). Packt Publication, Bangalore.
3. Richaro Peres, 2016. *Entity Framework Core Cookbook*. (2nd Edition). Packt Publication, Bangalore.
4. Matthew Mac, Donald and Màrio Szpuszta, 2008. *Pro Asp.Net 3.5 in C# 2008*. (2nd Edition). Apress Publication, Hariyana
5. Jeff Martin, 2016. *Visual Studio 2015*. (2nd Edition), Packt Publication, Bangalore.

Web Resources:

1. Web resources from NDL Library, E-content from open-source libraries
2. Opensource digital libraries: .Net Programming
3. https://www.geeksforgeeks.org/introduction-to-net-framework/
4. official website
5. https://www.javapoint.com/net-framework

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	2	2	2	3	3	3	2	2
CO2	3	3	2	2	2	2	2	3	3	3	2	2
CO3	3	3	2	1	2	2	2	3	3	3	2	2
CO4	3	3	2	1	2	2	2	3	3	3	2	2
CO5	3	3	2	1	2	2	2	3	3	3	2	2
TOTAL	**15**	**15**	**10**	**7**	**10**	**10**	**10**	**15**	**15**	**15**	**10**	**10**
AVERAGE	**3**	**3**	**2**	**1.4**	**2**	**2**	**2**	**3**	**3**	**3**	**2**	**2**

3 – Strong, 2- Medium, 1- Low

SEMESTER IV

CORE LAB COURSE IV: .NET PROGRAMMING

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU234CP1	-	-	5	-	5	5	75	25	75	100

Pre-requisite:

Basic knowledge on .NET framework

Learning Objectives:

1. To develop ASP.NET Web application using standard controls.
2. To enable the students to understand the programming features of .Net Framework using ASP.NET and C#.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	identify and understand the basic syntax and language constructs of C# and .NET framework	**K1 & K2**
2.	develop console applications using C# to solve simple programming problems.	**K3**
3.	analyze existing .NET codebases to understand their structure, dependencies, and design patterns.	**K4**
4.	analyze C# programming techniques in developing web applications.	**K4**
5.	create web application using various controls.	**K6**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyze; **K6** - Create

List of Exercises	No. of Hours
Visual C# 1. Designing an application to work with Class and Object 2. Designing an application to work with Constructor 3. Designing an application to work with Single Dimensional Arrays 4. Designing an application with Method Overload 5. Designing an application to work with Inheritance 6. Designing an application to work with Exception handling **ASP.NET** 1. Designing a Webpage using standard Web Forms Application 2. Designing Application with Navigation Controls 3. Designing application to work with databases 4. Program using Gridview Control. 5. Developing an application using Validation Controls. 6. Designing a Webpage using Login Controls.	**75**

Textbook

1. Kogent Learning Solutions Inc., (2011). *NET 3.5 Programming - Black Book.* (New Edition). New Delhi: DreamTech Press Publication. Chapters: 26, 29, 30,31,33,39.

Reference Books

1. Kogent Learning Solutions Inc., 2010. *C# 2008 Programming - Black Book.* (Platinum Edition). New Delhi: DreamTech Press Publications.
2. Reynald Adolphe, 2016. *Expert Programming in C# and .Net*. (2nd edition). Bangalore: Packt Publication.

3. Richaro Peres, 2016. *Entity Framework Core Cookbook*. (2nd edition). Bangalore: Packt Publication.
4. Matthew Mac, Donald and Màrio Szpuszta, 2008. *Pro Asp.Net 3.5 in C# 2008*. (2nd edition). Hariyana: Apress Publication.
5. Jeff Martin, 2016. *Visual Studio 2015*. (2nd edition), Bangalore: Packt Publication.

Web Resources

1. Web resources from NDL Library, E-content from open-source libraries
2. Opensource digital libraries: .Net Programming
3. https://www.geeksforgeeks.org/introduction-to-net-framework/
4. official website
5. https://www.javapoint.com/net-framework

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	2	2	2	3	3	3	2	2
CO2	3	3	2	2	2	2	2	3	3	3	2	2
CO3	3	3	2	1	2	2	2	3	3	3	2	2
CO4	3	3	2	1	2	2	2	3	3	3	2	2
CO5	3	3	2	1	2	2	2	3	3	3	2	2
TOTAL	**15**	**15**	**10**	**7**	**10**	**10**	**10**	**15**	**15**	**15**	**10**	**10**
AVERAGE	**3**	**3**	**2**	**1.4**	**2**	**2**	**2**	**3**	**3**	**3**	**2**	**2**

3 – Strong, 2- Medium, 1- Low

SEMESTER IV

ELECTIVE COURSE IV: SOFTWARE ENGINEERING

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU234EC1	4	-	-	-	3	4	60	25	75	100

Pre-requisite:

Basic knowledge in programming, software design principles and communication skills.

Learning Objectives:

1. To understand the basics of modular programming and how to create reusable code components.
2. To learn how to collaborate effectively with team members and gain proficiency in debugging techniques to identify and fix software bugs efficiently.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	recall fundamental concepts and principles of software engineering, including software development life cycle models, requirements engineering, and software design patterns.	**K1**
2.	understand the principles of software testing, including test planning, test case design, and test execution.	**K2**
3.	apply requirements engineering techniques to gather, analyze, and document software requirements for a given project.	**K3**
4.	analyze software requirements documents to identify inconsistencies, ambiguities, and conflicts.	**K4**
5.	create comprehensive test plans, test cases, and test scripts to ensure the quality and reliability of software systems.	**K6**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyze; **K6** – Create

Units	Contents	No. of Hours
I	Introduction to Software Engineering: The Evolving role of Software - Changing Nature of Software - Software Myths - A Generic view of process: Software Engineering – A Layered Technology - A Process Framework - The Capability Maturity Model Integration (CMMI) - Process Models: The Waterfall Model - Spiral Model and Agile Methodology.	**12**
II	Software Requirements: Functional and Non-functional Requirements - User Requirements - System Requirements - Interface Specification - The Software Requirements Document - Requirements Engineering Process: Feasibility Studies - Requirements Elicitation and Analysis - Requirements Validation - Requirements Management.	**12**
III	Design Engineering: Design Process and Design Quality - Design Concepts - The Design Model - Creating an Architectural Design: Software Architecture - Data Design - Architectural Styles and Patterns - Architectural Design - Conceptual Model of UML - Basic Structural Modeling - Class Diagrams - Sequence Diagrams - Collaboration Diagrams - Use Case Diagrams - Component Diagrams.	**12**

IV	Testing Strategies: A Strategic Approach to Software Testing – Strategic Issues – Test Strategies for Conventional Software – Test Strategies for Object Oriented Software – Validation Testing – System Testing – Art of debugging – Testing Tactics: Software Testing Fundamentals – White-Box Testing – Basis Path Testing – Control Structure Testing – Black-Box Testing	**12**
V	Risk management: Reactive Vs Proactive Risk Strategies - Software Risks - Risk Identification - Risk Projection - Risk Refinement - RMMM. Quality Management: Quality Concepts - Software Quality Assurance - Software Reviews - Formal Technical Reviews - Statistical Software Quality Assurance - Software Reliability - The ISO 9000 Quality Standards.	**12**
	Total	**60**

Self-study	Process Model: Waterfall model and Spiral model

Textbooks:

1. Roger S. Pressman, 2005. *Software Engineering, A Practitioner's Approach*, (6th Edition), McGraw Hill International Edition.
2. Ian Sommerville, 2008. *Software Engineering*, (7th Edition), Pearson Education

Reference Books:

1. Grady Booch, James Rambaugh, Ivar Jacobson, 2005. *The Unified Modeling Language User Guide*, Addison-Wesley.
2. James F. Peters, Witold Pedrycz, 2000. *Software Engineering, An Engineering Approach (1st edition)*, John Wiley & Sons
3. Waman S Jawadekar, 2004. *Software Engineering: Principles and Practice*, The McGraw Hill Companies.
4. Meilir Page-Jones, 2008. *Fundamentals of Object-Oriented Design using UML*, Pearson Education.
5. Capers Jones, 2013. The Technical and Social History of Software Engineering, Addison-Wesley.

Web Resources:

1. https://www.javatutorialpoints.com
2. https://www.guru99.com/python-tutorials.html
3. https://www.w3schools.com/software engineering
4. https://www.geeksforgeeks.org
5. https://en.wikipedia.org/wiki/software engineering

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	3	2	2	2	2	2	3	3	3	2	2
CO2	3	3	2	2	2	2	2	3	3	3	2	2
CO3	3	3	2	1	2	2	2	3	3	3	2	2
CO4	3	3	2	1	2	2	2	3	3	3	2	2
CO5	3	3	2	1	2	2	2	3	3	3	2	2
TOTAL	**15**	**15**	**10**	**7**	**10**	**10**	**10**	**15**	**15**	**15**	**10**	**10**
AVERAGE	**3**	**3**	**2**	**1.4**	**2**	**2**	**2**	**3**	**3**	**3**	**2**	**2**

3 – Strong, 2- Medium, 1- Low

SEMESTER III / IV

SKILL ENHANCEMENT COURSE SEC IV: DIGITAL FLUENCY

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
UG23CSE2	2	-	-	-	2	2	30	50	50	100

Pre-requisite: Basic computer knowledge

Learning Objectives:

1. To provide a comprehensive suite of productivity tools that enhance efficiency
2. To build essential soft skills that are needed for professional success.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	work with text, themes and styles	**K1**
2.	produce a mail merge	**K2**
3.	secure information in an Excel workbook	**K2**
4.	perform documentation and presentation skills	**K2, K3**
5.	add special effects to slide transitions	**K3**

K1 - Remember; **K2** - Understand; **K3** – Apply

Units	Contents	No. of Hours
I	**Microsoft Word 2010:** Starting Word 2010 - Understanding the Word Program Screen - Giving Commands in Word - Using Command Shortcuts – Document: Creating - Opening - Previewing - Printing and Saving. Getting Started with Documents: Entering and Deleting Text - Navigating through a Document - Viewing a Document. Working with and Editing Text: Spell Check and Grammar Check- Finding and Replacing Text - Inserting Symbols and Special Characters – Copying, Moving, and Pasting Text.	**6**
II	**Formatting Characters and Paragraphs**: Changing Font Type, Font Size, Font Color, Font Styles and Effects, Text Case, Creating Lists, Paragraph Alignment, Paragraph Borders and Shadings, Spacing between Paragraphs and Lines. Formatting the Page: Adjusting Margins, Page Orientation and Size, Columns and Ordering, Headers and Footers, Page Numbering. Working with Shapes, Pictures and SmartArt: Inserting Clip Art, Pictures and Graphics File, Resize Graphics, Removing Picture's Background, Text Boxes, Smart Art, Applying Special Effects. Working with Tables: Create Table, Add and delete Row or Column, Apply Table Style - Working with Mailings.	**6**
III	**Microsoft Excel 2010:** Creating Workbooks and Entering Data: Creating and Saving a New Workbook - Navigating the Excel Interface, Worksheets, and Workbooks - Entering Data in Worksheets - Inserting, Deleting, and Rearranging Worksheets. Formatting Worksheets: Inserting and Deleting Rows, Columns and Cells - Formatting Cells and Ranges - Printing your Excel Worksheets and Workbooks. Crunching Numbers with Formulas and Functions: Difference between Formulae and Functions - Applying Functions. Creating Powerful and Persuasive Charts: Creating, Laying Out, and Formatting a Chart.	**6**
IV	**Microsoft PowerPoint 2010:** Creating a Presentation - Changing the Slide Size and	**6**

	Orientation - Navigating the PowerPoint Window - Add content to a Slide - Adding, Deleting, and Rearranging Slides - Using views to work on Presentation. Creating Clear and Compelling Slides: Planning the Slides in Presentation - Choosing Slide Layouts to Suit the Contents - Adding Tables, SmartArt, Charts, Pictures, Movies, Sounds, Transitions and Animations - Slideshow.	
V	**Digital Platforms:** Graphic Design Platform: Canva - Logo Making, Invitation Designing. E-learning Platform: Virtual Meet – Technical Requirements, Scheduling Meetings, Sharing Presentations, Recording the Meetings. Online Forms: Creating Questionnaire, Publishing Questionnaire, Analyzing the Responses, Downloading the Response to Spreadsheet.	**6**
	Total	**30**

Self-study	Parts of a computer and their functions

Textbook:

1. Anto Hepzie Bai J. & Divya Merry Malar J.,2024, Digital Fluency, Nanjil Publications, Nagercoil.

Reference Books:

1. Steve Schwartz, 2017, *Microsoft Office 2010 for Windows*, Peachpit Press.
2. Ramesh Bangia, 2015, Learning Microsoft Office 2010, Khanna Book Publishing Company.
3. Bittu Kumar, 2018, *Mastering MS Office*, V & S Publishers.
4. James Bernstein, 2020, *Google Meet Made Easy*, e-book, Amazon.
5. Zeldman, Jeffrey, 2005, *Web Standards Design Guide*, Charles River Media.

Web Resources:

1. https://www.youtube.com/watch?v=oocieLn6umo
2. https://www.youtube.com/watch?v=pPSwbK4_GdY
3. https://www.youtube.com/watch?v=DKAiSDhU4To
4. https://www.youtube.com/watch?v=sbeyPahs-ng
5. https://www.youtube.com/watch?v=fACEzzmXelY

SEMESTER IV

ENVIRONMENTAL STUDIES

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
UG234EV1	2	-	-	-	2	2	30	25	75	100

Pre-requisite: Interest to learn about nature and surrounding.

Learning Objectives

1.To know the different types of pollutions, causes and effects

2.To understand the importance of ecosystem, resources and waste management

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	know the different kinds of resources, pollution and ecosystems	**K1**
2.	understand the biodiversity and its constituents	**K2**
3.	use the methods to control pollution and, to conserve the resources and ecosystem	**K3**
4.	analyse the factors behind pollution, global warming and health effects for sustainable development	**K4**
5.	evaluate various water, disaster and waste management systems	**K5**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyse; **K5** - Evaluate

Units	Contents	No. of Hours
I	**Nature of Environmental Studies** Multidisciplinary nature of environmental studies- scope of environmental studies - environmental ethics-importance- types- natural resources - renewable and non-renewable resources – forest, land, water and energy resources.	6
II	**Biodiversity and its Conservation** Definition: genetic, species of biodiversity - biodiversity hot-spots in India - endangered and endemic species of India – Red Data Book - In-situ and Ex-situ conservation of biodiversity. Ecosystem- types - structure and function - food chain - food web- ecological pyramids- forest and pond ecosystems.	6
III	**Environmental Pollution** Pollution - causes, types and control measures of air, water, soil and noise pollution. Role of an individual in prevention of pollution. Solid waste management: Causes, effects and control measures of urban and industrial wastes. Disaster management– cyclone, flood, drought and earthquake.	6
IV	**Environmental Management and Sustainable Development** From unsustainable to sustainable development -Environmental Law and Policy – Objectives; The Water and Air Acts-The Environment Protection Act -Environmental Auditing-Environmental Impact Assessment-Life Cycle Assessment- Human Health Risk Assessment, Water conservation, rain water harvesting, watershed management.	6
V	**Social Issues and the Environment** Population explosion-impact of population growth on environment and social environment. Women and Child Welfare, Role of information technology in environment and human health. Consumerism and waste products. Climate change - global warming, acid rain and ozone layer depletion.	6

	Field work: Address environmental concerns in the campus (or) Document environmental assets- river / forest / grassland / hill / mountain in the locality (or) Study a local polluted site-urban / rural / industrial / agricultural area.	
	Total	**30**

Self-study	Pollutants, Ecosystems and Resources

Textbook

1. Punitha A and Gladis Latha R, 2024. Fundamentals of Environmental Science.

Reference Books

1. Agarwal, K.C., 2001. *Environmental Biology*, Nidi Publishers. Ltd. Bikaner.
2. Brunner R.C., 1989, *Hazardous Waste Incineration*, McGraw Hill Ltd.
3. Gorhani, E & Hepworth, M.T. 2001. *Environmental Encyclopedia*, Jaico Publ. House, Mumbai.
4. De A.K.,2018. *Environmental Chemistry*, Wiley Eastern Ltd.
5. Gleick, H.P. 1993. *Water in crisis*, Pacific Institute for Studies Oxford Univ. Press.

Web Resources

1. https://www.sciencenews.org/topic/environment
2. https://news.mongabay.com/2024/05/
3. https://www.sciencedaily.com/news/earth_climate/environmental_issues/
4. https://wildlife.org/rising-oryx-numbers-may-distress-new-mexico-ecosystem/
5. https://phys.org/news/2024-02-global-wild-megafauna-ecosystem-properties.html

SEMESTER III & IV
LIFE SKILL TRAINING II: CATECHISM

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
UG234LC1	1	-	-	-	1	1	15	50	50	100

Learning Objectives:

1. To develop human values through value education
2. To understand the importance of personal development to lead a moral life

Course Outcomes

On the successful completion of the course, students will be able to:		
1	know and understand the aim and importance of value education	**K1,K2**
2	get rid of inferiority complex and act confidently in the society	**K3**
3	live lovingly by facing loneliness and make decisions on their own	**K3**
4	develop human dignity and able to stand bravely in adversity	**K6**
5	learn unity in diversity and grow in a life of grace	**K6**

K1 - Remember **K2**-Understand; **K3**-Apply; **K6**- Create

Units	Contents	No. of Hours
I	**Face Loneliness:** Loneliness – Causes for Loneliness – Loneliness in Jesus Christ Life – Ways to Overcome Loneliness – Need and Importance Bible Reference: Matthew: 6:5-6	3
II	**Inferiority Complex:** Inferiority Complex - Types – Ways to Get Rid of Inferiority Complex – Words of Eric Menthol – Balanced Emotion – Jesus and his Disciples. Bible Reference: Luke 8:43-48	3
III	**Decision Making:** Importance of Decision Making – Different Steps – Search – Think – Pray – Decide- Jesus and his Decisions Bible Reference: Mathew 7:7-8 **Independent:** Freedom from Control – Different Types of Freedom - Jesus the Liberator Bible Reference: Mark 10:46-52	3
IV	**Human Dignity:** Basic Needs – Factors that Degrade Human Dignity – How to Develop Human Dignity. Bible Reference: Luke 6:20-26 **Stand Bravely in Adversity:** Views of Abraham Maslow – Jesus and his Adversity. Bible Reference: Luke 22:43	3
V	**Unity in Diversity:** Need for Unity – The Second Vatican Council on the Mission of Christian Unity. Bible Reference: I Corinthians 1:10 **To Grow in a Life of Grace:** Graceful Life – View of Holy Bible – Moses – Amos – Paul – Graceful Life of Jesus Bible Reference: Amos 5:4	3
TOTAL		**15**

Textbooks

1. *Valvukku* Valikattuvom, Christian Life Committee, Kottar Diocese
2. The Holy Bible

SEMESTER III & IV
LIFE SKILL TRAINING II: MORAL

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
UG234LM1	1	-	-	-	1	1	15	50	50	100

Learning Objectives:

1. To cultivate human values through value education
2. To comprehend the importance of humane and morals to lead ethical and moral life.

Course Outcome

On the successful completion of the course, students will be able to:		
1	know the significance of life	**K1**
2	understand the importance of self-care	**K2**
3	realise the duty of youngsters in the society and live up to it	**K3**
4	analyse how to achieve success in profession	**K4**
5	develop mystical values by inculcating good thoughts	**K5**

K1 - Remember; K2 - Understand; K3 – Apply; K4 - Analyse; K5 – Evaluate

Unit	Contents	No. of Hours
I	**Edu Care:** Introduction- -Personal Care-Temple of Mind-Emotional stability- Inner views- Internal and external Beauty- Life is a Celebration	**3**
II	**Self-care:** Self- discipline- Selfishness in doing good things- Adolescence stage- What am I? - Self-esteem- Self-Confidence- Respect for womanhood	**3**
III	**Profession based Values:** Time Management-Continuous effort- What next? –Present moment is yours, Hard work and Smart Work-Broad view- destruct your failures	**3**
IV	**Mystical Values:** Thoughts- Positive and negative thoughts- Origin of negative thoughts-Moralisation of needs- Elimination of obstacles	**3**
V	**Society and you:** Knowing Humanity-Thankfulness- love and happiness-Honesty- Heroism -Youth is gift of God-Youngsters in politics and social media utilization.	**3**
TOTAL		**15**

Textbook

2. "Munaetrathin Mugavari", G. Chandran, Vaigarai Publisher.

SEMESTER IV/VI

SELF LEARNING COURSE II: WEB ANIMATION

Course Code	L	T	P	S	Credit	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU234SL1/ SU236SL1	-	-	-	-	1	-	-	**25**	**75**	**100**

Prerequisite:

Basic understanding of web development and animation concepts.

Learning Objectives:

1. To understand the principles of timing, easing and sequencing in web animation.
2. To gain proficiency in using CSS and JavaScript libraries/frameworks for creating interactive and visually appealing web animations.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	remember and understand HTML structure, tags, and saving web pages.	**K1 & K2**
2.	utilize CSS for image styling and text wrapping.	**K3**
3.	analyse and create various types of hyperlinks and use CSS.	**K3 & K4**
4.	learn and evaluate pose-to-pose sketching, rapid sketching, and basic acting.	**K4& K5**
5.	develop master pencil shading, textures, landscapes, and human anatomy.	**K6**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Units	Contents
I	Introduction: Define HTML and HTML 5 - Getting started with tags – Saving web pages - Viewing your web pages - Basic HTML Tags - Basic HTML template - Heading Tags - Paragraph and Break tags - Bold and Italics - HTML lists
II	Dealing with Images: Types of Images - Inserting Images - Image Attributes - Images and CSS - Text wrapping with CSS - CSS and image borders - Background Images - Adding Captions to Images.
III	Linking to other Pages: Hyperlinks - Linking to other Pages - Other Types of Hyperlinks - CSS and Hyperlinks - External Stylesheets – Inline Stylesheets – Internal Stylesheets.
IV	Introduction to pose to pose sketching: Rapid sketching from live Models - Introduction to Acting – Modeling - Sketching from Acting - Sketching from live Models - Introduction to Rapid Sketching Techniques - Sketching from Memory - Live Action - Basics of Acting - Style Breaking - Movements.
V	Shading in Different Angles of Pencil Strokes - Formatting in Different Textures with Pencil – Shading - Simple Objects in Drawing - Simple Shapes of Geometrical Shapes – Roadsides – Rivers - Perspective in Lines in Landscapes - Different Head Shapes – Characters - Human Anatomy

Textbooks

1. Thomas A. Powell, 2010. *HTML & CSS: The complete Reference*, (5th Edition), Osborne/McGraw Hill Reference.
2. Ethan Watrall, Jeff Siarto, 2009. *Head First Web Design*, (4th Edition), O'Reilly Media.
3. Roger King, 2015. *3D Animations for the Raw Beginner Using Maya*, (5th Edition), CRC Press Publisher.

Reference Books

2. Tod Polson, 2013. *The Noble Approach: Maurice Noble and the Zen of Animation Design*, (5th Edition), Chronicle Books LLC.
3. Kirupa Chinnathambi, 2017. *Creating Web Animations: Bringing Your UIs to Life*, (4th Edition), O'Reilly Media.
4. Julian Shapiro, 2015. *Web Animation Using JavaScript: Develop and Design*, (5th Edition), PeachpitPress Publisher.
5. Les Pardew, Ross S. Wolfley, 2005. *The Animator's Reference Book*, (3rd Edition), Thomson Course Technology.
6. Steven Bradley, 2014. *CSS Animations and Transitions for the Modern Web*, (2nd Edition), Pearson Education.

Web Resources

1. Website: MDN Web Docs - Animation
2. Website: CSS-Tricks
3. Website: GreenSock Documentation
4. Website: CodePen
5. Website: Aen Animation API

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	2	2	2	3	3	3	2	2
CO2	3	3	2	2	2	2	2	3	3	3	2	2
CO3	3	3	2	1	2	2	2	3	3	3	2	2
CO4	3	3	2	1	2	2	2	3	3	3	2	2
CO5	3	3	2	1	2	2	2	3	3	3	2	2
TOTAL	**15**	**15**	**10**	**7**	**10**	**10**	**10**	**15**	**15**	**15**	**10**	**10**
AVERAGE	**3**	**3**	**2**	**1.4**	**2**	**2**	**2**	**3**	**3**	**3**	**2**	**2**

3 – Strong, 2- Medium, 1- Low

SEMESTER V

CORE COURSE V: RELATIONAL DATABASE MANAGEMENT SYSTEM

Course Code	L	T	P	S	Credits	Inst. Hours	Total	Marks		
								CIA	External	Total
SU235CC1	4	1	-	-	4	5	75	25	75	100

Pre-requisite:

A basic understanding of computer systems, programming fundamentals, and data structures.

Learning Objectives:

1. To understand the database systems, their architecture, and functionalities.
2. To develop PL/SQL programming skills for building robust database applications with cursors and exception handling.

Course Outcomes

On the successful completion of the course, student will be able to:		
1.	understand the relational databases, architecture, and apply SQL for data operations.	**K2, K3**
2.	apply normalization techniques for data integrity and redundancy removal.	**K3, K4**
3.	apply advanced SQL techniques for efficient data retrieval and manipulation.	**K3, K4**
4.	evaluate the PL/SQL programs with cursors and exception handling.	**K3, K5**
5.	design and normalize database schemas using ER/EER models.	**K4, K5**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

Units	Contents	No. of Hours
I	**Relational Databases:** Purpose of Database System – Views of data – Data Models – Database System Architecture – Introduction to Relational Databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQL features – Embedded SQL – Dynamic SQL.	**15**
II	**Database Design:** Entity-Relationship Model – E-R Diagrams – Enhanced-ER Model – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.	**15**
III	**Normalization of Database Tables:** Database Tables and Normalization – The Need for Normalization – The Normalization Process – Higher level Normal Form. **Introduction to SQL:** Data Definition Commands – Data Manipulation Commands – SELECT Queries – Additional Data Definition Commands – Additional SELECT Query Keywords – Joining Database Tables.	**15**
IV	**Advanced SQL: 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:** Date and Time Function – Numeric Function – String Function – Conversion Function.	**15**

V	**PL/SQL**: **A Programming Language:** History – Fundamentals – Block Structure – Comments – Data Types – Other Data Types – Variable Declaration – Assignment Operation – Arithmetic Operators. **PL/SQL Cursors and Exceptions:** Cursors – Implicit Cursors, Explicit Cursors and Attributes – Cursor FOR loops – SELECT…FOR UPDATE – WHERE CURRENT OF Clause – Cursor with Parameters – Cursor Variables – Exceptions – Types of Exceptions.	**15**
Total		**75**

Self-study	First and Second Normal Form

Text Books:

1. A Silberschatz, H Korth, S Sudarshan, 2005. "*Database System and Concepts*", (5th Edition) McGraw-Hill,Tamilnadu State Council for Higher Education, New Delhi, India.
2. Raghu Ramakrishnan, Johannes Gehrke, "*Database Management Systems*", (3rd Edition), TATA McGraw Hill, New Delhi.
3. Avi Silberschatz, Henry F. Korth, S. Sudarshan, "*Database System Concepts*", (6th Edition), McGraw-Hill, New Delhi.

Reference Books:

1. Alexix Leon & Mathews Leon, 2009. "*Essential of DBMS*", Vijay Nicole Publications, Chennai, India.
2. C.J. Date, A.Kannan, S.Swami Nadhan, "*An Introduction to Database systems*", (8th Edition), Pearson Education, USA.
3. Alexix Leon & Mathews Leon, 2014. "*Fundamentals of DBMS*", (2nd Edition), Vijay Nicole Publications, Chennai.
4. Silberschatz, A., Korth H. F., & Sudharsha. S., 2011. "*Database System Concepts"*, (6th Edition), Tata McGraw Hill, New Delhi, India.
5. Elmasri, R., & Navathe, S. B. 2011. "*Fundamentals of Database Systems",* (6th Edition), Pearson Education, USA.

Web Resources:

1. https://www.simplilearn.com/tutorials/sql-tutorial/what-is-normalization-in-sql
2. https://www.lkouniv.ac.in/site/writereaddata/siteContent/202003291621085101 sanjeev_rdbms_unit-III_pl-sql_bba_ms_4_sem.pdf
3. https://gacbe.ac.in/pdf/ematerial/18BIT52C-U4.pdf
4. https://www.w3schools.com/Sql/sql_join.asp
5. http://asolanki.co.in/wp-content/uploads/2019/02/Fundamentals_of_Database_Systems_6th_Edition-1.pdf

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	2	1	2	1	3	-	-
CO2	3	2	3	2	3	1	3	-	-
CO3	3	3	2	2	2	1	-	3	-
CO4	3	3	3	2	3	2	-	3	-
CO5	3	3	3	3	3	2	-	-	3
TOTAL	**15**	**13**	**13**	**10**	**13**	**7**	**6**	**6**	**3**
AVERAGE	**5**	**2.6**	**2.6**	**2**	**2.6**	**1.4**	**1.2**	**1.2**	**0.6**

3 – Strong, 2- Medium, 1- Low

SEMESTER V

CORE COURSE VI: OPERATING SYSTEM

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU235CC2	4	1	-	-	4	5	75	25	75	100

Pre-requisite:

Basic knowledge of computer architecture, components and fundamentals of programming and data structures.

Learning Objectives:

1. To understand the fundamental concepts of operating system.
2. To analyze synchronization, scheduling, security, and system calls for efficient resource management.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	describe the basic concepts, structures, and operations of an operating system.	**K1& K2**
2.	explain process scheduling, IPC mechanisms, and thread management techniques.	**K2**
3.	apply synchronization techniques and deadlock handling methods in an OS environment.	**K3**
4.	analyze different memory management techniques, including paging and virtual memory.	**K4**
5.	evaluate file system structures, storage management strategies, and recovery mechanisms.	**K5**

K1 - Remember; **K2 -** Understand; **K3** – Apply; **K4** – Analyze; **K5** – Evaluate

Units	Contents	No. of Hours
I	**Introduction:** Operating System - Computer System Organization - Computer System Architecture - Operating System Operations - Resource Management - Kernel Data Structures – Computing Environments. **Operating System Structure:** Operating System Services – User and Operating System Interface – System Calls – Operating System Structures.	**15**
II	**Process Management**: **Processes:** Concepts – Operations on Processes - Process Scheduling – Interprocess Communication (IPC) – IPC in Shared -Memory Systems – IPC in Message-Passing Systems – Threads - Multithreading Models. **CPU Scheduling:** Basic Concepts – Scheduling Criteria – Scheduling Algorithms – Thread Scheduling – Real-Time CPU Scheduling.	**15**
III	**Process Synchronization: Synchronization Tools:** Critical Section Problem – Peterson's Solution – Mutex Locks – Semaphores – Monitors – Classic Problems of Synchronization - POSIX Synchronization – Synchronization in Java. **Deadlocks:** System Model – Deadlock in Multithreaded Applications – Deadlock Characterization – Methods for Handling Deadlocks – Deadlock Prevention – Deadlock Avoidance – Deadlock Detection – Recovery from Deadlock.	**15**
IV	**Memory Management: Main Memory:** Background – Contiguous Memory Allocation – Paging – Structure of Page Table - Swapping – Examples. **Virtual Memory:** Introduction – Demand Paging – Page	**15**

	Replacement – Allocation of Frames – Thrashing – Examples. **I/O Systems:** Overview – I/O Hardware – Application of I/O Interface – Kernel I/O Subsystem – Streams.	
V	**Storage Management: File System Interface:** File Concept – Access Methods – Directory Structure – Protection – Memory-Mapped Files. **File System Implementation:** File System Structure – File System Operations – Directory Implementation – Allocation Methods – Free Space Management – Efficiency and Performance – Recovery.	**15**
	Total	**75**

Self-study	Kernel Architecture and Design.

Textbooks:

1. Silberschatz, A., Galvin, P. B., Gagne, G.**,** 2018. *Operating System Concepts*, (10th Edition), Wiley, Hoboken, New Jercy.
2. Tanenbaum, A. S., 2014. *Modern Operating Systems*, (4th Edition), Pearson, Boston, USA.

Reference Books:

1. Stallings W.**,** 2018. *Operating Systems: Internals and Design Principles*, (9th Edition), Pearson, Boston, USA.
2. Dhamdhere D. M., 2014. *Operating Systems: A Concept-Based Approach*, (3rd Edition), McGraw-Hill, New Delhi, India.
3. Silberschatz A., Galvin P. B., Gagne G., 2014. *Operating System Concepts Essentials*, (1st Edition), Wiley, Hoboken, New Jercy.
4. Nutt G. J.**,** 2004. *Operating Systems: A Modern Perspective*, (2nd Edition), Pearson, Boston, USA.
5. Crowley C., 1999. *Operating Systems: A Design-Oriented Approach*, McGraw-Hill, New York.

Web Resources:

1. http://web.stanford.edu/class/cs140/
2. https://os-book.com/
3. https://www.kernel.org/doc/html/latest/
4. https://www.freertos.org/
5. https://cs50.harvard.edu/

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	2	2	1	3	3	3	3	2	1
CO2	3	3	1	2	2	1	3	3	3	3	2	1
CO3	3	3	1	2	2	1	3	3	3	2	3	1
CO4	3	3	1	2	2	1	3	3	3	2	3	1
CO5	3	3	1	2	3	1	3	3	3	2	2	1
TOTAL	**15**	**15**	**5**	**10**	**11**	**5**	**15**	**15**	**15**	**13**	**12**	**5**
AVERAGE	**3**	**3**	**1**	**2**	**2.2**	**1**	**3**	**3**	**3**	**2.6**	**2.4**	**1**

3 – Strong, 2- Medium, 1- Low

SEMESTER V

CORE LAB COURSE V: RELATIONAL DATABASE MANAGEMENT SYSTEM LAB

Course Code	L	T	P	S	Credits	Inst. Hours	Total	Marks		
								CIA	External	Total
SU235CP1	-	1	4	-	4	5	75	25	75	100

Prerequisite:

Basic knowledge of programming concepts and familiarity with data structures and algorithms.

Learning Objectives:

1. To understand the basic concepts and the applications of database systems using MYSQL.
2. To create and perform basic operation with MYSQL.
3. To interact with MYSQL by using nested queries, set of aggregate operations and views.

Course Outcomes

On the successful completion of the course, student will be able to:		
1.	apply SQL commands to create, modify, and manipulate tables in Oracle.	**K2 & K3**
2.	demonstrate set operations and aggregate functions for data analysis.	**K3**
3.	implement various SQL joins and nested subqueries for complex queries.	**K3**
4.	develop PL/SQL programs using loops, triggers, and conditions.	**K4**
5.	validate data entry and automate data processing using PL/SQL.	**K4**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4**-Evaluate

List of Exercises	No. of Hours
Implement the following exercises using Oracle: 1. Create a table and perform the following basic mysql operations a. Set the primary key b. Alter the structure of the table c. Insert values d. Delete values based on constraints e. Drop the table f. Display values using various forms of select clause 2. Develop mysql queries to implement the following set operations a. Union b. Union all c. Intersect d. Intersect all 3. Develop mysql queries to implement the following aggregate functions a. Sum b. Count c. Average d. Maximum e. Minimum f. Group by clause & having clause 4. Develop mysql queries to implement following join operations a. Natural join b. Inner join c. Using join conditions d. Outer join-left outer, right outer, full outer 5. Develop mysql queries to implement nested subqueries a. Set membership (int, not int) b. Set comparison (some, all) c. Empty relation (exists, not exists) d. Check for existence of Duplicate tuples (unique, not unique) 6. Develop mysql queries to create a view and expand it. 7. Develop mysql queries to implement a. String operations using % b. String operations using '_' 20 c. Sort the element using asc, desc	**75**

8. Write a Pl/SQL program using FOR loop to insert ten rows into a database table. 9. Triggers a. Creation of insert trigger b. delete trigger c. update trigger 10. Program to validate the Data Entry Using Triggers. 11. Write a Pl/SQL program using If-Else statement database table. 12. Write a Pl/SQL program using While loop to insert ten rows into a database table.	

Text Books:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, 2020**.** *"Database System Concepts"*, (7th Edition), McGraw-Hill, New York, USA.
2. Ramez Elmasri, Shamkant B. Navathe, 2017. *"Fundamentals of Database Systems"*, (7th Edition), Pearson, Boston, USA.
3. C.J. Date, A. Kannan, S. Swamynathan, 2006. *"An Introduction to Database Systems"*, (8th Edition), Pearson Education, Boston, USA.

Reference Books

1. Thomas Connolly, Carolyn Begg, 2015. *"Database Systems: A Practical Approach to Design, Implementation, and Management"*, (6th Edition), Pearson Education, Harlow, England.
2. Ivan Bayross,(2010). *"SQL, PL/SQL: The Programming Language of Oracle"*, (5th Edition), BPB Publications., New Delhi, India.
3. Peter Rob, C arlos Coronel, 2016. ***"****Database Systems: Design, Implementation, and Management"*, (12th Edition), Cengage Learning, Boston, USA.
4. Ivan Bayross, 2010. *"SQL, PL/SQL: The Programming Language of Oracle"*, (5th Edition), BPB Publications, New Delhi, India.
5. Loney Kevin and Koch George, 2002. "*Oracle 9i The complete reference"*, Tata McGraw Hill, New Delhi, India.

Web Resources

1. https://docs.oracle.com/en/database/oracle/
2. https://www.w3schools.com/sql/
3. https://www.geeksforgeeks.org/dbms/
4. https://www.tutorialspoint.com/sql/index.htm
5. https://mrcet.com/pdf/Lab%20Manuals/CSE%20II-II%20SEM.pdf

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	3	2	3	2	3	2	2
CO2	3	3	2	3	2	1	3	3	3
CO3	3	3	3	3	2	3	3	3	3
CO4	3	3	3	3	2	2	3	2	1
CO5	3	2	3	3	3	2	3	3	3
TOTAL	**15**	**13**	**14**	**14**	**12**	**10**	**15**	**13**	**12**
AVERAGE	**3**	**2.6**	**2.8**	**2.8**	**2.4**	**2**	**3**	**2.6**	**2.4**

3 – Strong, 2- Medium, 1- Low

SEMESTER V
CORE RESEARCH PROJECT

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								Internal	External	Total
SU235RP1	-	-	-	5	4	5	75	25	75	100

Course Requirements:

1. All students are mandated to undertake a dissertation in their final year (V semester).
2. Students may pursue their project in another institution with consent from the Supervisor, HoD, and Principal, especially with MoU/Collaboration for project completion.

Distribution of marks for project 25:75

Internal Components

Internal Viva= 15marks
Regularity and Systematic work= 10marks

External Components

Dissertation =30marks
Innovation =15marks
Presentation and Viva =30marks

Dissertation Format:

1. Dissertation format specifications include:
   - Font: Times New Roman
   - Heading: Font size 14 (Bold, Uppercase)
   - Subheadings: Font size 12 (Bold, Lowercase), numbered (e.g., Introduction 1; Subheading 1.1; 1.2)
   - Text content: Font size 12 (Normal)
   - Citation: Follow specified citation formats for referencing other researchers' work.
   - Line spacing: 1.5
   - Margin: 2" left, 1" right, Gutter: 0.5
   - Page numbering: Bottom middle alignment, excluding initial pages and references.
   - Total pages: Minimum 30, Maximum 50 (excluding initial pages and references).
   - Tables and Figures should be included subsequently after referring to them in the text.
   - Chapters should be printed on both sides.
2. Project reports must be completed within the stipulated time.
3. Submission requirements include one soft copy (PDF format on CD) and three hard copies (soft binding) duly signed and endorsed by the Supervisor and the Head.

Structure of Project Report:

1. Initial Pages:
   - Title Page
   - Supervisor's Certificate
   - Candidate's Declaration (endorsed by Supervisor and HoD)
   - Acknowledgment (one-page, signed by the candidate)
   - Table of Contents
   - List of Abbreviations
   - List of Tables
   - List of Figures
   - Abstract

2. Main Body:
    - Introduction with **Background** and Objectives
    - Methodology
    - **System Design and Architecture**
    - Module Description
    - **Implementation**
    - Output
    - Conclusion and Future Work
    - References
3. Reference guidelines for various sources are provided for proper citation.

SEMESTER V

DISCIPLINE SPECIFIC ELECTIVE I: a) COMPUTER NETWORKS

Course Code	L	T	P	S	Credits	Inst. Hours	Total	Marks		
								CIA	External	Total
SU235DE1	4	-	-	-	3	4	60	25	75	100

Prerequisite:

Basic Knowledge of Computer hardware

Learning Objectives:

1. To understand the basics of data communication and networking models.
2. To differentiate and analyze the various network model layers.

Course Outcomes

On the successful completion of the course, student will be able to:		
1.	recall the network models, signals and the functions of various layers	**K1**
2.	summarize the working of network models and its layers	**K2**
3.	utilize error control methods and routing techniques	**K3**
4.	examine the functions of network layer, transport layer and application layer	**K4**
5.	evaluate network architectures and the significance of each OSI layer	**K5**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4**-Analyse; **K5**-Evaluate

Units	Contents	No. of Hours
I	**Data Communication:** Data Communication - Networks - The Internet - Protocols and Standards - OSI Model- Layers in OSI Model - TCP/IP Protocol Suite – Addressing	**12**
II	**Data and Signals:** Analog and Digital - Digital Signals - Transmission Impairment - Performance - Multiplexing - Guided Media - Unguided Media. **Switching:** Circuit Switched Networks - Datagram Networks - Virtual Circuit Networks	**12**
III	**Data Link Layer:** Introduction - Error Detection and Correction. **Block Coding:** Error Detection, Error Correction. **Data Link Control:** Framing - Flow and Error Control - Protocols - Noiseless Channels - Noisy channels.	**12**
IV	**Network Layer:** Network Layer. **Logical Addressing:** IPv4 Addresses - IPv6 Addresses – Delivery – Forwarding - Unicast Routing Protocols – Multicast Routing protocols. **Transport Layer:** UDP, TCP, Congestion, Congestion Control	**12**
V	**Application Layer:** Domain Name Space - DNS in the Internet - Electronic Mail - File Transfer. **WWW:** Architecture – Web Documents - HTTP.	**12**
	Total	**60**

Textbook:

1. Behrouz A. Forouzan, 2007. *Data Communications and Networking*, (4th Edition). McGraw-Hill Companies.

UNIT I - Chapters 1,2

Self Study	Electronic Mail

UNIT II - Chapters 3,6,7,8
UNIT III - Chapters 10,11
UNIT IV - Chapters 19,22, 23, 24
UNIT V - Chapters 25,26,27

Reference Books:

1. Stallings, W., 2004. *Data and computer communications.* (7th Edition). Prentice Hall of India.
2. Tanenbaum, A. S., 2013. *Computer Networks*. (5th Edition). Prentice Hall of India.
3. Gill, N.S, 2014. *Essential of Computer and Network Technology*. (1st Edition). Khanna Book Publishing Company (P) Ltd
4. Kurose James, Ross Keith, 2012. *Computer Networking: A Top-Down Approach.* (6th Edition). Pearson Education.
5. Gary A.Donahue. 2011. *Network Warrior.* (1st Edition). O'Reilly Media Publications.

Web Resources:

1. https://www.youtube.com/watch?v=J4Myf0UNkLI
2. https://www.geeksforgeeks.org/basics-computer-networking/
3. https://www.studytonight.com/computer-networks/
4. https://www.youtube.com/watch?v=OYM-Wjs-Gbw
5. https://www.youtube.com/watch?v=IPvYjXCsTg8

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2	2	2	3	2	2	2	2
CO2	3	3	2	3	2	2	3	3	3	3	2	2
CO3	3	3	2	3	2	2	2	3	3	3	3	2
CO4	3	3	2	3	2	2	2	3	3	3	2	2
CO5	3	3	3	3	3	3	2	3	3	2	3	3
TOTAL	**15**	**14**	**11**	**14**	**11**	**11**	**11**	**15**	**14**	**13**	**12**	**11**
AVERAGE	**3**	**2.8**	**2.2**	**2.8**	**2.2**	**2.2**	**2.2**	**3**	**2.8**	**2.7**	**2.4**	**2.2**

3 – Strong, 2- Medium, 1- Low

SEMESTER V

DISCIPLINE SPECIFIC ELECTIVE I: b) CLOUD COMPUTING

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU235DE2	4	-	-	-	3	4	60	25	75	100

Pre-requisite:

Basic knowledge in networking, distributed computing, virtualization, and security principles.

Learning Objectives:

1. To gain knowledge of cloud storage mechanisms and security challenges in cloud computing.
2. To analyze and evaluate various cloud-based applications and services from leading providers.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	recall and understand the fundamental concepts, models, architectures, virtualization techniques and working principles of cloud computing	**K1& K2**
2.	apply knowledge of cloud storage, security mechanisms, and cloud tools in real-world scenarios.	**K3**
3.	analyze the risks and security challenges associated with cloud computing and suggest mitigation strategies	**K4**
4.	evaluate mitigation strategies for addressing cloud security risks and challenges	**K5**
5.	create and deploy cloud-based applications using leading cloud providers like AWS, Google cloud and Microsoft Azure	**K6**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyze;
K5 – Evaluate, **K6**-Create

Units	Contents	No. of Hours
I	**Cloud Computing Foundation:** Introduction to Cloud Computing – Move to Cloud Computing – **Types of Cloud:** Public, Private, Hybrid, Community – Working of Cloud Computing.	**12**
II	**Cloud Computing Architecture:** Cloud Computing Technology – Cloud Architecture – Cloud Modeling and Design. **Virtualization:** Foundation – Grid, Cloud and Virtualization –Virtualization and Cloud Computing.	**12**
III	**Data Storage and Cloud Computing:** Data Storage – Cloud Storage – Cloud Storage from LANs to WANs. **Cloud Computing Services:** SaaS, PaaS, IaaS – Cloud Computing at Work.	**12**
IV	**Cloud Computing and Security:** Risks in Cloud Computing – Data Security in Cloud – Cloud Security Services. **Cloud Computing Tools:** Tools and Technologies for Cloud – Cloud Mashups – Apache Hadoop – Cloud Tools.	**12**
V	Cloud Applications – Moving Applications to the Cloud – Microsoft Cloud Services – Google Cloud Applications – Amazon Cloud Services – Cloud Applications.	**12**
	Total	**60**

Self-study	Cloud Deployment Models (Public, Private and Community)

Text Books:

1. A.Srinivasan and J.Suresh, 2014. *Cloud Computing – A Practical Approach for Learning and Implementation*. (1st Edition). Pearson India Publications.
2. Thomas Erl, Zaigham Mahmood, and Ricardo Puttini, 2013. *Cloud Computing: Concepts, Technology & Architecture*. (1st Edition). Prentice Hall.

Reference Books:

1. *Raj*kumar Buyya, James Broberg, Andrzej, 2011. *Cloud Computing: Principles and Paradigms*. (1st Edition). Wiley India Publications.
2. Arshdeep Bahga and Vijay Madisetti, 2014. *Cloud Computing – A Hands-on Approach.* Universities Press (India) Pvt Ltd.
3. Toby Velte, Anthony Velte, and Robert Elsenpeter, 2010. *Cloud Computing: A Practical Approach. (Indian Edition).* McGraw Hill.
4. George Reese, 2009. *Cloud Application Architectures: Building Applications and Infrastructure in the Cloud.* O'Reilly Media.
5. Barrie Sosinsky, 2011. *Cloud Computing Bible.* (1st Edition). Wiley India.

Web Resources:

1. https://nptel.ac.in/courses/106105167/
2. https://www.geeksforgeeks.org/cloud-computing/
3. https://www.atlassian.com/microservices/cloud-computing?
4. https://learn.microsoft.com/en-us/azure/?product=popular
5. https://aws.amazon.com/

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	1	1	1	2	3	2	1	1	1
CO2	3	2	1	2	1	1	2	3	3	2	1	1
CO3	2	3	2	3	2	2	2	2	3	3	2	1
CO4	2	2	3	3	2	2	3	2	3	3	2	3
CO5	2	3	3	3	3	2	3	3	3	3	3	3
TOTAL	**12**	**12**	**10**	**12**	**9**	**8**	**12**	**13**	**14**	**12**	**9**	**9**
AVERAGE	**2.4**	**2.4**	**2.0**	**2.4**	**1.8**	**1.6**	**2.4**	**2.6**	**2.8**	**2.4**	**1.8**	**1.8**

3 – Strong, 2- Medium, 1- Low

SEMESTER V

DISCIPLINE SPECIFIC ELECTIVE I: c) INTERNET OF THINGS

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU235DE3	4	-	-	-	3	4	60	25	75	100

Pre-requisite:

Basic knowledge of computer networks and communication protocols and fundamental programming skills (C, Python, or Arduino IDE).

Learning Objectives:

1. To understand the fundamental concepts and architecture of IoT.
2. To identify and explain domain-specific IoT applications.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	describe the characteristics, architecture, and components of IoT.	**K1& K2**
2.	explain the relationship between IoT and wireless sensor networks, including development boards.	**K3**
3.	analyze domain-specific IoT applications and their implementations.	**K4**
4.	examine IoT security concerns and M2M communications standards.	**K4**
5.	evaluate the concept of smart cities and IoT-based automation strategies.	**K5**

K1 - Remember; **K2 -** Understand; **K3** – Apply; **K4** – Analyze, **K5** – Evaluate

Units	Contents	No. of Hours
I	**Introduction:** Introduction – Characteristics of IoT – Physical Design of IoT – Logical Design of IoT – IoT Enabling Technologies – IoT Levels and Deployment Templates – Components of IoT – Architecture of IoT – IoT Protocols – IoT technology stack – Blue tooth – Zig Bee and 6LowPAN.	**12**
II	**Domain Specific IoTs and Cloud IoT**: Introduction – Home Automation – Cities – Environment – Energy – Retail – Logistics – Agriculture – Industry – Health and Lifestyle. **Cloud an IoT**: Introduction – Cloud – IoT – Difference between cloud and IoT – Cloud IoT architecture –challenges.	**12**
III	**IoT and Wireless Sensor Networks:** Definition – Types of Sensors – Types of Actuators – Examples and Working. **IoT Development Boards:** Arduino IDE and Board Types, RaspberriPi Development Kit, RFID Principles and components. **Wireless Sensor Networks:** History and Context, The Node, Connecting Nodes, Networking Nodes, WSN and IoT.	**12**
IV	**Smart City and Use Cases: Smart City using IoT:** Introduction – Concept – The emergence – Dimensions and Components Design strategies – Factors affecting automation – IoT applications in smart cities – Education – E- governance – Industry. **IoT Use Cases:** Industrial IoT Use Case – IoT and smart energy – Smart transportation – Smart health – Smart home – Smart Education system – Governance use case – Smart cities.	**12**
V	**IoT Security and M2M Communications:** Introduction – Network Technologies for IoT and M2M – Security for IoT and M2M Technologies	**12**

	– Securities in IETF M2M network Technologies – Security in ETSI M2M Network Technologies – Other M2M standard Efforts.	
	Total	**60**

Self-study	Industrial IoT and IoT Data Analytics

Textbooks:

1. Lakhwani K., Gianey H. K., Wireko J. K., Hiran K. K., 2020. *Internet of Things – Principles, Paradigms and Applications of IoT*, (1st Edition), BPB Publications, New Delhi, India.
2. Bahga A., Madisetti V., 2015. *Internet of Things – A Hands-on Approach*, (1st Edition), Universities Press, Hyderabad, India.

Reference Books:

1. Holler J., Tsiatsis, V., Mulligan C., Avesand S., Karnousko, S., Boyle D., 2014. *From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence*, (1st Edition), Academic Press, Waltham, Massachusetts.
2. Khan J. Y., Yuce M. R. J., 2015. *Internet of Things, Systems and Applications*, (1st Edition), Wiley, Hoboken, New Jercy.
3. Sharma A., Bhushan B., 2017. *Internet of Things (IoT): Architecture, Design, and Applications*, (1st Edition), Wiley, Hoboken, New Jercy.
4. Liu M., Zhao X., Chen M., Zhang X., 2016. *Internet of Things: Applications and Challenges in Technology and Standardization*, (1st Edition), Springer, Cham, Switzerland.
5. Evans D., 2011. *The Internet of Things: How the Next Evolution of the Internet is Changing Everything*, (1st Edition), Cisco, San Jose, California.

Web Resources:

1. https://www.geeksforgeeks.org/introduction-to-internet-of-things-iot-set-1/
2. https://www.geeksforgeeks.org/architecture-of-internet-of-things-iot/
3. https://www.slideshare.net/SravyaGVNSK/iot-m2mpdf
4. https://www.tpointtech.com/internet-of-things-applications
5. https://www.techtarget.com/iotagenda/definition/Internet-of-Things-IoT

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	2	2	1	3	3	3	3	2	1
CO2	3	3	1	2	2	1	3	3	3	3	2	1
CO3	3	3	1	2	2	1	3	3	3	2	3	1
CO4	3	3	1	2	2	1	3	3	3	2	3	1
CO5	3	3	1	2	3	1	3	3	3	2	2	1
TOTAL	**15**	**15**	**5**	**10**	**11**	**5**	**15**	**15**	**15**	**13**	**12**	**5**
AVERAGE	**3**	**3**	**1**	**2**	**2.2**	**1**	**3**	**3**	**3**	**2.6**	**2.4**	**1**

3 – Strong, 2- Medium, 1- Low

SEMESTER V

DISCIPLINE SPECIFIC ELECTIVE II: a) VIRTUAL AND AUGMENTED REALITY

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU235DE4	4	-	-	-	3	4	60	25	75	100

Pre-requisite:

Basic knowledge in programming, software design principles and communication skills.

Learning Objectives:

1. To provide knowledge on basic principles of virtual & augmented reality.
2. To have the ability to use its technology as a platform for real-world applications.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	outline the fundamental terminologies, techniques, and applications of VR and AR.	**K1**
2.	describe different architectures and principles of VR and AR systems	**K2**
3.	utilize appropriate hardware and software technologies for different VR and AR applications.	**K3, K4**
4.	analyze the impact of VR and AR technologies on human perception and cognition	**K5**
5.	evaluate the significance of VR/AR content and interactions in solving real-world problems.	**K6**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyze;
K5 - Evaluate; **K6** – Create

Units	Contents	No. of Hours
I	**Virtual Reality:** The Three I's of VR – History – Early commercial VR Technology – Components of a VR System. **Input Devices:** Trackers – Navigation and Manipulation Interfaces – Gesture Interfaces.	**12**
II	**Output Devices:** Graphics Displays – Sound Displays – Haptic Feedback. **Computer Architecture for VR:** The Rendering Pipeline- PC Graphics Architecture. **VR Programming:** Toolkits and Scene Graphs – Traditional and Emerging Applications of VR.	**12**
III	**Augmented Reality:** Introduction – Augmented Reality Concepts: Working Principle of AR – Concepts related to AR - Ingredients of an Augmented Reality Experience.	**12**
IV	Augmented Reality Hardware – Augmented Reality Software – Software to create content for AR Application – Tools and Technologies.	**12**
V	**Augmented Reality Content:** Introduction - Creating Content for Visual, Audio, and other Senses – Interaction in AR. **Mobile Augmented Reality:** Introduction – Augmented Reality Applications Areas- Collaborative Augmented Reality.	**12**
	Total	**60**

Self-study	Ethical and Privacy Concerns in Virtual and Augmented Reality

Text Books:

1. Burdea, G.C. and Coiffet, P, 2003. *Virtual reality technology*. (2nd Edition). John Wiley & Sons.
2. Craig, A.B, 2013. *Understanding augmented reality: Concepts and applications*. (2nd Edition). Morgan Kaufmann.
3. Jon Peddie, 2017. *Augmented Reality: Where We Will All Live*‖. (1st Edition). Springer.

Reference Books:

1. Craig, A.B., Sherman, W.R. and Will, J.D, 2009. *Developing virtual reality applications: Foundations of effective design*. (1st Edition). Morgan Kaufmann.
2. Paul Mealy, 2018. *Virtual and Augmented Reality*. (1st Edition). Wiley
3. Arnaldi, B., Guitton, P. and Moreau, G. eds, 2018. *Virtual reality and augmented reality: Myths and realities*. (1st Edition). John Wiley & Sons.
4. Aukstakalnis, S, 2016. *Practical augmented reality: A guide to the technologies, applications, and human factors for AR and VR*. (1st Edition). Addison-Wesley Professional.
5. Jerald, J, 2015. *The VR book: Human-centered design for virtual reality*. (1st Edition). Morgan & Claypool.

Web Resources:

1. http://msl.cs.uiuc.edu/vr/
2. http://www.britannica.com/technology/virtual-reality/Living-in -virtual-world
3. https://mobidev.biz/blog/augmented-reality-development-guide
4. https://developer.nvidia.com/vrworks
5. https://www.roadtovr.com

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	2	2	1	2	3	2	2	2	1
CO2	3	2	1	2	2	1	2	3	2	2	2	1
CO3	2	3	1	3	2	2	2	2	3	3	2	1
CO4	2	3	1	3	2	2	2	2	3	3	2	1
CO5	2	3	2	3	3	2	2	2	3	3	2	2
TOTAL	**12**	**13**	**6**	**13**	**11**	**8**	**10**	**12**	**13**	**13**	**10**	**6**
AVERAGE	**2.4**	**2.6**	**1.2**	**2.6**	**2.2**	**1.6**	**2.0**	**2.4**	**2.6**	**2.6**	**2.0**	**1.2**

3 – Strong, 2- Medium, 1- Low

SEMESTER V

DISCIPLINE SPECIFIC ELECTIVE II: b) IMAGE PROCESSING

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU235DE5	4	-	-	-	3	4	60	25	75	100

Pre-requisite:

Basic knowledge of mathematics, linear algebra, and fundamental programming skills.

Learning Objectives:

1. To understand the fundamental concepts of digital image processing.
2. To learn about Image Restoration and Image Compression.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	understand the fundamental concepts of digital image processing.	**K1& K2**
2.	apply image enhancement techniques for improving image quality.	**K3**
3.	implement image restoration and denoising techniques.	**K3**
4.	analyze image segmentation methods for feature extraction.	**K4**
5.	evaluate different image compression techniques and their effectiveness.	**K5**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** – Analyze, **K5** – Evaluate

Units	Contents	No. of Hours
I	**Introduction:** Introduction – Image Sampling – Quantization – Resolution – Human Visual System – Classification of Digital Images – Image Types – Elements of Image Processing System – Image File Formats – Application of Digital Image Processing.	**12**
II	**Image Enhancement**: Introduction – Image Enhancement in Spatial Domain – Enhancement through Point Operation – Types of Point Operation – Histogram Manipulation – Linear Gray Level Transformation – Nonlinear Gray Level Transformation – Local or Neighborhood Operations – Image Sharpening – Image Enhancement in Frequency Domain – Homomorphic Filter – Zooming Operations – Image Arithmetic.	**12**
III	**Image Restoration and Denoising:** Introduction – Image Degradation – Types of Images Flur – Classification of Image Restoration Techniques – Image Restoration Model – Linear Image Restoration Techniques – Nonlinear Image Restoration Techniques – Blind Deconvolution – Image Denoising – Classification of Noise in Image – Median Filtering – Trimmed Average Filter – Performance Metric in Image Restoration – Application of Digital Image Restoration.	**12**
IV	**Image Segmentation:** Introduction – Classification of Image Segmentation Techniques – Region Approach to Image Segmentation – Clustering Techniques – Image Segmentation Based on Thresholding – Edge Based Segmentation – Classification of Edges – Edge Detection – Edge Linking – Hough Transform – Active Contour – Watershed Transformation – Shape Representation and Techniques.	**12**

V	**Image Compression:** Need for Image Compression – Redundancy in Images – Classification of Redundancy in Images – Image Compression Scheme – Classification of Image Compression Scheme – Run-length Coding – Shannon-Fano Coding – Huffman Coding – Arithmetic Coding – Dictionary-based Compression – Predictive Coding – Transform-based Compression – Scalar Quantization – Vector Quantization – Types of Vector Quantization.	**12**
	Total	**60**

Self-study	Basic Image Operations.

Textbooks:

1. Jayaraman S., Esakkirajan, S., Veerakumar T., 2011. *Digital Image Processing*, (1st Edition), McGraw Hill, New Delhi, India.
2. Gonzalez R. C., Woods R. E., 2018. *Digital Image Processing*, (4th Edition), Pearson Education, Upper Saddle River, New Jercy.

Reference Books:

1. Jain A. K., 1989. *Fundamentals of Digital Image Processing*, (1st Edition), PHI Learning, New Delhi, India.
2. Chanda B., Dutta Majumder D., 2009. *Digital Image Processing and Analysis*, (1st Edition), PHI Learning, New Delhi, India.
3. Sonka M., Hlavac V., Boyle R., 2014. *Image Processing, Analysis, and Machine Vision*, (4th Edition), Cengage Learning, Boston, Massachusetts.
4. Pratt W. K., 2013. *Digital Image Processing*, (4th Edition), Wiley, Hoboken, New Jercy.
5. Umbaugh S. E., 2017. *Digital Image Processing and Analysis: Human and Computer Vision Applications with CVIPtools*, (3rd Edition), CRC Press, Boca Raton, Florida.

Web Resources

1. https://www.coursera.org/learn/digital
2. https://www.imageprocessingplace.com/
3. https://opencv.org/
4. https://scikit-image.org/
5. https://ieeexplore.ieee.org/Xplore/home.jsp

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	2	2	1	3	3	3	3	2	1
CO2	3	3	1	2	2	1	3	3	3	3	2	1
CO3	3	3	1	2	2	1	3	3	3	2	3	1
CO4	3	3	1	2	2	1	3	3	3	2	3	1
CO5	3	3	1	2	3	1	3	3	3	2	2	1
TOTAL	**15**	**14**	**5**	**10**	**11**	**5**	**15**	**15**	**15**	**12**	**12**	**5**
AVERAGE	**3**	**2.8**	**1**	**2**	**2.2**	**1**	**3**	**3**	**3**	**2.4**	**2.4**	**1**

3 – Strong, 2- Medium, 1- Low

SEMESTER V

DISCIPLINE SPECIFIC ELECTIVE II: c) ARTIFICIAL INTELLIGENCE

Course Code	L	T	P	S	Credits	Inst. Hours	Total	Marks		
								CIA	External	Total
SU235DE6	3	1	-	-	3	4	60	25	75	100

Prerequisite:

Basic Knowledge in Programming and Algorithms

Learning Objectives:

1. To understand the basics of artificial intelligence
2. To differentiate and analyze the various artificial intelligence techniques

Course Outcomes

On the successful completion of the course, student will be able to:		
1.	recall the fundamentals of artificial intelligence	**K1**
2.	understand the techniques used for AI applications	**K2**
3.	apply various AI techniques to real world applications	**K3**
4.	examine the usage of appropriate techniques in AI applications	**K4**
5.	evaluate the different AI techniques	**K5**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4**-Analyse; **K5**-Evaluate

Units	Contents	No. of Hours
I	**Introduction:** Definitions of Artificial Intelligence - Artificial Intelligence Problems - Topics of Artificial Intelligence - Timelines of Artificial Intelligence - Production Systems - State Space Representation - Branches of Artificial Intelligence - Applications of Artificial Intelligence.	**12**
II	**Heuristic Search Techniques:** General and Test - Hill Climbing - Search Techniques - Problem Reduction - Constraints Satisfaction - Means-ends Analysis - Game Playing	**12**
III	**Knowledge Representation:** Knowledge Management - Types of Knowledge - Knowledge representation - Approaches to Knowledge Representation - Issues in Knowledge Representation - Knowledge Base - First Order Logic - Frames - Conceptual Dependency - Scripts - Semantic Network.	**12**
IV	**Reasoning:** Types of Reasoning - Non-monotonic Inference Methods - Non-monotonic Reasoning - Truth Maintenance Systems - Reasoning with Fuzzy Logic - Rule based Reasoning - Diagnosis Reasoning.	**12**
V	**Learning:** Types of Learning - Machine Learning: History of Machine Learning - Types in Machine Learning - Aspects of Inputs to Training - Learning Systems - Machine Learning Applications - Quantification of Classification - Intelligent Agents.	**12**
	Total	**60**

Self Study	History of Machine Learning

Textbook:

1. Chandra, V. S. S. & Hareendran, A.S, 2014. *Artificial Intelligence and Machine Learning.* (1st Edition). PHI Learning Pvt Ltd.
   Unit I - Chapter 1
   Unit II - Chapter 4
   Unit III - Chapter 5
   Unit IV - Chapter 7
   Unit V - Chapter 8

Reference Books:

1. Russell, S. J. & Norvig, P., 2016. *Artificial Intelligence - A Modern Approach* (3rd Edition). Pearson Education Limited.
2. Mitchell, T. M., 2017. *Machine Learning* (1st Edition). McGraw-Hill Education.
3. Mehrotra, D., 2019. *Basics of Artificial Intelligence & Machine Learning*. (1st Edition). Notion Press.
4. Rishal Hurbans, 2020. *Grokking Artificial Intelligence Algorithms*. (2nd Edition) Grayscale Indian Edition.
2. K.R.Chowdhary, 2020. *Fundamentals of Artificial Intelligence*. (1st Edition) Springer India Publications

Web Resources

1. https://intellipaat.com/blog/tutorial/artificial-intelligence-tutorial/
2. https://www.guru99.com/artificial-intelligence-tutorial.html
3. https://www.geeksforgeeks.org/artificial-intelligence-an-introduction/
4. https://www.tutorialspoint.com/artificial_intelligence/
5. https://www.youtube.com/watch?v=BpdM6DN1iLY

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2	2	2	3	2	2	2	2
CO2	3	3	2	3	2	2	3	3	3	3	2	2
CO3	3	3	2	3	2	2	2	3	3	3	3	2
CO4	3	3	2	3	2	2	2	3	3	3	2	2
CO5	3	3	3	3	3	3	2	3	3	2	3	3
TOTAL	**15**	**14**	**11**	**14**	**11**	**11**	**11**	**15**	**14**	**13**	**12**	**11**
AVERAGE	**3**	**2.8**	**2.2**	**2.8**	**2.2**	**2.2**	**2.2**	**3**	**2.8**	**2.7**	**2.4**	**2.2**

3 – Strong, 2- Medium, 1- Low

SEMESTER V
PROFESSIONAL COMPETENCY SKILL I- CAREER SKILLS

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
UG235PS1	1	1	-	-	2	2	30	25	75	100

Pre-requisite: A foundational understanding of the basic communication skills and computer literacy.

Learning Objectives

1. To develop effective communication and interpersonal skills to enhance workplace interactions and teamwork
2. To build job readiness skills such as resume writing, interview techniques, and professional ethics

Course Outcomes

On the successful completion of the course, students will be able to:		
1	outline key career skills such as communication, teamwork, and problem-solving	**K1**
2	explain the importance of professional ethics, workplace etiquette, and time management	**K2**
3	demonstrate effective resume writing, interview techniques, and job application strategies	**K3**
4	assess different workplace scenarios to determine appropriate communication and conflict resolution strategies	**K4**
5	develop a personal career plan with clear goals, skills assessment, and strategies for professional growth	**K5**

K1- Remember; **K2**- Understand; **K3**- Apply; **K4**- Analyse; **K5**- Evaluate

Units	Contents	No. of Hours
I	**Linguistic Skills** Vocabulary, Resume Writing, Report Writing, Technical Writing, Agenda Preparation, Preparing Minutes, E-mail.	**6**
II	**Employability Skills** Social Etiquette, Telephone Etiquette, Interview Skills, Types of Interviews, Mock Interview, Group Discussion.	**6**
III	**Digital Capabilities** Digital Learning, Digital Participation, ICT Proficiency, Creative Production, Digital Identity, Digital well-being	**6**
IV	**Body Language** Defining Body Language, Scope and Relevance, Proxemics, Oculesics, Haptics, Kinesics, Paralanguage, Chronemics, Chromatics and Olfactics	**6**
V	**Coping Mechanisms** Goal Setting, Emotional Intelligence, Team Management, Stress Management, Time Management, Leadership Skills, Problem solving Skills, Decision Making.	**6**
	Total	**30**

Self-study	Basic language skills and communication skills

Textbooks

Virgin Nithya Veena. V & Jemi A.R. 2025. *New Age Career Skills*.

Reference Books

1. Herta A. Murphy and Herbert W. Hildebrandt. 1997. *Effective Business Communication*. 7th edition. McGraw- Hill.
2. Jeff Butterfield. 2020. *Soft Skills for Everyone*. Cengage India Pvt. Ltd.
3. Jayaprakash N Satpathy. 2024. *Soft Skills for Career*. Urania Publishing House.
4. S. Xavier Alphonse S. J. 2008. *Change or Be Changed*. ICRDCE. Sri Venkateswara Printers. Chennai.
5. AK. Xavier. 2025. *Employability Skills*. JKP Publications. Madurai.

Web Resources

1. https://exchange.nottingham.ac.uk/content/uploads/Professional-Competencies-Handbook-Sept-2018.pdf
2. https://vpge.stanford.edu/professional-development/competencies-grad-grow
3. https://vpge.stanford.edu/professional-development/competencies-grad-grow
4. https://www.indeed.com/career-advice/resumes-cover-letters/core-competencies-and-skills-valued-by-employers
5. https://resources.hrsg.ca/blog/what-s-the-difference-between-skills-and-competencies

SEMESTER V

INTERNSHIP

Course Code	L	T	P	S	Credits	Inst. Hours	Marks
CU235IS1	-	-	-	-	**2**	-	**100**

FRAMEWORK FOR INTERNSHIP

- Preparatory Inputs
- Industrial Visit
- Internship
- Periodic reviews by industry supervisor and faculty guide
- Report Writing
- Viva-voce

Note: Industries allowed – Govt./NGO/MSME/Rural Internship/Innovation / Entrepreneurship / Private Industry.

S.No.	Components	Marks
1	Industry Contribution	50
2	Report & Viva-voce	50

GUIDELINES FOR PREPARING INTERNSHIP REPORT

The training report should be presented in the following format only:

a) The report should be printed in A4 sheets.
b) Text Format in the report:
   - Times New Roman 12 Font size, with 1.5 line spacing.
   - Margins 1.5” left and 1” all other sides of the report.
c) Page numbers should be placed at the bottom middle position.
d) Chapters should be numbered as I, II, III and IV.
e) The tables and charts should be in the format of 1.1, 1.2, etc.
f) The training report should have a minimum of 25 pages and should not exceed 50 pages.
g) Students should submit 2 hard copies of report (department copy + student copy) duly signed by the faculty guide and the HOD.
h) The hard copy should be in bound format with soft binding as the cover page.
i) Students are eligible for training evaluation only if she has completed 25 days of training.

FORMAT FOR INTERNSHIP REPORT

The report should be bound with pages in the following sequence:

1) Cover page - Outer cover of the report.
2) Front page - The format of cover page and front page should be one and the same.
3) Certificate
4) Company Certificate
5) Declaration
6) Acknowledgement
7) Contents

8) List of Tables if any
9) List of Figures/Charts if any
10) List of Abbreviations, if any
11) Chapter I, II, III and IV
12) Appendices
13) Bibliography

GUIDELINES FOR WRITING ACKNOWLEDGEMENT

The summer training report should contain acknowledgements in the following order:

- Principal & Secretary, College Management
- The Head of the Department
- Faculty guide and Industry supervisor
- Management of the organization in which training was taken up.

GUIDELINES FOR WRITING CHAPTERWISE REPORT

- **Chapter I** of the report should be titled as "**INTRODUCTION**". The Introduction chapter should include Introduction, Importance, Objectives, Scope and Period of the training.
- **Chapter II** of the report should be titled as "**COMPANY PROFILE**".
- **Chapter III** of the report should be titled as "**ACTIVITIES DONE.”** The third chapter should cover the objectives of the different departments and its functioning and also the learning outcome.
  Tables and figures in a chapter should be placed in the immediate vicinity of the reference where they are cited.

- **Chapter IV should be titled as "CONCLUSION".** The Conclusion part should include the observations made by the trainee in each department and the extent of fulfillment of training objectives and also reflections.

SEMESTER V

HUMAN RIGHTS, JUSTICE AND ETHICS

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
UG235HR1	1	-	-	-	1	1	15	50	50	100

Learning Objectives

1. To identify issues, problems, and violations of human rights.
2. To promote awareness of social justice, equality and human dignity.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	explain human rights principles and the role of the UN, with a focus on human rights issues in India.	**K1, K2**
2.	apply ethical principles in social, national, and professional contexts.	**K3**
3.	analyse social justice issues like untouchability, casteism, and discrimination.	**K4**
4.	examine legal frameworks for women's and child rights in India.	**K4**
5.	assess media's influence on values, digital rights, and consumerism.	**K5**

K1- Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyse; **K5** - Evaluate

Units	Contents	No. of Hours
I	**Social Justice:** Concept and need for social justice-Parameters of social justice - Issues: untouchability, casteism, and discrimination	**3**
II	**Foundations of Human Rights:** Concept and principles of human rights- United Nations and Human Rights- Human rights concerns in India	**3**
III	**Women's Rights and Child Rights:** UN and women's rights – major issues - Constitutional and legal provisions for women in India - Child rights in India – Major Issues -legal framework and enforcement	**3**
IV	**Values and social media:** Media Power- Socio, cultural and political consequences of mass mediated culture - New media prospects and challenges - Role of media in value building -Digital Rights and Privacy- Consumerist culture	**3**
V	**Ethics:** Meaning and Importance- Social ethics: Tolerance, equity, justice for all - Nationalism: love for nation, pride for nature- Professional ethics: Dedication to work and duty**.**	**3**
	Total	**15**

Self-study	Mass Media: Effects and Influence on youth and children

Reference Books

1. Baxi, Upendra. *The Future of Human Rights*. Oxford University Press, 2008.
2. Donnelly, Jack. *Universal Human Rights in Theory and Practice*. Cornell University Press, 2013.
3. Agnes, Flavia. *Law and Gender Inequality: The Politics of Women's Rights in India*. Oxford University Press, 2001.
4. *State of the World's Children 2021*. UNICEF, 2021.
5. McLuhan, Marshall. *Understanding Media: The Extensions of Man*. MIT Press, 1994.

Web Recourses

1. http://www.oxfordreference.com/views/BOOK_SEARCH.html?book=t286
2. http://globetrotter.berkeley.edu/humanrights/bibliographies/
3. https://libguides.princeton.edu/history/humanrights

SEMESTER VI

CORE COURSE VII: COMPUTER GRAPHICS

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU236CC1	5	-	-	-	4	5	75	25	75	100

Prerequisite:

Basic knowledge of programming concept and computer graphics

Learning Objectives:

1. To understand the basic object-oriented programming concepts and apply them in problem solving.
2. Understand the basic concepts of Computer Graphics

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	demonstrate the behavior of programs involving the basic programming constructs like control structures	**K1**
2.	understand the fundamental principles of graphics systems like raster-scan and random-scan systems	**K2**
3.	apply 2D transformation and implement viewing transformations to create effective 2D visualizations	**K3**
4.	investigate and apply advanced visible surface detection algorithms	**K3**
5.	understand the concept of 3D graphics including 3D geometric transformations, projection techniques, depth cueing and visible surface detection methods	**K4**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyze

Units	Contents	No. of Hours
I	**Introduction to C++:** History – Features - Rules of C++ Programming – Structure of C++ Program - C++ Tokens – Data Types - Console I/O Statements - Operators – Control Statements – Loops – Arrays.	**15**
II	**Overview of Graphics Systems:** Video Display Device - Refresh Cathode-ray tubes - Raster Scan Displays - Random Scan Displays - Color CRT Monitors - Direct view Storage Tubes - Flat Panel Displays - Three-Dimensional Viewing Devices. **Raster-Scan Systems:** Video Controller - Random-Scan Systems - Input device - Hard-Copy Devices	**15**
III	**Output Primitives:** Line Drawing Algorithms-DDA Algorithms – Bresenham's Line Algorithm- Circle generating Algorithm - Properties of Circles. **Two-Dimensional Geometric Transformation:** Basic Transformations - Translation - Rotation - Scaling - Other Transformations: Reflections. **Two-Dimensional Viewing:** Windows to view point coordinate Transformations - Clipping Operations - Point Clipping - Line Clipping - Curve Clipping - Text Clipping - Exterior Clipping.	**15**
IV	**Three Dimensional Concepts:** Three-Dimensional Display Method - Parallel Projection - Depth Cueing - Visible Line and Surface - Three Dimensional Geometric and modelling Transformations: Translation - Rotation - Scaling. **Three-Dimensional Viewing:** Viewing Pipeline - Viewing Coordinates - Projections - Parallel Projections - Perspective Projections.	**15**

V	**Visible Surface Detection Methods:** Classification Visible Surface Detection Algorithms - Back Face Detection - A-Buffer Method - Scan Line Method - Depth Sorting Method - BSP Tree Method - Area Subdivision Method.	**15**
	Total	**75**

Self-study	OOPS Concept

Textbooks

1. Donald Hearn and M. Pauline Baker, "*Computer Graphics*", (2nd Edition), 1996.
2. E. Balagurusamy, "*Object Oriented Programming with C++"*, (8th Edition), 2020

Reference Books

1. John f. Hughes, Andries Van Dam, Morgan Mcguire, David F. Sklar, James D. Foley, Steven K. Feiner, Kurt Akeley, "*Computer Graphics Principles and Practice*" (3rd Edition), Pearson Education,2014.
2. Paul Deitel and Harvey Deitel, 2017. *"C++ How to Program"*, (10th Edition), Pearson Education.
3. Andrew Koenig, 2000. "*Accelerated C++*", (1st Edition), Addison-Wesley Publication.
4. Dr. Rajiv Chopra, 2010, "*Computer Graphics*", (4th Edition), S Chand Publication.
5. Rajesh K.Maurya, 2018, "*Computer Graphics with Virtual Reality System*" (3rd Edition), Wiley Publication.

Web Resources

1. https://cplusplus.com
2. https://www.programiz.com/cpp-programming
3. https://www.geeksforgeeks.org/introduction-to-computer-graphics/
4.https://www.reddit.com/r/GraphicsProgramming/comments/iiveq7/computer_graphics_learning_resources/?rdt=33027
5. https://www.coursera.org/courses?query=computer%20graphics

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2	2	2	3	2	2	2	2
CO2	3	3	2	3	2	2	3	3	3	3	2	2
CO3	3	3	2	3	2	2	2	3	3	3	3	2
CO4	3	3	2	3	2	2	2	3	3	3	2	2
CO5	3	3	3	3	3	3	2	3	3	2	3	3
TOTAL	**15**	**14**	**11**	**14**	**11**	**11**	**11**	**15**	**14**	**13**	**12**	**11**
AVERAGE	**3**	**2.8**	**2.2**	**2.8**	**2.2**	**2.2**	**2.2**	**3**	**2.8**	**2.7**	**2.4**	**2.2**

3 – Strong, 2- Medium, 1- Low

SEMESTER VI

CORE COURSE VIII: MACHINE LEARNING

Course Code	L	T	P	S	Credits	Inst. Hours	Total	Marks		
								CIA	External	Total
SU236CC2	4	1	-	-	4	5	75	25	75	100

Prerequisite:

Basic Knowledge in Programming and Algorithms

Learning Objectives:

1. To understand the basics of Machine Learning
2. To differentiate and analyze the various machine learning techniques

Course Outcomes

On the successful completion of the course, student will be able to:		
1.	recall the fundamentals of machine learning	**K1**
2.	understand the techniques used for ML applications	**K2**
3.	apply various ML techniques to real world applications	**K3**
4.	examine the usage of appropriate techniques in ML applications	**K4**
5.	evaluate the different ML techniques	**K5**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4**-Analyse; **K5**-Evaluate

Units	Contents	No. of Hours
I	**Introduction to Machine Language:** Introduction - What is Human Learning? Types of Human Learning - What is Machine Learning? – Working – Types - Problems Not to be Solved Using Machine Learning - Applications of Machine Learning - State-of-The-Art Languages/Tools in Machine Learning - Issues in Machine Learning	**15**
II	**Preparing to Model:** Machine Learning Activities - Basic Types of Data in Machine Learning - Exploring Structure of Data - Data Quality and Remediation - Data Pre-Processing. **Modelling and Evaluation:** Selecting a Model - Training a Model (for Supervised Learning) - Model Representation and Interpretability. **Evaluating Performance of a Model:** Supervised learning – Classification, Supervised Learning – Regression, Unsupervised learning – Clustering - Improving Performance of a Model	**15**
III	**Basics of Feature Engineering:** Introduction to Feature and Feature Engineering – Feature Transformation: Feature Construction, Feature Extraction - Feature Subset Selection – Importance of Linear algebra, Probability and Statistical tools in Machine Learning, **Basics of Neural Network:** Understanding the Biological Neuron - Exploring the Artificial Neuron - Architectures of Neural Network - Learning Process in ANN.	**15**
IV	**Supervised Learning Classification:** Introduction - Example of Supervised Learning - Classification Model - Classification Learning Steps - Common Classification Algorithms: *k*-Nearest Neighbour (*k*NN), Decision Tree, Random Forest Model, Support Vector Machines, **Unsupervised Learning:** Unsupervised vs Supervised Learning - Application of Unsupervised Learning – Clustering – K-means Clustering.	**15**
V	**Real-world ML Applications & Case Studies:** Image Recognition - Natural Language Processing (NLP) - Recommender Systems - Fraud	**15**

	Detection - Healthcare & AI – Ethics & Bias in Machine Learning	
	Total	**75**

Textbook

1. Saikat Dutt, S.Chandramouli, A.K.Das, 2018. *Machine Learning*. (1st Edition). Pearson

Self Study	Issues in Machine Learning

Publication

Unit 1: From Chapter 1
Unit 2: From Chapters 2 and 3
Unit 3: From Chapters 4, 5 10
Unit 4: From Chapters 7 and 9
Unit 5: From References and Web resources given below

Reference Books

1. Sarah Guido, A.Muller, 2016. *Introduction to Machine Learning with Python*. (1st Edition). O'Reilly Media Publications.
2. John D. Kelleher, Brian M.N, Aoife D'A., 2020. *Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, and Case Studies*. (2nd Edition). MIT Press.
3. A.Geron, 2017. *Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems.* (1st Edition). O'Reilly Media Publications.
4. Andriy Burkov, 2019. *The Hundred Page Machine Learning Book*. (1st Edition). Andriy Burkov Publication
5. Oliver Theobald, 2017. *Machine Learning for Absolute Beginners*. (3rd Edition). Scatterplot Press.

Web Resources

1. https://www.coursera.org/articles/machine-learning-applications
2. https://www.geeksforgeeks.org/machine-learning-introduction
3. https://www.simplilearn.com/tutorials/machine-learning-tutorial/machine-learning-applications
4. https://www.youtube.com/watch?v=i_LwzRVP7bg
5. https://www.youtube.com/watch?v=LcWFedjaR4Q

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2	2	2	3	2	2	2	2
CO2	3	3	2	3	2	2	3	3	3	3	2	2
CO3	3	3	2	3	2	2	2	3	3	3	3	2
CO4	3	3	2	3	2	2	2	3	3	3	2	2
CO5	3	3	3	3	3	3	2	3	3	2	3	3
TOTAL	**15**	**14**	**11**	**14**	**11**	**11**	**11**	**15**	**14**	**13**	**12**	**11**
AVERAGE	**3**	**2.8**	**2.2**	**2.8**	**2.2**	**2.2**	**2.2**	**3**	**2.8**	**2.7**	**2.4**	**2.2**

3 – Strong, 2- Medium, 1- Low

SEMESTER VI

CORE LAB COURSE VI: COMPUTER GRAPHICS LAB

Course Code	L	T	P	S	Credits	Inst. Hours	Total	Marks		
								CIA	External	Total
SU236CP1	-	2	2	-	3	4	60	25	75	100

Prerequisite:

Basic knowledge of programming skill.

Learning Objectives:

1. To gain knowledge about C++ to successfully read and write C++ computer programs.
2. To apply geometric transformations, viewing and clipping on graphical objects.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	recall the concepts of C++ programming	**K1,K2**
2.	draw lines, circles and different shapes using Graphics	**K3**
3.	apply and analyse two dimensional transformations	**K3,K4**
4.	design tiled and cascaded display	**K5,K6**
5.	create simple animations applying graphics	**K6**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyze; **K5**- Evaluate**, K6** – Create

List of Exercises	No. of Hours
1. Line Drawing using DDA 2. Line Drawing using Bresenham's Algorithm 3. Circle Drawing using Bresenham's Algorithm 4. 2D Transformation 5. Different Shapes Using Graphics Function 6. Random Balls 7. Bouncing Ball 8. News Headlines 9. Drop Word By Word 10. Moving a Car 11. Scenery of Rain 12. Tiled and Cascaded Display	**60**

Textbooks

1. Donald Hearn and M. Pauline Baker, "*Computer Graphics*", (2nd Edition), 1996.
2. Balagurusamy, E, "*Object Oriented Programming with C++"*, (8th Edition), 2020

Reference Books

1. John f. Hughes, Andries Van Dam, Morgan Mcguire, David F. Sklar, James D. Foley, Steven K. Feiner, Kurt Akeley, "*Computer Graphics Principles and Practice*" (3rd Edition), Pearson Education,2014.
2. Paul Deitel and Harvey Deitel, 2017. *"C++ How to Program"*, (10th Edition), Pearson Education.
3. Andrew Koenig, 2000. "*Accelerated C++*", (1st Edition), Addison-Wesley Publication.
4. Dr. Rajiv Chopra, 2010, "*Computer Graphics*", (4th Edition), S Chand Publication.
5. Rajesh K.Maurya, 2018, "*Computer Graphics with Virtual Reality System*" (3rd Edition), Wiley Publication.

Web Resources

1. https://cplusplus.com
2. https://www.programiz.com/cpp-programming
3. https://www.geeksforgeeks.org/introduction-to-computer-graphics/

4. https://www.reddit.com/r/GraphicsProgramming/comments/iiveq7/computer_graphics_learning_resources/?rdt=33027
5. https://www.coursera.org/courses?query=computer%20graphics

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2	2	2	3	2	2	2	2
CO2	3	3	2	3	2	2	3	3	3	3	2	2
CO3	3	3	2	3	2	2	2	3	3	3	3	2
CO4	3	3	2	3	2	2	2	3	3	3	2	2
CO5	3	3	3	3	3	3	2	3	3	2	3	3
TOTAL	**15**	**14**	**11**	**14**	**11**	**11**	**11**	**15**	**14**	**13**	**12**	**11**
AVERAGE	**3**	**2.8**	**2.2**	**2.8**	**2.2**	**2.2**	**2.2**	**3**	**2.8**	**2.7**	**2.4**	**2.2**

3 – Strong, 2- Medium, 1- Low

SEMESTER VI

CORE LAB COURSE VII: MACHINE LEARNING LAB

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU236CP2	-	-	4	-	3	4	60	25	75	100

Pre-requisite:

Students should know the basics of algorithms and programming.

Learning Objectives:

1. To understand and implement basic machine learning algorithms.
2. To acquire skills in data manipulation and data analysis using Python

Course Outcomes

On successful completion of this course, students will be able to		
1.	define and explain the different types of machine learning models	**K1**
2.	identify machine learning algorithms employed in addressing diverse problems, including classification, regression, and clustering	**K2**
3.	explain appropriate metrics to evaluate machine learning model performance	**K3**
4.	evaluate and troubleshoot issues in machine learning models to improve their performance	**K5**
5.	design and implement machine learning models that can be deployed across various environments	**K6**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K5** – Evaluate; **K6** - Create

Contents	No. of Hours
1. The probability that it is Friday and that a student is absent is 3 %. Since there are 5 school days in a week, the probability that it is Friday is 20 %. What is the probability that a student is absent given that today is Friday? Apply Baye's rule in python to get the result. 2. Extract data from database using Python 3. Extract data from Excel sheet using Python 4. Implement Linear Regression 5. Implement K-Means Clustering 6. Implement Naive Bayes Theorem to Classify English Text 7. Implement a Back Propagation Algorithm 8. Implement FIND-S algorithm 9. Create and display a decision tree 10. Implement kNN algorithm 11. Create a Confusion Matrix using Python and obtain the following metrics: Accuracy, Precision, Sensitivity (Recall), Specificity, and F-score	**60**

Textbook

1. Aurélien Géron, 2019. *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow Concepts, Tools, and Techniques to Build Intelligent Systems*. (1st Edition). O'Reilly Media Publications.

Reference Books

1. Sebastian Raschka, 2017. *Python Machine Learning*. (1st Edition). O'Reilly Media Publications.
2. Manaranjan Pradhan, U.Dinesh Kumar, 2019. *Machine Learning Using Python*. (1st Edition). Wiley Publications.
3. Peter Harrington, 2012. *Machine Learning in Action*. (1st Edition). Manning Publications.
4. Francois Challot, 2017. *Deep Learning with Python*. (1st Edition). Manning Publications.

5. Andreas Muller, 2016. *Introduction to Machine Learning with Python: A Guide for Data Scientists.* (1st Edition). O'Reilly Media Publication.

Web Resources

1. https://www.w3schools.com/python/python_ml_getting_started.asp
2. https://www.geeksforgeeks.org/machine-learning-with-python/
3. https://www.youtube.com/watch?v=JxgmHe2NyeY
4. https://www.youtube.com/watch?v=NWONeJKn6kc
5. https://www.youtube.com/watch?v=hDKCxebp88A

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2	2	2	3	2	2	2	2
CO2	3	3	2	3	2	2	3	3	3	3	2	2
CO3	3	3	2	3	2	2	2	3	3	3	3	2
CO4	3	3	2	3	2	2	2	3	3	3	2	2
CO5	3	3	3	3	3	3	2	3	3	2	3	3
TOTAL	**15**	**14**	**11**	**14**	**11**	**11**	**11**	**15**	**14**	**13**	**12**	**11**
AVERAGE	**3**	**2.8**	**2.2**	**2.8**	**2.2**	**2.2**	**2.2**	**3**	**2.8**	**2.7**	**2.4**	**2.2**

3 – Strong, 2- Medium, 1- Low

SEMESTER VI

DISCIPLINE SPECIFIC ELECTIVE III: a) CRYPTOGRAPHY

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU236DE1	5	-	-	-	3	5	75	25	75	100

Pre-requisite:

Basic knowledge of computer networks, information security fundamentals, and programming concepts

Learning Objectives:

1. To introduce the basic concepts of cyber security
2. To acquire knowledge on cyber threats and attacks

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	recollect the basic concepts, need, approaches, principles and components of security.	**K1, K2**
2.	identify the various cyber threats and attacks.	**K2**
3.	use the various Security Technologies and Tools.	**K3**
4.	analyse the basic principles of cryptography and algorithms.	**K4**
5.	verify and evaluate the various protocols for secure communication.	**K5**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyze; **K5** - Evaluate

Units	Contents	No. of Hours
I	Components of Information System - Software Development Life Cycle - Security Software Development Life Cycle - Security Professionals and the Organisation - Communicates of Interest.	**15**
II	Introduction - Business Need First - Threats - Attacks - Secure Software Development.	**15**
III	Introduction - Access Control – Firewall - Protecting Remote Connections - Intrusion Detection and Prevention System – Honeypots, Honeynets and Padded Cell - System Scanning and Analysis Tools - Biometric Access Control.	**15**
IV	Foundation of Cryptology - Cipher Methods – Cryptographic Algorithms - Cryptographic Tools – Protocols for Communication - Attacks on Cryptosystems.	**15**
V	Introduction – An Overview of Risk Management – Risk Identification – Risk Assessment – Risk Control Strategies – Selecting a Risk Control Strategy – Risk Management Discussion Points - Recommended Risk Control Practices.	**15**
	Total	**75**

Self-study	Evolution of cyber threats and modern attack trends.

Text Books

1. Whitman, M. E., & Mattord, H. J, 2009. *Principles of information security*. (4th Edition) Boston, MA: Thomson Course Technology.
2. Stallings, W, 2003. *Network security essentials: applications and standards*. (6th Edition). Pearson Education India.

Reference Books

1. Stallings, W, 2006. *Cryptography and network security.* (7th Edition). Pearson Education India.

2. Atul Kahate, 2019. *Cryptography and Network Security.* (4th Edition). McGraw Hill.
3. Smith, R. E, 2019. *Elementary information security*. (3rd Edition). Jones & Bartlett Learning.
4. Kim, D and Solomon, M. G, 2016. *Fundamentals of information systems security*. (4th Edition). Jones & Bartlett Publishers.
5. Charles P. Pfleeger, Shari Lawrence Pfleeger and Jonathan Margulies, 2019**.** *Security in Computing*. (5th Edition). Pearson.

Web Resources

1. https://www.nist.gov/cyberframework
2. https://www.coursera.org/courses?query=cryptography
3. https://owasp.org
4. https://www.sans.org
5. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	2	1	2	3	3	2	1	2	1
CO2	2	3	2	1	3	1	2	2	3	2	1	2
CO3	3	2	1	2	1	3	2	3	2	3	1	1
CO4	2	3	2	1	3	2	1	2	3	1	2	3
CO5	3	1	2	3	2	1	2	3	1	2	3	1
TOTAL	**13**	**11**	**8**	**9**	**10**	**9**	**10**	**13**	**11**	**9**	**9**	**8**
AVERAGE	**2.6**	**2.2**	**1.6**	**1.8**	**2**	**1.8**	**2**	**2.6**	**2.2**	**1.8**	**1.8**	**1.6**

3 – Strong, 2- Medium, 1- Low

SEMESTER VI

DISCIPLINE SPECIFIC ELECTIVE III: b) NETWORK SECURITY

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU236DE2	5	-	-	-	3	5	75	25	75	100

Prerequisite:

Basic knowledge of security concept in network.

Learning Objectives:

1. To learn fundamental of cryptography
2. To understand the application layer security standards

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	understand the fundamentals of cryptography and network security	**K2**
2.	apply symmetric and asymmetric cryptographic techniques	**K3**
3.	analyse authentication, key management and network security protocols	**K4**
4.	evaluate security mechanisms for applications, networks and systems	**K5**
5.	apply cypber security measures and ethical practices	**K3**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyze; **K6** – Create

Units	Contents	No. of Hours
I	**Fundamentals of Networking Security:** Overview of networking security- Security Services - Confidentiality, Authentication, Integrity, Nonrepudiation, Access Control – Availability and Mechanisms - Security Attacks - Interruption, Interception, Modification and Fabrication.	**15**
II	**Authentication and Security**: Authentication Overview – Authentication Protocols – Authentication and Key Establishment – Key Exchange – Mediated Key Exchange – User Authentication – Password-based Authentication Password Security – Certificate Authority and Key Management – Digital Signatures – Digital Certificates.	**15**
III	**Public-Key Cryptography and Message Authentication**: Basics of Cryptography - Cryptographic Hash Functions – Symmetric and Public-key Encryption - Public key Cryptography Principles & Algorithms – Cipher Block Modes of Operation – Secure Hash Functions – HMAC.	**15**
IV	**Security Attacks:** Buffer Overflow Attacks and Format String Vulnerabilities – Denial-of-Service Attacks - Hijacking Attacks: Exploits and Defenses – Internet Worms – Viruses – Spyware – Phishing – Botnets – TCP Session Hijacking – ARP Attacks – Route Table Modification – UDP Hijacking – Man-in-the-Middle Attacks.	**15**
V	**IP Security and Web Security:** Network Defence Tools: Firewalls, VPNs, Intrusion Detection, and Filters. **Email Privacy:** Pretty Good Privacy (PGP) and S/MIME – Network Security Protocols in Practice - Introduction to Wireshark – SSL – IPsec, and IKE - DNS Security - Secure Socket Layer (SSL) and Transport Layer Security (TLS) – Secure Electronic Transaction (SET).	**15**
	Total	**75**

Self-study	Network Defence Tools: Firewalls, VPNs, Intrusion Detection, and filters

Text Book

1. William Stallings, 2014, *Cryptography and Network Security: Principles and Practice*, (6th edition) , Pearson, ISBN 13:9780133354690

Reference Books:

1. M. Speciner, R. Perlman, C. Kaufman, 2002 *Network Security: Private Communications in a public World*,(3rd Edition), Prentice Hall.
2. Gregor N. Purdy, 2004, *Linux iptables Pocket Reference* , O'Reily
3. Michael Rash, 2007, "Linux Firewalls"(1st Edition), No Starch Press.
4. Charlie Kaufman, Radia Perlman, Mike Speciner, Ray Perlner , 2018, *Network Security: Private Communication in public world*, Pearson .
5. Lars Klander, 1997, *Kacker Proof: The ultimate guide to Network Security*(1st Edition), Jamsa Pr.

Web Resources

1. https://www.sans.org/security-resources/
2. https://owasp.org/
3. https://www.cisecurity.org/
4. https://www.cisa.gov/
5. https://thehackernews.com/

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2	2	2	3	2	2	2	2
CO2	3	3	2	3	2	2	3	3	3	3	2	2
CO3	3	3	2	3	2	2	2	3	3	3	3	2
CO4	3	3	2	3	2	2	2	3	3	3	2	2
CO5	3	3	3	3	3	3	2	3	3	2	3	3
TOTAL	**15**	**14**	**11**	**14**	**11**	**11**	**11**	**15**	**14**	**13**	**12**	**11**
AVERAGE	**3**	**2.8**	**2.2**	**2.8**	**2.2**	**2.2**	**2.2**	**3**	**2.8**	**2.7**	**2.4**	**2.2**

3 – Strong, 2- Medium, 1- Low

SEMESTER VI

DISCIPLINE SPECIFIC ELECTIVE III: DATA SCIENCE ESSENTIALS

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU236DE3	5	-	-	-	5	5	75	25	75	100

Pre-requisite:

Understanding of basic mathematical concepts (Algebra, Probability).

Learning Objectives:

1. Identify data types, sources, evaluation methods, and Big Data characteristics.
2. Apply data cleaning, handle missing values, and perform integration, transformation, and feature selection.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	explain different data types, sources, and characteristics of Big Data.	**K1, K2**
2.	apply data cleaning, transformation, and integration techniques.	**K3**
3.	analyze datasets using measures of central tendency, dispersion, and correlation.	**K4**
4.	implement data manipulation using NumPy and Pandas.	**K3**
5.	evaluate and interpret data through visual representation using Python libraries.	**K5**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Units	Contents	No. of Hours
I	Data Types: Understanding Data - Types of Data - Data Evaluation - Data Sources - Preparing and Gathering Data- Digital Data - Introduction to Big Data - Sources of Big Data - Characteristics of Big Data.	**15**
II	Data Cleaning Techniques - Handling Missing Data - Data Transformation- Data Integration and Aggregation - Introduction to Feature Selection.	**15**
III	Measures of Central Tendency (Mean, Median, Mode) - Measures of Dispersion (Variance, Standard Deviation, Range) - Data Distribution (Normal Distribution, Skewness, Kurtosis) - Correlation and Covariance- Outlier Detection Methods.	**15**
IV	Numpy and Pandas - Features of Numpy - Mathematical Functions - Statistical Functions and Arrays – Features of Pandas - Series Data Structure - Data Frames - Creation and Manipulation of Data Frames.	**15**
V	Data Visualization - Matplotlib Package - Plotting Graphs - Legends - Colors - Labels - Seaborn - Package -Plotly and Dash Packages.	**15**
	Total	**75**

Self-study	Case study: Data ethics and privacy concerns in handling data

Textbooks:

1. Joel Grus, 2019. *Data Science from Scratch*. (2nd Edition). O'Reilly Media.
2. Jake VanderPlas, 2016. *Python Data Science Handbook*. (1st Edition). O'Reilly Media.
3. Wes McKinney, 2017. *Python for Data Analysis*. (2nd Edition). O'Reilly Media.
4. Aurelien Geron, 2019. *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow*. (2nd Edition). O'Reilly Media.
5. Andreas C. Muller & Sarah Guido, 2016. *Introduction to Machine Learning with Python*. (1st Edition). O'Reilly Media.

Reference Books:

1. Cathy O'Neil and Rachel Schutt, 2013. *Doing Data Science: Straight Talk from the Frontline*. (1st Edition). O'Reilly Media.
2. Hadley Wickham & Garrett Grolemund, 2017. *R for Data Science*. (1st Edition). O'Reilly Media.
3. Sinan Ozdemir, 2016 *Principles of Data Science*. (1st Edition). Packt Publishing.
4. Avrim Blum, John Hopcroft, and Ravindran Kannan, 2020. *Foundations of Data Science.* (1st Edition). Cambridge University Press.
5. Davy Cielen, Arno D.B. Meysman, Mohamed Ali, 2016. *Introducing Data Science*. (1st Edition). Manning Publications.

Web Resources:

1. https://www.kaggle.com/
2. https://datasetsearch.research.google.com/
3. https://towardsdatascience.com/
4. https://www.datacamp.com/
5. https://ocw.mit.edu/

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	2	1	1	1	3	2	1	1	1
CO2	3	3	2	2	1	1	1	3	3	2	1	1
CO3	3	3	2	3	2	1	1	3	3	3	2	1
CO4	3	3	2	3	2	2	2	3	3	3	2	1
CO5	3	3	2	3	3	2	2	3	3	3	3	2
TOTAL	**15**	**14**	**9**	**13**	**9**	**7**	**7**	**15**	**14**	**12**	**9**	**6**
AVERAGE	**3**	**2.8**	**1.8**	**2.6**	**1.8**	**1.4**	**1.4**	**3**	**2.8**	**2.4**	**1.8**	**1.2**

3 – Strong, 2- Medium, 1- Low

SEMESTER VI
DISCIPLINE SPECIFIC ELECTIVE IV: a) CYBER SECURITY

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU236DE4	5	-	-	-	3	5	75	25	75	100

Pre-requisite:

Basic familiarity with cybersecurity, networking, and digital device operations is necessary.

Learning Objectives:

1. To understand the fundamentals of cybercrime, computer forensics, and protective mechanisms.
2. To explore the principles of WLAN, Email, and Smartphones along with their security measures.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	understand, describe, analyze and examine the basics of cyber security concepts and its implementation in India	**K1 & K2**
2.	apply security practices across digital platforms and perform forensic investigations effectively	**K3**
3.	apply and analyze various investigation roles and WiFi protection mechanisms effectively	**K3 & K4**
4.	analyze and evaluate methods for seizing digital information, forensic data, and forensic reports	**K4 & K5**
5.	create and evaluate advanced digital forensic methods integrated with cybercrime prevention techniques	**K5 & K6**

K1- Remember, **K2**- Understand, **K3**- Apply, **K4**- Analyze, **K5**- Evaluate, **K6**- Create

Units	Contents	No. of Hours
I.	**Introduction to Cybercrime:** Classification of Cybercrimes – Reasons for Commission of Cybercrime – Malware and its type – Kinds of Cybercrime – Authentication – Encryption – Digital Signatures – Antivirus – Firewall – Steganography – Computer Forensics – why should we report Cybercrime – Introduction Counter Cyber Security Initiatives in India – Generating Secure Password – Using Password Manager - Enabling two-step Verification – Security Computer using free Antivirus.	**15**
II.	**Online Security:** Clearing Cache for browsers – Wireless LAN - Major issues with WLAN - Safe browsing guidelines for Social Networking Sites – Email Security tips – Introduction - Smart Phone Security guidelines – Purses, Wallets, Smart Phones – Platforms, Setup and Installation - Communicating Securely with a Smart Phone.	**15**
III.	**Cyber Investigation:** Introduction – Role as a Cybercrime Investigator – The role of Law Enforcement Officers – The role of the Prosecuting Attorney – **Incident Response:** Introduction - Post Mortem Versus Live Forensics – Computer Analysis for the Hacker Defender Program - Network Analysis – Legal Issues of Intercepting Wi-Fi Transmission – Wi-Fi Technology – Wi-Fi RF- Scanning RF – Eavesdropping on Wi-Fi – Fourth Amendment Expectation of Privacy in WLAN.	**15**

IV.	**Seizure of Digital Information:** Introduction – Defining Digital Evidence – Digital Evidence Seizure Methodology – Factors Limiting the wholesale Seizure of Hardware – Other options for Seizing Digital Evidence – Common Threads within Digital Evidence Seizure – Determining the most appropriate Seizure Method – Conducting Cyber Investigations – Demystifying Computer/Cybercrime – IP Addresses – The Explosion of Networking – Interpersonal Communication.	**15**
V.	**Digital forensics and Data Analysis**: Introduction – The evolution of Computer Forensics – Phases of Digital Forensics - Collection – Examination - Analysis – Reporting – **Cybercrime Prevention:** Introduction – Crime Targeted at a Government Agency.	**15**
Total		**75**

Self-study	Evolution of Computer Forensics

Textbooks:

1. Jeetendra Pande, 2017. **"***Introduction to Cyber Security*" Published by Uttarakhand Open University, Uttarakhand, India. (Chapter: 1.2-6.4,9.3-12.2)
2. Anthonyreyes, Kevin o'shea, Jim steele, Jon R. Hansen, Captain Benjamin R. Jean Thomas Ralph, 2007. "*Cyber-crime investigations*" - bridging the gaps between security professionals, law enforcement, and prosecutors, USA. (Chapter: 4, 5, 6, 7, 8, 9,10)

Reference Books:

1. Sebastian Klipper, 2015. "Cyber Security" EinEinblickfur Wirtschafts wissens chaftler Fachmedien Wiesbaden, Wiesbaden, Germany.
2. John G.Voller Black and Veatch, 2014. "*Cyber Security*" Published by John Wiley & Sons, Inc., Hoboken, New Jersey Published simultaneously in Canada, USA.
3. William Stallings, 2017. "*Cryptography and Network Security - Principles and Practice*", (Seventh Edition), Pearson Education.
4. Nina Godbole, Sunit Belapure, 2011. *"Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives"*, (First Edition), Wiley India, Boston, New Delhi, India.
5. Behrouz A. Ferouzan, Debdeep Mukhopadhyay, 2015. "*Cryptography and Network Security*", (3rd Edition), Tata Mc Graw Hill, New Delhi, India.

Web Resources:

1. https://www.tpointtech.com/cyber-security-technology
2. https://www.simplilearn.com/tutorials/cyber-security-tutorial/what-is-
3. https://www.geeksforgeeks.org/what-is-cyber-security/
4. https://www.sailpoint.com/identity-library/five-types-of-cybersecurity
5. https://www.w3schools.com/cybersecurity/

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2	2	2	3	2	2	2	2
CO2	3	3	2	3	2	2	3	3	3	3	2	2
CO3	3	3	2	3	2	2	2	3	3	3	2	2
CO4	3	2	3	3	2	2	3	3	3	3	2	2
CO5	3	3	2	3	2	2	3	3	3	3	2	2
TOTAL	**15**	**13**	**11**	**14**	**10**	**10**	**13**	**15**	**14**	**14**	**10**	**10**
AVERAGE	**3**	**2.6**	**2.2**	**2.8**	**2**	**2**	**2.6**	**3**	**2.8**	**2.8**	**2**	**2**

3 – Strong, 2- Medium, 1- Low

SEMESTER VI

DISCIPLINE SPECIFIC ELECTIVE IV: b) BLOCKCHAIN TECHNOLOGIES

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU236DE5	5	-	-	-	3	5	75	25	75	100

Pre-requisite:

Basic knowledge of computer networks, cryptography, distributed systems and programming skills.

Learning Objectives:

1. To understand the concepts of block chain technology
2. To understand the consensus and hyper ledger fabric in block chain technology.

Course Outcomes

On the successful completion of the course, students will be able to		
1.	to understand the blockchain fundamentals, architecture, and basic cryptographic primitives.	**K1 & K2**
2.	use and analyze consensus mechanisms and protocols for permissioned blockchains.	**K3**
3.	apply Hyperledger Fabric components to implement blockchain solutions.	**K3**
4.	examine blockchain applications in finance, supply chains, and trade.	**K4**
5.	evaluate blockchain use in government systems ensuring privacy and security.	**K5**

K1- Remember**, K2-** Understand**, K3-** Apply**, K4-** Analyze**, K5-** Evaluate

Units	Contents	No. of Hours
I	**History:** Digital Money to Distributed Ledgers - **Design Primitives:** Protocols, Security, Consensus, Permissions. **Privacy:** Block Chain Architecture and Design - Basic Crypto primitives: Hash, Signature Hash Chain to Block Chain - Basic Consensus Mechanisms.	**15**
II	Requirements for the Consensus Protocols - Proof of Work (PoW) - Scalability aspects of Block Chain Consensus Protocols**:** Permissioned Block Chains - Design Goals - Consensus Protocols for Permissioned Block Chains.	**15**
III	Decomposing the Consensus Process - Hyper Ledger Fabric Components - Chain code Design and Implementation: Hyper ledger Fabric II: Beyond Chain Code: Fabric SDK and Front End - Hyper Ledger Composer Tool.	**15**
IV	**Block chain in Financial Software and Systems (FSS):** Settlements, - KYC, - Capital Markets - Insurance Block Chain in Trade/Supply Chain: Provenance of Goods, Visibility, Trade/Supply Chain Finance, Invoice Management / Discounting.	**15**
V	**Block Chain for Government:** Digital Identity, Land Records and Other kinds of record keeping between government Entities, Public Distribution System / Social Welfare Systems: Block Chain Cryptography: Privacy and Security on Block Chain.	**15**
Total		**75**

Self-study	Digital Identity

Textbooks:

1. Mark Gates, 2017. "*Blockchain: Ultimate Guide to Understanding Blockchain, Bitcoin, Cryptocurrencies, Smart Contracts and the Future of Money", Volume1,* CreateSpace Independent Publishing Platform, USA.
2. Arshdeep Bhaga, Vijay Madisetti, 2017. "*Block chain Applications: A Hands-On Approach*", Vijay Madisetti publishers 2017, USA.
3. Rodrigoda Rosa Righi, AntonioMarcos Alberti, MadhusudanSingh,2020,"*Blockchain Technology for Industry 4.0*" Springer, Switzerland.

Reference Books:

1. Andreas Antonopoulos, 2014. "*Mastering Bitcoin: Unlocking Digital Crypto currencies*", O'Reilly Media, Inc, USA.
2. Ahmed Banafa, 2023. "*Introduction to Blockchain Technology", (First Edition),* River Publishers, New York, USA.
3. Satoshi Nakamoto, "*Bitcoin: A Peer-to-PeerElectronicCashSystem*"
4. Melanie Swa, 2014. "*Block chain* ",O'Reilly Media, USA.
5. Imran. Bashir, 2018. "*Mastering block chain: Distributed Ledger Technology, Decentralization, and Smart Contracts Explained",* (2nd Edition), Packet Publishing, UK.

Web References:

1. https://nptel.ac.in/courses/106105184/
2. https://www.geeksforgeeks.org/history-of-blockchain/
3. https://www.universitiespress.com/schandramouli/blockchaintechnology
4. https://www.javatpoint.com/blockchain-tutorial
5. https://www.tutorialspoint.com/blockchain/index.htm
6. https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs01/

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	1	3	2	-
CO2	2	3	2	2	1	1	2	3	-
CO3	2	2	3	2	2	1	3	2	-
CO4	1	2	1	3	2	2	2	-	1
CO5	1	1	2	2	3	2	2	1	2
TOTAL	**9**	**10**	**9**	**10**	**9**	**7**	**12**	**8**	**3**
AVERAGE	**1.8**	**2**	**1.8**	**2**	**1.8**	**1.4**	**2.4**	**1.6**	**0.8**

3Strong, 2- Medium, 1- Low

SEMESTER VI

DISCIPLINE SPECIFIC ELECTIVE IV: c) ETHICAL HACKING

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU236DE6	5	-	-	-	3	5	75	25	75	100

Pre-requisite:

Basic knowledge in ethical hacking, malware attacks and methods of system hacking

Learning Objectives:

1. To understand the basics of computer-based vulnerabilities.
2. To explore different foot printing, reconnaissance and scanning methods.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	recall and understand the fundamental concepts of ethical hacking, the role of security and penetration testers, and penetration-testing methodologies, including relevant laws and regulations.	**K1**
2.	gain knowledge of TCP/IP and its layers (Application, Transport, Internet) with a focus on IP addressing and how these protocols relate to network security.	**K2**
3.	identify common network and computer attacks such as malware, intruder attacks, and methods for protecting against malware and addressing physical security.	**K3**
4.	learn methods for system hacking, including web server attacks, wireless network vulnerabilities, and tools used by attackers and security testers, while also exploring network protection systems like firewalls, IDS/IPS, and security incident response mechanism	**K3**
5.	develop skills in footprinting, reconnaissance, and network scanning, utilizing tools and techniques to identify potential vulnerabilities and bypass security systems such as firewalls and IDS.	**K4**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyze

Units	Contents	No. of Hours
I	**Introduction:** Ethical Hacking Overview - Role of Security and Penetration Testers – Penetration -Testing Methodologies - Laws of the Land - Overview of TCP/IP- The Application Layer - The Transport Layer - The Internet Layer - IP Addressing - Network and Computer Attacks - Malware - Protecting Against Malware Attacks - Intruder Attacks - Addressing Physical Security	15
II	Foot Printing, Reconnaissance and Scanning Networks Footprinting Concepts - Footprinting through Search Engines, Web Services, Social Networking Sites, Website, Email - Competitive Intelligence - Footprinting through Social Engineering - Footprinting Tools - Network Scanning Concepts - Port-Scanning Tools - Scanning Techniques - Scanning Beyond IDS and Firewall.	15
III	**Enumeration and vulnerability Analysis:** Enumeration Concepts - NetBIOS Enumeration – SNMP, LDAP, NTP, SMTP and DNS Enumeration - Vulnerability Assessment Concepts - Desktop and Server OS Vulnerabilities - Windows OS Vulnerabilities - Tools for Identifying Vulnerabilities in Windows - Linux OS Vulnerabilities - Vulnerabilities of Embedded Oss.	15

IV	**System Hacking:** Hacking Web Servers - Web Application Components- Vulnerabilities - Tools for Web Attackers and Security Testers Hacking Wireless Networks - Components of a Wireless Network – Wardriving- Wireless Hacking - Tools of the Trade.	**15**
V	**Access Control Lists:** Cisco Adaptive Security Appliance Firewall - Configuration and Risk Analysis Tools for Firewalls and Routers - Intrusion Detection and Prevention Systems - Network-Based and Host-Based IDSs and IPSs - Web Filtering - Security Incident Response Teams – Honeypots.	**15**
	Total	**75**

Self-study	Overview of TCP/IP- The Application Layer - The Transport Layer - The Internet Layer - IP Addressing

Textbooks:

1. Michael T. Simpson, Kent Backman, and James E. Corley, 2010. *Hands-On Ethical Hacking and Network Defense, Course Technology*, Delmar Cengage Learning.
2. Patrick Engebretson, SYNGRESS, Elsevier, 2013. *The Basics of Hacking and Penetration Testing*

Reference Books:

1. Dafydd Stuttard & Marcus Pinto, 2011. *The web Application Hacker's Handbook*, (2nd Edition), Wiley Publication.
2. John Erickson, 2008. *Hacking: The Art of Exploitation*, (2nd Edition), No Starch Press.
3. Patrick Engebreston, 2013. *The Basics of Hacking and Penetration Testing*, (1st Edition) Elsevier Publication.
4. Rafay Baloch, 2018. *Ethical Hacking and Penetration Testing Guide*, (1st Edition), Packt Publication.
5. Peter Kim, 2015. *The Hacker Playbook 2: Practical Guide To Penetration* Testing, (1st Edition), CreateSpace Independent Publishing Platform.

Web Resources:

1. https://owasp.org/
2. https://www.geeksforgeeks.org
3. https://www.cisa.gov/
4. https://www.cybrary.it/course/ethical-hacking
5. https://www.blackhatethicalhacking.com

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	2	2	2	3	3	3	2	2
CO2	3	3	2	2	2	2	2	3	3	3	2	2
CO3	3	3	2	1	2	2	2	3	3	3	2	2
CO4	3	3	2	1	2	2	2	3	3	3	2	2
CO5	3	3	2	1	2	2	2	3	3	3	2	2
TOTAL	**15**	**15**	**10**	**7**	**10**	**10**	**10**	**15**	**15**	**15**	**10**	**10**
AVERAGE	**3**	**3**	**2**	**1.4**	**2**	**2**	**2**	**3**	**3**	**3**	**2**	**2**

3 – Strong, 2- Medium, 1- Low

SEMESTER VI

PROFESSIONAL COMPETENCY SKILL II: UNIX AND SHELL PROGRAMMING LAB

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU236PS1	-	-	2	-	2	2	30	25	75	100

Pre-requisite:

Basic knowledge of Linux/Unix commands, file systems, and programming fundamentals (control structures, functions, and data types).

Learning Objectives:

1. Write shell scripts to automate file operations, system tasks, and text processing using file commands, pipes, and redirection.
2. Develop logic-based shell scripts using conditionals, loops, and mathematical operations for data manipulation and decision-making.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	demonstrate proficiency in using file manipulation commands through shell scripting.	**K1,K2**
2.	display and interpret system configuration details such as user information, shell, OS type, CPU, and memory using shell scripts.	**K3**
3.	apply pipes, redirection, and filter commands to process and analyze text and data streams.	**K4**
4.	develop shell scripts for automation tasks such as file management (removing zero-size files), data display, and user-driven choices.	**K5**
5.	implement logic-based operations and control structures (loops and conditionals) to perform mathematical and string processing.	**K6**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** – Analyze; **K5** – Evaluate; **K6** - Create

List of Exercises	No. of Hours
1. Write a shell script to stimulate the file commands: rm, cp, cat, mv, cmp, wc, split, diff. 2. Write a shell script to show the following system configuration: a. currently logged user and his log name. b. current shell, home directory, Operating System type, current Path setting, current working directory. c. show currently logged number of users, show all available shells d. show CPU information like processor type, speed e. show memory information. 3. Write a Shell Script to implement the following: pipes, Redirection and tee commands. 4. Write a shell script for displaying current date, user name, file listing and directories by getting user choice. 5. Write a shell script to implement the filter commands. 6. Write a shell script to remove the files which has file size as zero bytes. 7. Write a shell script to find the sum of the individual digits of a given number. 8. Write a shell script to find the greatest among the given set of numbers using command line arguments. 9. Write a shell script for palindrome checking.	**30**

10. Write a shell script to print the multiplication table of the given argument using for-loop.	

Text Books:

1. Ebrahim M., 2018. *Mastering Linux Shell Scripting*, (2nd Edition), Packt Publishing, Birmingham, UK.
2. Tushar S., Lakshman **S.**, 2013. *Linux Shell Scripting Cookbook*, (2nd Edition), Packt Publishing, Birmingham, UK.
3. Kanetkar Y., 2011. *UNIX Shell Programming*, (1st Edition), BPB Publications, New Delhi, India.

Reference Books:

1. Venkateshmurthy M. G., 2009. *Unix and Shell Programming*, (1st Edition), Pearson Education, New Delhi, India.
2. Parker S., 2011. *Shell Scripting: Expert Recipes for Linux, Bash, and More*, (1st Edition), Wrox, Indianapolis, Indiana.
3. Newham C., 2005. *Learning the bash Shell*, (3rd Edition), O'Reilly Media, Sebastopol, California.
4. Robbins A., Beebe N. H. F., 2005. *Classic Shell Scripting*, (1st Edition), O'Reilly Media, Sebastopol, California.
5. Matthew N., Stones R., 2011. *Beginning Linux Programming*, (4th Edition), Wrox Press, Indianapolis, Indiana.

Web -Resources:

1. Linux Shell Scripting Tutorial **– https://www.tutorialspoint.com**
2. Bash Beginners Guide **– https://www.tldp.org**
3. GNU Bash Manual **–** https://www.gnu.org/software/bash/manual
4. Geeks for Geeks – Shell Scripting **– https://www.geeksforgeeks.org**
5. YouTube – Shell Scripting Crash Course **– https://www.youtube.com**

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	2	2	2	3	3	3	2	2
CO2	3	3	2	2	2	2	2	3	3	3	2	2
CO3	3	3	2	1	2	2	2	3	3	3	2	2
CO4	3	3	2	1	2	2	2	3	3	3	2	2
CO5	3	3	2	1	2	2	2	3	3	3	2	2
TOTAL	**15**	**15**	**10**	**7**	**10**	**10**	**10**	**15**	**15**	**15**	**10**	**10**
AVERAGE	**3**	**3**	**2**	**1.4**	**2**	**2**	**2**	**3**	**3**	**3**	**2**	**2**

3 – Strong, 2- Medium, 1- Low

SEMESTER VI

GENDER EQUITY AND INCLUSIVITY

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
UG236GE1	1	-	-	-	1	1	15	50	50	100

Learning Objectives

1. To understand the challenges faced by women in the society.
2. To analyze the legitimate rights and laws that aid women to march towards emancipation and empowerment.

Course Outcomes

On the successful completion of the course, student will be able to:		
1	interpret the life struggles of women and to promote equality	K1
2	identify the socio-cultural and religious practices that subjugate women	K2
3	probe deep into the root cause of marginalization of women and to promote an inclusive nature	K3
4	investigate the challenges faced by women in practical life	K4
5	evaluate exploitation of women as commercial commodities in advertisements and media	K5

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 – Evaluate

Unit	Contents	No. of Hours
I	**Life Struggle of a Woman:** Challenges faced by girl students, education and religion, woman and society, working environment.	3
II	**Cultural Traits:** Myths and religious texts, opposition and rebuttal, contemporary literature, cultural decay, opportunities provided by social media**.**	3
III	**Women's Rights:** Democratic women's association, Laws for women's rights, essential legal rights of girl child in India, gender justice, millennium development goals, Political parties.	3
IV	**Women's Liberation:** Struggle for social rebirth, role of government and NGO's-self-help group for women, Indian political of legal profession and gender representation. the supreme courts efforts, challenging patriarchal narratives, global responsibility, women in sustainable development.	3
V	**Inclusivity:** Equal opportunities for women and men, equal access and opportunities for disabled people, indigenous populations, refugees and migrants - Importance of challenging and redefining gender roles - value and respect towards all gender	3

	identities.	
	TOTAL	**15**

Reference Books

1. Hosoda, M. 2021. Promoting Gender Diversity and Inclusion at Workplace: A Case Study of Japanese Retail and Financial Service Company. Rikkyo University
2. Palo, S., Jha, K. K. 2020. Introduction to Gender. Tata Institute of Social Sciences.
3. Debois, E. and L. Dumenil. 2005. Through Women's Eyes: An American History With Documents. St. Martin Press.
4. Carter, Sarah. Mansell, 1990. Women's Studies: A Guide to Information Sources
5. .Datchana Moorthy Ramu.2020. Gender Equality and Sustainable development Goals,Notion Press.

Web Resources

1. https://en.wikipedia.org/wiki/Women%27s_studies
2. https://libguides.berry.edu/wgs/reference
3. https://www.albany.edu/~dlafonde/women/wssresguide9602
4. https://openbooks.library.umass.edu/introwgss/chapter/references-feminist-movements/
5. https://libguides.niu.edu/womensandgenderstudies/ReferenceSources