

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 - IV

UG Guidelines & Syllabus

**DEPARTMENT OF ARTIFICIAL INTELLIGENCE
& DATA SCIENCE**



2024-2027

(With effect from the academic year 2025-2026)

Issued from

THE DEANS' OFFICE

Vision

To establish a centre of excellence in Artificial Intelligence and Data Science that promotes innovation, sustainability, and social transformation by developing professionals and leaders with strong ethical values to tackle global issues for a balanced and sustainable future.

Mission

To provide quality education through the use of advanced tools, promote a culture of collaboration, and encourage customer-oriented innovations that bridge academia and industry, making a significant contribution to societal improvement.

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:	PEOs addressed
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. Artificial Intelligence and Data Science, the graduates will be able to:	Mapping with POs
PSO1	evolve AI and Data Science based domain knowledge and skills to pursue advanced studies in the field and integrate these techniques with emerging technologies.	PO1
PSO2	develop innovative ideas in AI and data science to enhance entrepreneurial and employability skills for real-world challenges.	PO2
PSO3	cultivate versatile skills for problem-solving, technical proficiency, effective communication, and community engagement through self-directed activities.	PO4 & PO7
PSO4	communicate and collaborate proficiently to become competent AI professionals, while addressing biases, and upholding data privacy regulations.	PO5 & PO6
PSO5	reflect on green initiatives and leverage AI to address economic challenges while promoting sustainable development.	PO3

Mapping of POs and PSOs

POs	PSO1	PSO 2	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

S – Strong, M- Medium

Components**Part III (Major and Elective)**

Courses	Components	No. of Courses x Maximum Mark	Total
Core	Theory Courses	8x100	800
	Lab Courses	6x100	600
	Research Project	1 x100	100
Elective	Theory Courses	4x100	400
Discipline Specific Elective	Theory Courses	4 x 100	400
Total Marks			2300

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	5 (5) +	5 (5) +	5 (5) +	5 (5) +	5 (4) +	6(5) +	78	70
Core Lab Course	5 (5)	5 (5)	5 (5)	5 (5)	5 (4) + 5 (4) +	6(5) + 6(4)		
Core Research Project					5 (4)			
Elective Course	4 (3)	4 (3)	4 (3)	4 (3)	4 (3) + 4 (3)	5 (3) + 5 (3)	34	24
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

Co-curricular Courses

Course	S I	S II	S III	S IV	S V	S VI	Total
Life Skill Training (LST)	-	(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
Massive Open Online Courses (MOOCs)	(2)						2
Student Training Activity: Clubs & Committees / NSS				(1)			1
Community Engagement Activity: Reaching the Unreached Neighbourhood (RUN)				(1)			1
Human Rights, Justice and Ethics					(1)		1
Gender Equity and Inclusivity						(1)	1
Total							14

Total number of Compulsory Credits = Curricular credits + Co-curricular credits: **140 + 14**

COURSES OFFERED**SEMESTER I**

Course	Course Code	Title of the Course	Credits	Hours/Week
Part I	TU241TL1 FU241FL1	Language: Tamil French	3	6
Part II	EU241EL1	English: A Stream	3	6
	EU241EL2	English: B Stream		
	EU241EL3	English: C Stream		
Part III	IU241CC1	Core Course I: Programming for Problem Solving	5	5
	IU241CP1	Core Lab Course I: Problem Solving Lab	5	5
	IU241EC1	Elective Course I: Mathematical Foundations for Artificial Intelligence	3	4
Part IV	IU241NM1	Non-Major Elective NME I: Cyber Forensics	2	2
	IU241FC1	Foundation Course FC: Web Designing	2	2
		Total	23	30

SEMESTER II

Course	Course Code	Title of the Course	Credits	Hours/Week
Part I	TU242TL1	Language: Tamil	3	6

	FU242FL1	French		
Part II	EU242EL1	English: A Stream	3	6
	EU242EL2	English: B Stream		
	EU242EL3	English: C Stream		
Part III	IU242CC1	Core Course II: Python Programming	5	5
	IU242CP1	Core Lab Course II: Python Programming Lab	5	5
	IU242EC1	Elective Course II: Discrete Mathematics	3	4
Part IV	IU242NM1	Non-Major Elective NME II: Understanding Internet	2	2
	IU242SE1	Skill Enhancement Course SEC I: Quantitative Aptitude	2	2
		Total	23	30

SEMESTER III

Course	Course Code	Title of the Course	Credits	Hours / Week
Part I	TU243TL1	Language: Tamil	3	6
	FU243FL1	French		
Part II	EU243EL1	English: A Stream	3	6
	EU243EL2	English: B Stream		
	EU243EL3	English: C Stream		
Part III	IU243CC1	Core Course III: Artificial Intelligence and its Applications	5	5
	IU243CP1	Core Lab Course III: Artificial Intelligence Applications Lab	5	5
	IU243EC1	Elective Course III: Data Structures	3	4
Part IV	IU243SE1	Skill Enhancement Course SEC-II: Principles of Computer Architecture	2	2
	UG24CSE1	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	TU244TL1	Language: Tamil	3	6
	FU244FL1	French		
Part II	EU244EL1	English: A Stream	3	6
	EU244EL2	English: B Stream		
	EU244EL3	English: C Stream		
Part III	IU244CC1	Core Course IV: Machine Learning Techniques	5	5
	IU244CP1	Core Lab Course IV: Machine Learning Lab	5	5
	IU244EC1	Elective Course IV: Human Computer	3	4

		Interaction		
Part IV	UG24CSE2	Skill Enhancement Course SEC-IV: Digital Fluency	2	2
	UG244EV1	Environmental Studies (EVS)	2	2
		Total	23	30

SEMESTER V

Course	Course Code	Title of the Course	Credits	Hours/ Week
Part III	IU245CC1	Core Course V: Data Science Using R	4	5
	IU245CC2	Core Course VI: Robotics and its Applications	4	5
	IU245CP1	Core Lab Course V: Data Science Using R Lab	4	5
	IU245RP1	Core Research Project	4	5
	IU245DE1	Discipline Specific Elective I: a) Data Communication and Networks	3	4
	IU245DE2	Discipline Specific Elective I: b) Image Processing		
	IU245DE3	Discipline Specific Elective I: c) Pattern Recognition		
	IU245DE4	Discipline Specific Elective II: a) Data Mining	3	4
	IU245DE5	Discipline Specific Elective II: b) Big Data Analytics		
	IU245DE6	Discipline Specific Elective II: c) Cloud Computing		
Part IV	UG235PS1	Professional Competency Skill I: Career Skills	2	2
	IU245IS1	Internship	2	-
		Total	26	30

SEMESTER VI

Course	Course Code	Title of the Course	Credits	Hours/ Week
Part III	IU246CC1	Core Course VII: Intelligent System	5	6
	IU246CC2	Core Course VIII: Computer Vision	5	6
	IU246CP1	Core Lab Course VI: Computer Vision Lab	4	6
	IU246DE1	Discipline Specific Elective III: a) Software Project Management	3	5
	IU246DE2	Discipline Specific Elective III: b) Distributed Computing		
	IU246DE3	Discipline Specific Elective III: c) Virtual Reality Technology		
	IU246DE4	Discipline Specific Elective IV: a) Mobile Adhoc Network	3	5

	IU246DE5 IU246DE6	b) IOT and its Applications c) Computer Graphics & Visualization		
	IU246PS1	Professional Competency Skill II	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 Courses

Semester	Course Code	Title of the Course	Credits	Total Hours
I	IU241V01	Object Oriented Concepts	1	30
I	IU241V02	Programming using JAVA	1	30
I	IU241V03	System Software and Operating Systems	1	30
III	IU243V01	Microsoft Power BI	1	30
III	IU243V02	Fundamentals of Computer Networks	1	30
III	IU243V03	IBM Cloud Essentials	1	30

*Any one course can be opted by the students every year.

Self-Learning Courses

Part	Semester	Code	Title of the Course	Credit
IV	III/V	IU243SL1/IU245SL1	Data Security	1
	IV/VI	IU244SL1/IU246SL1	Data Analytics Using Python	

*Any one course can be opted by the students every year.

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 5 x 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

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 = 25: 75

Internal Components and Distribution of Marks

Components	Marks
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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 One 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)	25
Part B: Open choice – 5 out of 8 questions (5 x 10)	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 Studies

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
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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 One out of Three)	9	Part C 5 x 9 (Open choice any Five out of Eight)	45
Total	25	Total	75

1. Outcome Based Education (OBE)**(i) Knowledge levels for assessment of Outcomes based on Blooms Taxonomy**

S. No.	Level	Parameter	Description
1	K1	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
	Internal	1	-	-	1	-	1	1	1	1	1	1	-	8

III UG	External	5	1	1	4	1	1	-	3	1	1	-	2	20
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The levels of assessment are flexible and it should assess the cognitive levels and outcome attainment.

2. Evaluation

- The performance of a student in each course is evaluated in terms of percentage of marks with a provision for conversion to grade points.
- 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.
- There shall be examinations at the end of each semester, for odd semesters in October/November; for even semesters in April/ May.
- 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.
- Viva-voce: Each project group shall be required to appear for Viva -voce examination in defence of the project.
 - The results of all the examinations will be published in the college website.

3. 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.

4. Grading System

For the Semester Examination:

Calculation of Grade Point Average for End Semester Examination:

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

For the entire programme:

$$\text{Cumulative Grade Point Average (CGPA)} = \frac{\sum C_i C_{ni} G_{ni}}{\sum C_i C_{ni}}$$

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

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

5. 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: PROGRAMMING FOR PROBLEM SOLVING

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU241CC1	4	1	-	-	5	5	75	25	75	100

Pre-requisite:

Basic computer operation skills.

Learning Objectives:

1. To recognize the importance of programming languages, recall memory management and identify bugs in C programs.
2. To apply problem-solving techniques, implement memory-efficient modularization and develop C programs with varied data types.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	remember the fundamentals of C programming and describe the program development process.	K1&K2
2.	prepare solutions for problems using branching and looping statements.	K3
3.	decompose a problem into functions and synthesize a complete program using divide and conquer approach.	K3
4.	formulate algorithms and programs using arrays, pointers and structures	K3
5.	analyse various programming constructs and structures.	K4

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

Units	Contents	No. of Hours
I	INTRODUCTION TO COMPUTING: Introduction - Art of Programming through Algorithms and Flowcharts. Overview of C: History and importance of C- Basic structure of C program- Executing a C program. Constants, Variables and Data Types: Introduction- Character Set- C Tokens- Declaration of Variables- Assigning Values to Variables- Defining Symbolic Constants. Managing Input and Output Operations - Operators and Expressions.	15
II	CONTROL STRUCTURES: Decision Making and Branching: Introduction- Decision Making with IF Statement- Simple IF Statement- IF-ELSE Statement- Nesting of IF-ELSE Statements- ELSE IF Ladder- Switch statement- The Conditional Operator- goto statement. Decision Making and Looping: Introduction- while Statement- do statement- for statement- Nested control structures- break statement- continue statement.	15
III	Arrays and Strings: Defining an array - Processing an array - Multidimensional arrays - Searching algorithm - Linear search - Sorting algorithm - Bubble sort algorithm - Strings - Defining a string - Initialization of strings- Reading and writing a string- Processing the strings.	15
IV	Functions and Pointers: Functions- Overview- Defining a function- Accessing a function- Function prototypes- Passing arguments to a function- Passing arrays to functions- Recursion. Pointers: Introduction- Declaring Pointer Variables- Initialization of Pointer variables- accessing a Variable through its Pointers- Dynamic memory allocation	15

V	Structures and File Management: Defining a structure- Declaring structure variables-Accessing structure members- Array of structures- Structures and pointers. File Management in C: Introduction- Defining and opening a file-closing a file- Input/output and Error Handling on Files.	15
	Total	75

Self-study	Multidimensional arrays, Array of structures.
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Textbooks:

1. Byron Gottfried, 2016. *Schaum's Outline of Programming with C*, 3rd Edition, McGraw Hill Education.
2. Balagurusamy E, 2019. *Programming in ANSI C*, 8th Edition, McGraw Higher Education.

Reference Books:

1. Yashavant Kanetkar, 2016. *Let Us C*, 15th Edition, BPB Publications.
2. Herbert Schildt, 2017. *The Complete Reference C*, 4th Edition, McGraw Hill Education.
3. Beulah Christalin Latha, Anuja Beatrice, Carolin Jeeva & Anita Sofia, 2018. *Fundamentals of Computing and Programming*, 1st Edition, Pearson.
4. Sumitabha Das, 2018. *Computer Fundamentals and C Programming*, 18th Edition, McGraw Hill Education.
5. Stephen G. Kochan, 2015. *Programming in C*, 4th Edition, Addison-Wesley Professional.

Web Resources:

1. <http://www.geeksforgeeks.org/c-programming-language/>
2. <http://www.tutorialspoint.com/cprogramming/index.htm>
3. <http://www.programiz.com/c-programming>
4. <http://www.learn-c.org/>
5. http://en.wikibooks.org/wiki/C_Programming

**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	3	1	2	2	1	2	3	3	2	2	1
CO3	3	3	1	2	2	1	2	3	3	2	2	1
CO4	3	3	1	2	2	1	2	3	3	2	2	1
CO5	3	3	1	2	2	1	2	3	3	2	2	1
TOTAL	15	15	5	10	10	5	10	15	15	10	10	5
AVERAGE	3	3	1	2	2	1	2	3	3	2	2	1

3 – Strong, 2- Medium, 1- Low

SEMESTER I
CORE LAB COURSE I: PROBLEM SOLVING USING C LAB

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU241CP1	-	1	4	-	5	5	75	25	75	100

Pre-requisite:

Basic computer operation skills.

Learning Objectives:

1. To develop proficiency in fundamental programming concepts and structures using C.
2. To apply advanced programming techniques to solve complex problems.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	translate given algorithms to a working and correct program.	K2&K3
2.	identify and correct logical errors encountered at run time.	K2&K3
3.	create iterative as well as recursive programs.	K6
4.	represent data in arrays, strings and structures and manipulate them through a program.	K2&K3
5.	declare pointers of different types and use them in defining self-referential structures.	K2&K3

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

List of Exercises	No. of Hours
Implement the following exercises using C language: 1. Implementation of Basic C programs. 2. Simple computational problems using arithmetic expressions and operators. 3. Problem solving using branching and logical expressions. 4. Iterative problems using Loops, while and for loops. 5. Implementation of linear searching, bubble sort, and Matrix Manipulation using Arrays. 6. Implementation of Text Processing using Strings. 7. Find roots of a quadratic equation using functions and recursion. 8. Implementation of basic file operations.	75

Textbooks:

1. Byron Gottfried, 2016. *Schaum's Outline of Programming with C*, 3rd Edition, McGraw Hill Education.
2. Balagurusamy E, 2019. *Programming in ANSI C*, 8th Edition, McGraw Higher Education.

Reference Books:

1. Yashavant Kanetkar, 2016. *Let Us C*, 15th Edition, BPB Publications.
2. Herbert Schildt, 2017. *The Complete Reference C*, 4th Edition, McGraw Hill Education.
3. Beulah Christalin Latha, Anuja Beatrice, Carolin Jeeva & Anita Sofia, 2018. *Fundamentals of Computing and Programming*, 1st Edition, Pearson.
4. Sumitabha Das, 2018. *Computer Fundamentals and C Programming*, 18th Edition, McGraw Hill Education.
5. Karl Beecher, 2017. *Computational Thinking: A Beginner's Guide to Problem Solving and Programming*, 1st Edition, BCS Learning & Development Limited.

Web Resources:

1. <http://www.geeksforgeeks.org/c-programming-language/>

2. <http://www.tutorialspoint.com/cprogramming/index.htm>
3. <http://www.programiz.com/c-programming>
4. <http://www.learn-c.org/>
5. http://en.wikibooks.org/wiki/C_Programming

**MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	2	3	1	3	3	3	3	2	1
CO2	3	3	1	2	3	1	3	3	3	3	2	1
CO3	3	3	1	2	3	1	3	3	3	3	2	1
CO4	3	3	1	2	3	1	3	3	3	3	2	1
CO5	3	3	1	2	3	1	3	3	3	3	2	1
TOTAL	15	15	5	10	15	5	15	15	15	15	10	5
AVERAGE	3	3	1	2	3	1	3	3	3	3	2	1

3 – Strong, 2- Medium, 1- Low

SEMESTER I
ELECTIVE COURSE I: MATHEMATICAL FOUNDATIONS FOR ARTIFICIAL INTELLIGENCE

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU241EC1	3	1	-	-	3	4	60	25	75	100

Pre-requisite:

Knowledge of basic principles of logic, operations on sets.

Learning Objectives:

1. To utilize logical connectives to form and evaluate complex logical statements.
2. To apply basic Boolean algebra laws to simplify logical expressions.
3. To solve linear systems using the Gauss Elimination Method.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	understand the basics of computers and the number conversions	K1 & K2
2.	analyse and evaluate logical arguments and statements using formal logical principles.	K4 & K5
3.	acquire knowledge of lattice structures and Boolean algebra, including the application of Boolean algebra laws and the principle of duality to solve logical problems.	K2 & K3
4.	understand the basic concepts of set theory and relations including inclusion-exclusion principles, types of relations and demonstrate the ability to apply these concepts in problem-solving.	K2 & K3
5.	To learn various methods to solve algebraic and transcendental equations.	K1 & K2

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

Units	Contents	No. of Hours
I	Introduction to Programming: Introduction to Computers - Computer characteristics - Hardware vs software – Types of Computers- System Software and Application Software- Types of programming languages Number Systems and Base Conversions- 1's and 2's complement of a Binary Number- Binary Coded Decimal.	12
II	Propositional Logic in AI: Statement (Propositions) – Laws of Formal Logic – Basic Set of Logical Operators / Operations – Conjunction – Disjunction – Negation – Prepositions and Truth Tables – Connectives – Compound Propositions – Conditional Statement – Converse, Contrapositive and Inverse – Biconditional Statement – Algebra of Propositions – Propositional Functions – Tautologies and Contradictions – System Specifications (Consistency) – Principle of Substitution Chapter 3: Sections 3.2 to 3.8 (Pages 122-133)	12
III	Lattices Theory and Boolean Algebra: Introduction- Definition (Partially Ordered Set-Poset)- Distributive Lattice- Complemented Lattice- Definition of Boolean Algebra-Basic Boolean Algebra Laws- Definition (Principle of Duality). Chapter 4 : Section 4.1,4.2, 4.5, 4.6, 4.8-4.10 (Pages 4.1-4.2, 4.6-4.7, 4.15 – 4.25)	12
IV	Set Theory and Relations: Introduction- Set-Finite Set-Cardinality - Operations on Sets- Union- Intersection- Disjoint Sets- Difference Set-	12

	Complement Set - Principle of Inclusion and Exclusion - Ordered Pair - Binary Relation- Types of Relations- Symmetric Relation-Anti-Symmetric Relation-Reflexive Relation- Transitive Relation- Equivalence Relation- Partially Ordering Relation Chapter 3: Section: 3.1-3.4, 3.10 – 3.14, 3.16, 3.17, 3.22, 3.26 – 3.31 (Pages: 3.1-3.3, 3.7-3.11, 3.15-3.20)	
V	Basic Numerical Methods in AI: Introduction - Iteration Method - Bisection Method - Newton Raphson Method - Linear System of Equations - Gauss Elimination Method. Chapter 1: 1.0, 1.2, 1.4, 1.6, 2.3	12
	Total	60

Self-study	Truth Table, Biconditional Statement
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Textbooks:

1. Deborah Morley and Charles S. Parker; Fundamentals of Computers; Cengage Learning, India edition; 2009. (Unit-1)
2. Chakraborty S.K. and Sarkar B.K., 2011. *Discrete Mathematics*, 1st Edition, Oxford University. (Unit 2)
3. Geetha P., 2023. *Discrete Mathematics*, 2nd Edition, SciTech Publications (India) Pvt. Ltd. (Units 3,4)
4. Arumugam, S., Thangapandi Isaac, S., Soma Sundaram, A. (2013). Numerical Analysis with Programming in C. (4th edition). Bombay: New Gamma Publishing House. (Unit 5)

Reference Books:

1. Liu C. L., 2018. *Elements of Discrete Mathematics*, 2nd Edition, McGraw Hill.
2. Norman Biggs L., 2011. *Discrete Mathematics*, 1st Edition, Pearson, USA.
3. Kenneth H. Rosen, 2022. *Discrete Mathematics and its Applications*, 8th Edition, McGraw Hill.
4. Santha. S., 2011. *Discrete Mathematics*, (1st Edition), Technology University Series.

Web Resources:

1. <https://www.slideshare.net/asadfaraz4/intro-to-discrete-mathematics>
2. https://onlinecourses.nptel.ac.in/noc23_cs109/preview
3. https://www.youtube.com/watch?v=amaH38_mXK4
4. <https://www.brilliant.org>
5. <https://www.youtube.com/watch?v=aMzGSDqSrv8>

**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	3	2	2	3	2	2	2	2
CO3	2	2	2	2	2	2	2	3	3	2	2	2
CO4	2	3	2	3	3	2	2	3	2	2	2	2
CO5	2	2	2	2	2	2	2	2	2	2	3	2
TOTAL	12	12	10	12	12	10	10	14	11	10	11	10
AVERAGE	2.4	2.4	2	2.4	2.4	2	2	2.8	2.2	2	2.2	2

3 – Strong, 2- Medium, 1- Low

SEMESTER I
NON-MAJOR ELECTIVE NME I: CYBER FORENSICS

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU241NM1	1	1	-	-	2	2	30	25	75	100

Pre-requisite:

Fundamental knowledge of computer systems, networks, and operating systems.

Learning Objectives:

1. To understand the definition and core principles of computer forensics fundamentals.
2. To study the various types of computer forensics evidence and their significance in investigations.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	recall and describe the definition of computer forensics fundamentals.	K1 & K2
2.	apply and analyze the different types of computer forensics technology.	K4
3.	analyse various computer forensics systems.	K4
4.	apply the methods for data recovery, evidence collection and data seizure.	K3
5.	gain knowledge of duplication and preservation of digital evidence.	K1

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

Units	Contents	No. of Hours
I	Overview of Computer Forensics Technology: Computer Forensics Fundamentals: Use of Computer Forensics in Law Enforcement - Computer Forensics Assistance to Human Resources/Employment Proceedings - Computer Forensics Services - Benefits of professional Forensics Methodology - Steps taken by Computer Forensics Specialists. Forensics Technology -Types of Law Enforcement.	6
II	Computer Forensics Evidence and capture: Data Recovery: Data Recovery Defined - Data Backup and Recovery - The Role of Backup in Data Recovery - The Data Recovery Solution. Evidence Collection and Data Seizure: Collection Options - Obstacles - Types of Evidence - The Rules of Evidence -Controlling Contamination: The chain of custody.	6
III	Duplication and Preservation of Digital Evidence: Processing steps - Legal Aspects of collecting and Preserving Computer forensic Evidence. Computer image Verification and Authentication: Special needs of Evidential Authentication - Practical Consideration - Practical Implementation.	6
IV	Computer Forensics Analysis: Discovery of Electronic Evidence: Electronic Document Discovery: A Powerful New Litigation Tool. Identification of Data: Time Travel - Forensic Identification and Analysis of Technical Surveillance Devices.	6
V	Reconstructing Past Events: How to Become a Digital Detective - Useable File Formats - Unusable File Formats - Converting Files. Networks: Network Forensics Scenario - a technical approach - Destruction of E-Mail - Damaging Computer Evidence - Documenting the Intrusion on Destruction of Data - System Testing.	6
Total		30

Self-study	Types of Business Computer Forensic Technology, How to Become a Digital Detective
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Textbooks:

1. John Vacca R., 2002. *Computer Forensics: Computer Crime Investigation*, 3rd Edition, Firewall Media.
2. Marjie Britz T., 2020. *Computer Forensics and Cyber Crime: An Introduction*, 4th Edition, Pearson.

Reference Books

1. Nelson, Phillips Enfinger, Steuart, 2004. *Computer Forensics and Investigations*, 1st Edition, Cengage Learning.
2. Anthony Semmes and Brian Jenkinson, 2007. *Forensic Computing: A Practitioner Guide*, 2nd Edition, Springer-Verlag London Limited.
3. Robert M. Slade, 2005. *Software Forensics Collecting Evidence from the Scene of a Digital Crime*, 1st Edition, Tata McGraw-Hill.
4. EC-Council, 2009. *Computer Forensics: Investigating Data and Image Files*, 1st Edition, Cengage Learning.
5. Bill Nelson, Amelia Phillips, Christopher Steuart, 2015. *Guide to Computer Forensics and Investigations*, 5th Edition, Cengage Learning.

Web Resources:

1. <https://www.vskills.in/>
2. <https://www.hackingarticles.in/best-of-computer-forensics-tutorials/>
3. https://books.google.co.in/books/about/Cyber_Forensics.html
4. https://en.wikipedia.org/wiki/Computer_forensics
5. <https://archive.org/details/computerforensic>

**MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	2	2	2	2	3	3	2	2	1
CO2	3	3	1	2	2	2	2	3	3	2	2	1
CO3	3	3	1	2	2	2	2	3	3	2	2	1
CO4	3	3	1	2	2	2	2	3	3	2	2	1
CO5	3	3	1	2	2	2	2	3	3	2	2	1
TOTAL	15	15	5	10	10	10	10	15	15	10	10	5
AVERAGE	3	3	1	2	2	2	2	3	3	2	2	1

3 – Strong, 2- Medium, 1- Low

SEMESTER I
FOUNDATION COURSE: WEB DESIGNING

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU241FC1	1	1	-	-	2	2	30	25	75	100

Pre-requisite:

Basic understanding about Websites and Web pages.

Learning Objectives:

1. To understand the design rules in constructing web pages and sites.
2. To enable the students to learn the basic working scheme of the Internet and World Wide Web.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	understand and identify the elements and attributes in a web page.	K1&K2
2.	design web pages using DHTML and Cascading StyleSheets.	K3
3.	design and construct web sites using tables.	K3
4.	apply the attributes in designing web pages	K3
5.	analyze a web page and identify its elements and attributes.	K4

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

Units	Contents	No. of Hours
I	Introduction to HTML: Designing a Home page – History of HTML – HTML generations- HTML Documents-Anchor tag –Hyperlinks –Sample HTML documents.	6
II	Head and Body section: Header Section –Title-Prologue-Links - Colorful web page –Comments lines Designing the body: Heading printing –Aligning the headings-Horizontal rule- paragraph-Tab settings- Image and pictures-Embedding PNG format Images.	6
III	Ordered and unordered lists: List-Unordered lists- headings in a list – ordered lists- Nested lists. Table handling: Tables- table creation in HTML- Width of the Tables and cells-Cells spanning multiple rows/Columns- Coloring cells – Column specification.	6
IV	Frames: Frame set - Definition – Frame definition –Nested Frames Web Page Design Project: Frameset Definition – Animals – Birds – Fish. Forms: Action 15 attributes –Method attributes –Enctype attribute – Drop down list- sample forms.	6
V	DHTML and Style sheets: Defining styles – Elements of styles- Linking a style sheet to an HTML document –Inline styles Internal & External style sheets – Multiple styles.	6
	Total	30

Self-study	Coloring cells, Table Creation
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Textbooks:

1. Xavier, C. 2010. *World Wide Web Design with HTML*. (23rd edition). New Delhi:TMH Publication.
2. Rizwan Ahmed, P. 2013. *Internet and its Application*. (2nd edition). Chennai: Margham Publications.

Reference Books

1. Paul J. Deitel, Deitel, 2008. *Internet & World Wide Web: How to Program*. (5th edition). Pearson Education.
2. Raymond Greenlaw, Ellen Hepp. 2007. *Fundamentals of Internet and www*. (2nd edition). New Delhi: Tata McGrawHill.
3. Ivan Bayross. 2010. *HTML, DHTML, JavaScript, Perl CGI*. (4th edition). BPB Publications.
4. Kogent Learning Solutions Inc., 2012. *Web Technologies Black Book*. (New Edition). New Delhi: DreamTech Press Publishers.
5. David Pitt, 2014. *Modern Web Essential JavaScript & Html5*. (2nd edition), New Delhi: Infoq Publication.

Web Resources:

1. <https://www.geeksforgeeks.org/how-to-design-a-web-page-in-html/>
2. <https://www.marsdevs.com/blogs/web-designing-using-html-and-css>
3. https://www.w3schools.com/tags/tag_frame.asp
4. <https://www.w3schools.com/html/default.asp>
5. <https://www.educba.com/design-web-page-in-html/>

**MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	2	2	1	2	3	3	2	2	1
CO2	3	3	1	2	2	1	2	3	3	2	2	1
CO3	3	3	1	2	2	1	2	3	3	2	2	1
CO4	3	3	1	2	2	1	2	3	3	2	2	1
CO5	3	3	1	2	2	1	2	3	3	2	2	1
TOTAL	15	15	5	10	10	5	10	15	15	10	10	5
AVERAGE	3	3	1	2	2	1	2	3	3	2	2	1

3 – Strong, 2- Medium, 1- Low

SEMESTER I**SPECIFIC VALUE-ADDED COURSE I: OBJECT ORIENTED CONCEPTS**

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU241V01	1	1	-	-	2	2	30	25	75	100

Pre-requisite:

A solid understanding of basic programming constructs, including variables, data types, loops, conditionals, and functions, in at least one programming language.

Learning Objectives:

1. To understand and apply core OOP principles.
2. To design and develop Object-Oriented programs.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	define object-oriented programming terminology and describe basic programming constructs.	K1&K2
2.	illustrate object relationships.	K2
3.	analyze code for OOP principles.	K4
4.	compare different OOP designs.	K4
5.	develop basic object-oriented programs.	K3

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

Units	Contents	No. of Hours
I	Overview of C++ programming language: Setting up C++ Development Environment (compiler, IDE) - Writing your first C++ program: Hello World - Basic syntax: variables - data types - operators - Hands-on exercises: Write simple programs to practice syntax.	6
II	Control Flow and Functions: Conditional statements - if, else if, else - Looping statements: for, while, do-while - Switch statement - Functions: declaration-definition- parameters- return types - Hands-on exercises: Write programs to demonstrate control flow and function concepts	6
III	Object-Oriented Programming (OOP) Basics: Introduction to Object-Oriented Programming in C++ - Classes and Objects - Constructors and methods - Encapsulation and access specifiers (public, private, protected) - Hands-on exercises: Create classes and objects- define methods.	6
IV	Inheritance and Polymorphism Inheritance: extending classes - Method overriding - Polymorphism: runtime and compile-time - Abstract classes and interfaces (pure virtual functions) - Hands-on exercises: Implement inheritance and polymorphism in C++ programs.	6
V	Exception Handling and File I/O Handling exceptions: try, catch, throw - Catching specific exceptions - File handling in C++: Reading from and writing to files - Hands-on exercises: Write programs to handle exceptions and work with files.	6
	Total	30

Self-study	File handling in C++: Reading from and writing to files.
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Textbooks:

1. Bjarne Stroustrup, 2013. *The C++ Programming Language*, 4th Edition Addison-Wesley.
2. Grady Booch, 2007. *Object-Oriented Analysis and Design with Applications*, 3rd Edition, Addison-Wesley.

Reference Books

1. Erich Gamma, Richard Helm, Ralph Johnson, and John Vlissides, 1994. *Design Patterns:*

Elements of Reusable Object-Oriented Software, 1st Edition, Addison-Wesley.

2. Stanley B. Lippman, Josée Lajoie, and Barbara E. Moo, 2012. *C++ Primer*, 5th Edition, Addison-Wesley.
3. Scott Meyers, 2014. *Effective Modern C++: 42 Specific Ways to Improve Your Use of C++11 and C++*, 1st Edition, O'Reilly Media.
4. Bjarne Stroustrup, 2014. *Programming: Principles and Practice Using C++*, 2nd Edition Addison-Wesley.
5. Andrew Koenig and Barbara E. Moo, 2000. *Accelerated C++: Practical Programming by Example*, 1st Edition, Addison-Wesley.

Web Resources:

1. <https://www.geeksforgeeks.org/c-plus-plus/>
2. <https://en.cppreference.com/>
3. <https://www.learncpp.com/>
4. <https://learn.saylor.org>

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	2.5	2	1
CO2	3	2	1	2	2	1	2	3	2	2.5	2	1
CO3	3	2	1	2	2	1	2	3	2	2.5	2	1
CO4	3	2	1	2	2	1	2	3	2	2.5	2	1
CO5	3	2	1	2	2	1	2	3	2	2.5	2	1
TOTAL	15	10	5	10	10	5	10	15	10	12.5	10	5
AVERAGE	3	2	1	2	2	1	2	3	2	2.5	2	1

3 – Strong, 2- Medium, 1- Low

SEMESTER I
SPECIFIC VALUE-ADDED COURSE I: PROGRAMMING USING JAVA

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU241V02	1	1	-	-	2	2	30	25	75	100

Pre-requisite:

A basic understanding of programming fundamentals, including variables, data types, control structures (such as loops and conditionals), and functions.

Learning Objectives:

1. To understand the basic concepts of Java.
2. To develop high quality, internally documented, well-structured object oriented program using Java.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	recall and describe the object-oriented programming concepts in JAVA.	K1&K2
2.	apply the relevant object-oriented concepts to implement a real time application with design patterns.	K3
3.	demonstrate the application of polymorphism in various ways.	K2
4.	illustrate the use of inheritance, exceptions, generics and collection.	K2
5.	develop applications with event-driven graphical user interface and file management.	K3

K1 - Remember; K2 - Understand; K3 – Apply

Units	Contents	No. of Hours
I	Introduction to Java: Overview of Java programming language - Setting up Java Development Environment (JDK, IDE) - Writing your first Java program: Hello World - Basic syntax: variables- data types- operators - Hands-on exercises: Write simple programs to practice syntax	6
II	Control Flow: Conditional statements: if, else if, else – Looping statements: for, while, do-while - Switch statement - Hands-on exercises: Write programs to demonstrate control flow concepts.	6
III	Object-Oriented Programming (OOP) Basics: Introduction to Object - Oriented Programming - Classes and Objects - Constructors and methods - Encapsulation and access modifiers (public, private, protected) - Hands-on exercises: Create classes and objects, define methods	6
IV	Inheritance and Polymorphism: Inheritance: extending classes - Method overriding - Polymorphism: runtime and compile time - Abstract classes and interfaces - Hands-on exercises: Implement Inheritance and Polymorphism in Java programs	6
V	Exception Handling and File I/O: Handling exceptions: try, catch, finally - Checked vs unchecked exceptions - File handling in Java: Reading from and writing to files - Hands-on exercises: Write programs to handle exceptions and work with files.	6
	Total	30

Self-study	Abstract classes and interfaces.
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Textbooks:

1. Herbert Schildt, 2017. *Java: The Complete Reference*, 10th Edition, McGraw Hill Education.
2. Harvey M. Dietel, 2007. *Java How to Program*, 7th Edition, Prentice Hall.

Reference Books

1. Elisabeth Freeman, 2004. *Head First Design Patterns*, 1st Edition, O'Reilly.
2. Kathy Sierra, Bert Bates, 2005. *Head First Java*, 2nd Edition, O'Reilly Media.
3. Joshua Bloch, 2017. *Effective Java*, 3rd Edition, Addison-Wesley.
4. Herbert Schildt, 2018. *Java: The Complete Reference*, 11th Edition, McGraw-Hill Education.
5. Kathy Sierra and Bert Bates, 2005. *Head First Java*, 2nd Edition, O'Reilly Media

Web Resources:

1. <https://www.javatpoint.com/java-tutorial>
2. <https://www.w3schools.com/java/>
3. <https://www.tutorialspoint.com/java/index.htm>
4. <https://www.geeksforgeeks.org/java/>
5. <https://www.tutorialspoint.com/java/index.htm>
6. <https://www.codecademy.com/catalog/language/java>

**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	2.5	2	1
CO2	3	2	1	2	2	1	2	3	2	2.5	2	1
CO3	3	2	1	2	2	1	2	3	2	2.5	2	1
CO4	3	2	1	2	2	1	2	3	2	2.5	2	1
CO5	3	2	1	2	2	1	2	3	2	2.5	2	1
TOTAL	15	10	5	10	10	5	10	15	10	12.5	10	5
AVERAGE	3	2	1	2	2	1	2	3	2	2.5	2	1

3 – Strong, 2- Medium, 1- Low

SEMESTER I
SPECIFIC VALUE-ADDED COURSE I: SYSTEM SOFTWARE AND OPERATING SYSTEMS

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU241V03	1	1	-	-	2	2	30	25	75	100

Pre-requisite:

Basic computer science knowledge, in a programming language, understanding of computer architecture, familiarity with mathematical foundations, and experience with command line interfaces.

Learning Objectives:

1. To demonstrate a comprehensive understanding of system software principles, and analyze, design, and develop software systems effectively.
2. To know about operating system fundamentals distributed operating systems principles, and to design, manage, and troubleshoot complex computing environments proficiently.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	recall the fundamental principles of system software and define the CPU scheduling algorithms.	K1
2.	demonstrate role and functioning of compilers, interpreters, loaders, and linkers in the translation of high-level code to machine code and management of program execution.	K2
3.	explain the concepts of deadlock characterization and the various methods for handling deadlocks in operating systems.	K2
4.	apply their knowledge of memory management techniques, to solve memory allocation problems, and to design and implement basic operating system functionalities.	K3
5.	analyze the performance implications of different CPU scheduling algorithms and assess their impact on system performance and user experience.	K4

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

Units	Contents	No. of Hours
I	System Software: Machine - Assembly and High-Level Languages; Compilers and Interpreters; Loading - Linking and Relocation; Macros - Debuggers. Basics of Operating Systems: Operating System Structure - Operations and Services; System Calls - Operating System Design and Implementation; System Boot.	6
II	CPU Scheduling: Scheduling Criteria and Algorithms; Thread Scheduling - Multiple-Processor Scheduling - Real-Time CPU Scheduling. Deadlocks: Deadlock Characterization - Methods for Handling Deadlocks - Deadlock Prevention - Avoidance and Detection; Recovery.	6
III	Memory Management: Contiguous Memory Allocation - Swapping - Paging - Segmentation - Demand Paging - Page Replacement - Allocation of Frames - Thrashing - Memory-Mapped Files.	6
IV	Security: Protection - Access Matrix - Access Control - Revocation of Access Rights - Program Threats - System and Network Threats;	6

	Cryptography as a Security Tool - User Authentication - Implementing Security Defences.	
V	Windows Operating Systems: Design Principles - System Components - Terminal Services and Fast User Switching; File System - Networking. Distributed Systems: Types of Networks based Operating Systems - Network Structure - Communication Structure and Protocols; Distributed File Systems.	6
	Total	30

Self-study	Types of Networks based Operating Systems.
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Textbooks:

1. Leland L. Beck and Daryl D. Manjikian, 1997. *System Software: An Introduction to Systems Programming*, 3rd Edition, Addison Wesley.
2. William Stallings, 2018. *Operating Systems: Internals and Design Principles*, 9th Edition, Pearson.

Reference Books

1. Andrew S. Tanenbaum and Herbert Bos, 2014. *Modern Operating Systems*, 4th Edition, Pearson.
2. Abraham Silberschatz, Peter B. Galvin, and Greg Gagne, 2018. *Operating System Concepts*, 10th Edition, John Wiley & Sons.
3. Richard Anthony, 1996. *Systems Programming: Designing and Developing Distributed Applications*, 1st Edition, Pearson.
4. Johnson M. Hart, 2010. *Windows System Programming*, 4th Edition, Addison-Wesley.
5. Pavel Yosifovich, Mark E. Russinovich, David A. Solomon, and Alex Ionescu, 2017. *Windows Internals, Part 1: System architecture, processes, threads, memory management, and more*, 7th Edition, Microsoft Press.

Web Resources:

1. <https://www.simplilearn.com/tutorials/programming-tutorial/what-is-system-software>
2. <https://www.quora.com/How-can-I-learn-subject-System-software-on-my-own>
3. <https://learn.microsoft.com/en-us/windows/win32/>
4. <https://pages.cs.wisc.edu/~remzi/OSTEP/>
5. <https://learn.microsoft.com/en-us/windows/apps/>

**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	2.5	2	1
CO2	3	2	1	2	2	1	2	3	2	2.5	2	1
CO3	3	2	1	2	2	1	2	3	2	2.5	2	1
CO4	3	2	1	2	2	1	2	3	2	2.5	2	1
CO5	3	2	1	2	2	1	2	3	2	2.5	2	1
TOTAL	15	10	5	10	10	5	10	15	10	12.5	10	5
AVERAGE	3	2	1	2	2	1	2	3	2	2.5	2	1

3 – Strong, 2- Medium, 1- Low

SEMESTER II
CORE COURSE II: PYTHON PROGRAMMING

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU242CC1	4	1	-	-	5	5	75	25	75	100

Pre-requisite:

Basic Knowledge of Programming concept.

Learning Objectives:

1. To understand and identify, important libraries in Python, and explain best practices and idiomatic expressions for writing clean and efficient Python code.
2. To develop proficiency in core Python scripting elements and build applications.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	remember fundamental python syntax and basic data types, and understand the concepts.	K1&K2
2.	analyze and apply functions, control statements, strings, lists and dictionaries in python programming	K3&K4
3.	demonstrate the concept of object, class inheritance and polymorphism in Python.	K2
4.	apply user defined functions and classes in python.	K3
5.	develop programming skills to solve real time computational problems	K3

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

Units	Contents	No. of Hours
I	Python, Data Types, Expressions: Python Programming - Running Code in the Interactive Shell - Input - Processing and Output - Editing - Saving and Running a Script - Data Types - String Literals - Escape Sequences - String Concatenation - Variables and the Assignment Statement - Numeric Data Types and Character Sets - Integers and Long Integers - Floating-Point Numbers and Character Sets - Expressions - Arithmetic Expressions and Mixed-Mode Arithmetic and Type Conversions.	15
II	Functions, Modules and Control Statements: Functions and Modules - Calling Functions - The math Module - The Main Module - Program Format and Structure and Running a Script from a Terminal Command Prompt - Iteration - for loop - Selection - Boolean Type - Comparisons - and Boolean Expressions - if-else Statements - One-Way Selection Statements - Multi-way if Statements - Logical Operators and Compound Boolean Expressions - Short-Circuit Evaluation and Testing Selection Statements - Conditional Iteration - while loop.	15
III	Strings and Text Files: Strings - Accessing Characters and Substrings in Strings - Strings and String Methods - Text Files - Text Files and Their Format - Writing Text to a File - Writing Numbers to a File - Reading Text from a File - Reading Numbers from a File and Accessing and Manipulating Files and Directories on Disk.	15
IV	Lists and Dictionaries: Lists - List Literals and Basic Operators - Replacing an Element in a List - List Methods for Inserting and Removing Elements - Searching and Sorting a List - Mutator Methods and the Value	15

	None - Aliasing and Side Effects - Equality and Tuples - Defining Simple Functions - Parameters and Arguments - return Statement - Boolean Functions and main function - Dictionaries: Dictionary Literals - Adding Keys and Replacing Values - Accessing Values - Removing Keys and Traversing a Dictionary.	
V	Design with Functions and Design with Classes: Design with Functions and Design with Classes - Functions as Abstraction Mechanisms - Problem Solving with Top-Down Design - Design with Recursive Functions and Managing a Program's Namespace – Design with classes: Objects and Classes - Data Modeling and Structuring Classes with Inheritance and Polymorphism.	15
	Total	75

Self-study	Logical Operators and Compound Boolean Expressions, Defining Simple Functions.
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Textbooks:

1. Kenneth A. Lambert, Martin Osborne, 2010. Fundamentals of Python: From First Programs Through Data Structures, Course Technology, 1st Edition, Cengage Learning.
2. Paul Barry, 2016. Head First Python 2e, 2nd Revised edition, O'Reilly.

Reference Books:

1. Zed A. Shaw, 2014. *Learn Python the Hard Way*, 3rd Edition, Addison-Wesley.
2. Dave Kuhlman, 2013. *A Python Book: Beginning Python, Advanced Python, and Python Exercises*, 1st Edition, Self-Published.
3. Kent D Lee, 2011. *Python Programming Fundamentals*, 1st Edition, Springer-Verlag London Limited.
4. Reema Thareja, 2017. *Python Programming using problem solving approach*, 1st Edition, Oxford University Press.
5. Nageswara Rao R., 2017. *Core Python Programming*, 1st Edition, Dream tech Publishers.

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_\(programming_language\)](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	1	2	2	1	2	3	2	2.5	2	1
CO2	3	2	1	2	2	1	2	3	2	2.5	2	1
CO3	3	2	1	2	2	1	2	3	2	2.5	2	1
CO4	3	2	1	2	2	1	2	3	2	2.5	2	1
CO5	3	2	1	2	2	1	2	3	2	2.5	2	1
TOTAL	15	10	5	10	10	5	10	15	10	12.5	10	5
AVERAGE	3	2	1	2	2	1	2	3	2	2.5	2	1

3 – Strong, 2- Medium, 1- Low

SEMESTER II
CORE LAB COURSE II: PYTHON PROGRAMMING LAB

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU242CP1	-	1	4	-	5	5	75	25	75	100

Pre-requisite:

Basic computer operation skills.

Learning Objectives:

1. To understand the basics of python programming concepts.
2. To understand the high-performance programs designed to build up the real proficiency.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	remember fundamental python syntax and basic data types, and describe the concepts.	K1&K2
2.	analyze and apply functions, control statements, strings, lists and dictionaries in python programming	K3&K4
3.	demonstrate the concept of object, class inheritance and polymorphism in Python.	K2
4.	apply user defined functions and classes in python.	K3
5.	develop programming skills to solve real time computational problems	K3

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

List of Exercises	No. of Hours
Implement the following exercises using Python Programming language: 1. Program using Control Statements. 2. Program using Operators. 3. Program using Lists and List comprehensions. 4. Program using Set. 5. Program using Dictionary. 6. Program using Function. 7. Program using String. 8. Program using File. 9. Program using Polymorphism. 10. Program using Inheritance.	75

Textbooks:

1. Kenneth A. Lambert, Martin Osborne, 2010. *Fundamentals of Python: From First Program Through Data Structures, Course Technology*, 1st Edition, Cengage Learning,
2. Paul Barry, 2016. *Head First Python 2e*, 2nd Revised edition, O'Reilly.

Reference Books:

1. Zed A. Shaw, 2014. *Learn Python the Hard Way*, 3rd Edition, Addison-Wesley.
2. Dave Kuhlman, 2013. *A Python Book: Beginning Python, Advanced Python, and Python Exercises*, 1st Edition, Self-Published.
3. Kent D Lee, 2011. *Python Programming Fundamentals*, 1st Edition, Springer-Verlag London Limited
4. Reema Thareja, 2017. *Python Programming using Problem Solving Approach*, 1st Edition, Oxford University Press.
5. Nageswara Rao R., 2017. *Core Python Programming*, 1st Edition, Dream Tech Publishers.

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_\(programming_language\)](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	1	2	2	1	2	3	2	2.5	2	1
CO2	3	2	1	2	2	1	2	3	2	2.5	2	1
CO3	3	2	1	2	2	1	2	3	2	2.5	2	1
CO4	3	2	1	2	2	1	2	3	2	2.5	2	1
CO5	3	2	1	2	2	1	2	3	2	2.5	2	1
TOTAL	15	10	5	10	10	5	10	15	10	12.5	10	5
AVERAGE	3	2	1	2	2	1	2	3	2	2.5	2	1

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
IU242EC1	3	1	-	-	3	4	60	25	75	100

Pre-requisite:

Knowledge of basic concepts of Set Theory

Learning Objectives:

1. To impart the knowledge of fundamental concepts in probability to solve problems.
2. To understand graph algorithms and representations to solve real-world AI problems.

Course Outcomes

On the successful completion of the course, student will be able to:		
1.	gain a deep understanding of functions and their role in problem solving.	K1 & K2
2.	understand the basic principles of counting, including the product, sum rules, and apply combinatorial techniques to solve problems in various contexts.	K2 & K3
3.	acquire knowledge of the theory of probability and multiplication law of probability.	K1 & K2
4.	apply the concept of Baye's theorem and compute mathematical expectation.	K2 & K3
5.	design and implement graph-based solutions to AI problems using appropriate data structures and algorithms.	K2 & K3

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

Units	Contents	No. of Hours
I	Functions: Introduction- Types of Functions- Classification of Functions- Algebraic Function- Transcendental Function- Composition of Functions – Identity Function- Inverse of a Function. Chapter 5: Section 5.1-5.8 (Pages 5.1-5.14)	12
II	Combinatorics: Introduction- The Basics of Counting Principles-Product Rule- The Sum Rule- Permutations- Combination-Permutations with Repetition- Circular Permutation. Chapter 7: Section 7.1-7.4, 7.7-7.10 (Pages 7.1-7.3, 7.7-7.14)	12
III	Discrete Probability: Introduction - Sample Space - Event - Exhaustive Event - Favourable Event - Mutually Exclusive Events - Equally Likely Events - Probability - Axioms of Probability - Conditional Property -Multiplication Law of Probability - Multiplication Law of Probability for Independent Events - Extension of Multiplication Law of Probability. Chapter 9: Sections: 9.1-9.10, 9.12-9.15	12
IV	Discrete Probability: Total Probability - Baye's Theorem - Mathematical Expectations. Chapter 9: Sections: 9.16-9.18	12
V	Graph Theory: Introduction – Graph – Undirected Graph – Directed Graph – Multi Graph – Pseudo Graph – Simple Graph – General Graph – Degree of a Vertex – Finite	12

	Graph – Order of a Graph – Size of a Graph – Null Graph – Isolated Graph – Regular Graph – Isomorphic Graphs – Matrix Representation of Graphs – Adjacency Matrices – Incidence Matrix – Subgraph - Weighted Graph. Chapter 11: Sections: 11.1- 11.3.3, 11.3.10	
	Total	60

Self study	Sample Space ; Unit V: Simple Graph, General Graph
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Textbooks

1. 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.
2. Norman L Biggs, 2011. *Discrete Mathematics* (1st Edition), Pearson, USA.
3. Kenneth Bogart and Robert L Drysdale, 2014. *Discrete Mathematics for Computer Science* (3rd Edition), Addison-Wesley.
4. Kenneth H. Rosen, 2011. *Discrete Mathematics and its Applications* (7th Edition), McGraw Hill.
5. Kenneth H. Rosen, 2022. *Discrete Mathematics and its Applications*, (8th Edition), McGraw Hill.
6. S.K.Chakraborty and B.K.Sarkar, 2011. *Discrete Mathematics* (1st Edition), Oxford University.

Web Resources

1. <https://www.slideshare.net/asadfaraz4/intro-to-discrete-mathematics>
2. https://onlinecourses.nptel.ac.in/noc23_cs109/preview
3. https://www.youtube.com/watch?v=amaH38_mXK4
4. <https://brilliant.org/wiki/discrete-mathematics/>
5. <https://discrete.openmathbooks.org/dmoi3.html>

**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: UNDERSTANDING INTERNET

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU242NM1	1	1	-	-	2	2	30	25	75	100

Pre-requisite:

Basic computer literacy, knowledge of networks and protocols.

Learning Objectives:

1. To understand and gain knowledge of internet mass medium.
2. To study the various features of internet technology, demographic and psychographic description of internet audiences, issues related to cybercrime and cyber security.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	understand the basic concept of network and HTML.	K1 & K2
2.	understand the basics of WWW and web browsers.	K2 & K3
3.	describe the security hash function and concepts of security methods.	K2 & K3
4.	solve problems involving malware.	K3 & K4
5.	apply algorithm for secure network.	K2 & K3

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

Units	Contents	No. of Hours
I	Introduction to Internet: Working and history of the internet- Uses of the internet - World Wide Web (WWW)- Web Client- Web Browser- Webpage – Website - Search Engine- Difference between network and internet- Advantages and Disadvantages of the Internet. Application Software and Programming Languages – Application Software - Packaged Software Products (Off-the-Shelf Products).	6
II	WWW and Web Browsers: WWW-Evolution of Web-Basic Elements of WWW-Web Browsers- Search Engines- Search Criteria. Web Publishing: Web Publishing- Web Page Design. Email: E-Mail Basics- E-Mail System-E-Mail Protocol-E-Mail Addresses-Structure of an E-Mail Message-E-Mail Clients & Servers- Mailing List-E-Mail Security.	6
III	Digital Transformation: Data (High Value Commodity) -Digital Transformation in Business - Features of Digital Transformation - Banking and Financial Services Industry (BFSI) - Human Resource Management – Healthcare - Big Data Analytics in Healthcare - Virtual Reality Wearable medical devices.	6
IV	Cyber Security: IT Assets - Risk and Vulnerabilities - Computer Security Types - Fundamental Principles of Security - Physical Safety and Security - Access Control - Biometric Access Control - Network Security - AAA Server – Firewall – Malware – Spyware – Adware – Spamware – Virus – Ransomware – Worms - Trojan Horse	6
V	Computer Virus: Types of Computer Viruses - Antivirus Protection - Digital Signature - Cyber Crime – Hacking – Phishing - Spam e-mails - Attack using Malware - ATM Skimming – Ransom ware - Fake News - Deep fake – Cyber bullying.	6
	Total	30

Self-study	Advantages and Disadvantages of the Internet
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Textbooks:

1. C. Xavier, 2021. *Fundamentals of Internet and Emerging Technologies*, New Age International Publishers Ltd., New Delhi., Chapters 1, 2, 3 and 9 to 16 only.
2. Pradeep K. Sinha, Priti Sinha, 2021. *Computer Fundamentals: Concepts, Systems & Applications*, 8th Edition. BPB Publications.

Reference Books

1. Teach U Comp Inc., 2014. *Mastering HTML5 and CSS3 Made Easy*.
2. Thomas Michaud, 2013. *Foundations of Web Design: Introduction to HTML & CSS*, New Riders publishers.
3. Randal Bryant, David O'Hallaron, 2015. *Computer Systems: A Programmer's Perspective*, Pearson Education.
4. EC-Council, 2009. *Computer Forensics: Investigating Data and Image Files*, 1st Edition, Cengage Learning.
5. Douglas E. Comer, 2018. *The Internet Book: Everything You Need to Know About Computer Networking and How the Internet Works*, 5th edition, Taylor and Francis.

Web Resources:

1. <https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf>
2. <https://www.w3schools.com/html/default.asp>
3. <https://www.geeksforgeeks.org/introduction-to-internet/>
4. <https://www.geeksforgeeks.org/computer-fundamentals-tutorial/>
5. <https://archive.org/details/computerforensic>

**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	3	3	3	3	3	2	2
CO2	3	3	2	2	2	2	2	3	3	2	2	2
CO3	3	3	3	2	2	2	2	2	3	3	3	2
CO4	3	3	3	2	2	3	3	3	3	3	2	2
CO5	3	3	3	2	2	3	3	3	3	3	3	2
TOTAL	15	15	13	10	10	13	13	14	15	14	12	10
AVERAGE	3	3	2.6	2	2	2.6	2.6	2.8	3	3	2.4	2

3 – Strong, 2- Medium, 1- Low

SEMESTER II
SKILL ENHANCEMENT COURSE I SEC 1: QUANTITATIVE APTITUDE

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU242SEC1	1	1	-	-	2	2	30	25	75	100

Pre-requisite:

Basic proficiency in mathematics and logical thinking.

Learning Objectives:

1. To develop skill to meet the competitive examinations for better job opportunity.
2. To enrich their knowledge and to develop their logical reasoning thinking ability.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	understand the basic concepts of numbers.	K1&K2
2.	apply the concept of percentage, profit and loss.	K3
3.	solve problems using distance and time.	K3
4.	analyze the concepts of discount and probability.	K4
5.	solve the problems easily with short cut methods.	K3

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

Units	Contents	No. of Hours
I	Numbers -HCF and LCM of numbers-Decimal fractions - Simplification-Square roots and cube roots - Average-Problems on Numbers. Problems on Divisibility Rules - Finding Units Digit for a Complex Calculation - Finding Reminders - Problems on Prime Factorization and Decimal Fractions	6
II	Problems on Ages - Surds and Indices - percentage - profits and loss - ratio and proportion-partnership-Problems on unitary methods Problems on alternate days and wages - Problems on chain-rule.	6
III	Time and work - pipes and cisterns - Time and Distance - problems on trains - Boats and streams - simple interest - compound interest - Area-Volume and surface area -Problems on circular tracks, races and games.	6
IV	Permutation and combination-probability-True Discount-Bankers Discount-Height and Distances-Odd man out & Series-Problems on linear arrangement - Problems on circular arrangement -Problems when repetitions are allowed - Problems on selections.	6
V	Calendar - Clocks - Problems on stocks and shares - Data representation - Tabulation – Data Interpretation- Bar Graphs-Pie Charts-Line graphs.	6
	Total	30

Self-study	HCF and LCM of numbers, simple interest
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Textbooks:

1. Aggarwal R. S., 2016. *Quantitative Aptitude (Fully solved)*, Reprint, S. Chand & Company Ltd.

Reference Books

1. Praveen R.V., 2013. Quantitative Aptitude and Reasoning, 2nd Revised Edition, Prentice-Hall of India Pvt. Ltd.
2. Ranganath G. K., Sampangiram C. S. and Rajaram Y., 2008. A text Book of business Mathematics, Himalaya Publishing House.
3. Abhijit Guha, 2019. Quantitative Aptitude for Competitive Examinations, 7th Edition, McGraw Hill.

Web Resources:

1. <https://www.indiabix.com/aptitude/problems-on-trains/>
2. <https://www.javatpoint.com/aptitude/quantitative>
3. <https://www.careerride.com/problems-on-percentage.aspx>
4. <https://testbook.com/objective-questions/mcq/>
5. <https://talentbattle.in/practice-quantitative-aptitude-questions/>

**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	2.5	2	1
CO2	3	2	1	2	2	1	2	3	2	2.5	2	1
CO3	3	2	1	2	2	1	2	3	2	2.5	2	1
CO4	3	2	1	2	2	1	2	3	2	2.5	2	1
CO5	3	2	1	2	2	1	2	3	2	2.5	2	1
TOTAL	15	10	5	10	10	5	10	15	10	12.5	10	5
AVERAGE	3	2	1	2	2	1	2	3	2	2.5	2	1

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
UG242LC1	1	-	-	-	1	1	15	50	50	100

Objectives:

1. To develop human values through value education
2. To understand the significance of humane and values to lead a moral life

On the successful completion of the course, students 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

Textbooks

Humane and Values. Holy Cross College (Autonomous), Nagercoil
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
UG242LM1	1	-	-	-	1	1	15	50	50	100

Objectives:

1. To develop human values through value education
2. To understand the significance of humane and values to lead a moral life

Course Outcomes

On the successful completion of the course, students 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

Text Book

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

SEMESTER III**CORE COURSE III: ARTIFICIAL INTELLIGENCE AND ITS APPLICATIONS**

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU243CC1	4	1	-	-	5	5	75	25	75	100

Pre-requisite:

Basic data structures and algorithms.

Learning Objectives:

1. To introduce the basic principles, techniques and applications of Artificial Intelligence.
2. To develop AI applications in real-life scenarios.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	understand AI fundamentals.	K1 & K2
2.	learn problem solving techniques in AI.	K3
3.	utilize knowledge representation and reasoning.	K4
4.	implement and evaluate AI models.	K5
5.	apply AI techniques to solve real-world problems.	K6

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

Units	Contents	No. of Hours
I	Introduction to Artificial Intelligence: Definition of AI - History and Evolution of AI - Applications of AI in Various Fields - Types of AI: Narrow AI, General AI, and Super AI - AI vs Machine Learning vs Deep Learning - AI Techniques: Search, Knowledge Representation, Learning.	15
II	Problem Solving and Search Strategies: Problem Solving as State Space Search - Uninformed Search Strategies, Uniform Cost Search, Informed Search Strategies: A* Algorithm, Greedy Best-First Search, Heuristic Functions, Constraint Satisfaction Problems (CSPs).	15
III	Knowledge Representation and Reasoning: Introduction to Knowledge Representation, Logical Reasoning: Propositional Logic, First-Order Logic, Rule-Based Systems and Expert Systems, Semantic Networks & Frames, Probabilistic Reasoning: Bayesian Networks.	15
IV	Machine Learning and AI Applications: Supervised Learning: Classification & Regression, Unsupervised Learning: Clustering & Dimensionality Reduction, Reinforcement Learning Basics, AI in Image Processing & Computer Vision, AI in Natural Language Processing (NLP), AI in Robotics.	15
V	AI Ethics, Challenges and Future Trends: Ethical Considerations in AI, Bias and Fairness in AI, AI and Privacy Concerns, Explainable AI (XAI), Future of AI: Autonomous Systems, Quantum AI, AGI.	15
	Total	75

Self-study	AI vs Machine Learning vs Deep Learning
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Textbooks:

1. Stuart Russell & Peter Norvig, 2015. *Artificial Intelligence: A Modern Approach*, 3rd Edition, Pearson.
2. Melanie Mitchell, Farrar, Straus and Giroux, 2019. *Artificial Intelligence: A Guide for*

Reference Books:

1. Dr. R.P. Mahapatra, *Fundamentals of Artificial Intelligence*, S. Chand Publishing.
2. Winston Patrick Henry, 1993. *Introduction to Artificial Intelligence*, Addison – Wesley.
3. Charniak. 2002, *Introduction to Artificial Intelligence*, Pearson Education.
4. Aurelien Geron, 2019, *Hands - on Machine learning with Scikit-Learn, Keras and TensorFlow*, O'Reilly Media, 2nd Edition.
5. Michael Nielsen, 2015. *Neural Networks and Deep Learning*, Determination Press.

Web Resources:

1. <https://www.coursera.org/learn/ai-for-everyone>
2. <https://cs229.stanford.edu/>
3. <https://ocw.mit.edu/courses/6-034-artificial-intelligence-fall-2010/>
4. <https://www.geeksforgeeks.org/artificial-intelligence/>
5. <https://www.analyticsvidhya.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	2	3	3	3	3	3	2
CO2	3	3	1	2	2	2	3	3	3	3	3	3
CO3	3	2	1	2	2	2	3	3	3	3	3	2
CO4	3	2	1	2	2	2	3	3	3	3	3	3
CO5	3	2	1	2	3	3	3	3	3	3	3	2
TOTAL	15	11	5	10	11	11	15	15	15	15	15	12
AVERAGE	3	2.2	1	2	2.2	2.2	3	3	3	3	3	2.4

3 – Strong, 2- Medium, 1- Low

SEMESTER III**CORE LAB COURSE III: ARTIFICIAL INTELLIGENCE APPLICATIONS LAB**

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU243CP1	-	1	4	-	5	5	75	25	75	100

Pre-requisite:

Basic Python Programming skills.

Learning Objectives:

1. To develop AI-based problem-solving skills by applying mathematical operations and machine learning techniques.
2. To design and implement AI applications in natural language processing and to enhance decision-making and automation.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	apply fundamental AI concepts, including search algorithms, mathematical operations, and constraint satisfaction problems.	K3
2.	implement machine learning models such as linear regression for predictive analysis and evaluate their performance.	K5
3.	develop AI applications in natural language processing.	K6
4.	implement and analyze computer vision techniques, including image processing and face detection.	K4
5.	design and implement heuristic-based algorithms (A*) for optimization and decision-making in AI applications.	K6

List of Exercises	No. of Hours
Implement the following exercises: 1. Basic mathematical operations for AI. 2. Implement a simple search algorithm. 3. Implement Sentiment Analysis using NLTK. 4. Implement Image Processing with OpenCV. 5. Predict house prices using linear regression. 6. Implement a Constraint Satisfaction Problem. 7. Implement A* algorithm. 8. Design an AI Chatbot. 9. Implement Speech Recognition. 10. Implement Face Detection and Recognition.	75

Textbooks:

1. Stuart Russell & Peter Norvig, 2021. *Artificial Intelligence: A Modern Approach*, Pearson, 4th Edition.
2. Steven Bird, Ewan Klein, & Edward Loper, 2009. *Natural Language Processing with Python*, O'Reilly Media, 1st Edition.

Reference Books:

1. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, 2013. *Data Structures and Algorithms in Python*, 1st Edition, Wiley.
2. Joseph Howse, 2020. *OpenCV Computer Vision with Python*, Packt Publishing, 4th Edition.
3. Daniel Jurafsky & James H. Martin, 2023. *Speech and Language Processing*, Pearson, 3rd Edition.
4. Dr. Basant Agarwal, Benjamin Baka, 2022. *Hands-On Data Structures and Algorithms*

with Python, 3rd Edition, Packt Publishing.

- Bradley N. Miller, David L. Ranum, 2011. *Problem Solving with Algorithms and Data Structures Using Python*, 2nd Edition, Franklin, Beedle & Associates Inc.

Web Resources:

- <https://www.geeksforgeeks.org/python-data-structures-and-algorithms/>
- <https://www.nltk.org/>
- <https://ai.stanford.edu/>
- <https://opencv.org/>
- <https://pytorch.org/>

**MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES**

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

3 – Strong, 2- Medium, 1- Low

SEMESTER III
ELECTIVE COURSE III: DATA STRUCTURES

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU243EC1	3	1	-	-	3	4	60	25	75	100

Pre-requisite:

Basic programming skills.

Learning Objectives:

1. To enhance the problem solving and critical thinking skills.
2. To understand the data structure techniques.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	remember the concepts of basic data structures.	K1
2.	understand the operations of data structures.	K2
3.	apply data structures to solve problems	K3
4.	analyze network structures using trees and graphs	K4
5.	evaluate and create various algorithmic techniques and its applications	K5 & K6

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

Units	Contents	No. of Hours
I	INTRODUCTION AND OVERVIEW: Concept of data Structures, Python Specific Data Structures- Performance Analysis- Data structure operations- Arrays- Linear arrays- Representation of Linear arrays in Memory- Traversing Linear Arrays- Inserting and Deleting-Representation of Multidimensional Arrays.	12
II	STACKS AND QUEUES: Operations on stack- Insert, Delete, Update, Arithmetic Expressions: Evaluation of a postfix expression-Transforming infix expression into postfix-Queues-Operations on queues, Insert, Delete, and Update.	12
III	LINKED LIST: Representation of Linked list in memory-Traversing a linked list-Searching- Insertion into a linked list- Insertion Algorithm-Deletion from a Linked List- Deletion Algorithms- Doubly Linked List-Insertion-Deletion- Applications of Linked List.	12
IV	TREES AND GRAPHS: Tree Terminologies-Binary Trees-Representation of binary trees in memory - Traversing Binary Trees- Pre order- In-order- Post order- Graphs- Graph Terminologies-Types of graphs-Topological Sort-Euler Circuit- Breadth first search- Depth first search.	12
V	SORTING: Sorting Techniques- Insertion sort, Selection sort, Quick sort, Merge sort- Searching- Searching Techniques- Linear search, Binary search. Hashing: Static Hashing, Hash table, Hash functions.	12
	Total	60

Self-study	Merge Sort, Linear Search
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Textbooks:

1. Kent D. Lee and Steve Hubbard , 2019. *Data Structures and Algorithms with Python*.
2. Seymour Lipschutz, *Data Structures*, 2013. Schaum's Outline series, 1st Edition.

Reference Books:

1. Narasimha Karumanchi, 2016. *Data Structures and Algorithms* , Career Monk Publications, 2nd Edition.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, 2009. *Introduction to Algorithms*, The MIT Press; 3rd edition.
3. Dr. K. Nagesware Rao, Dr. Shaik Akbar, Immadi Murali Krishna, *Problem Solving and Python Programming*, 2018.
4. D. S. Kushwaha and A. K. Misra, 2017. *Data structures A Programming Approach with C*, PHI.
5. Mark Allen Weiss, 2014. *Data Structures and Algorithm Analysis in C++*, Pearson Education, 4th Edition.

Web Resources:

1. <https://www.javatpoint.com/data-structure-tutorial>
2. <https://www.geeksforgeeks.org/data-structures/>
3. <https://www.studytonight.com/data-structures/>
4. <https://www.w3schools.in/data-structures-tutorial/intro/>
5. <https://www.programiz.com/dsa>

**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	3	1	2	2	1	2	3	3	2	2	1
CO3	3	3	1	2	2	1	2	3	3	2	2	1
CO4	3	3	1	2	2	1	2	3	3	2	2	1
CO5	3	3	1	2	2	1	2	3	3	2	2	1
TOTAL	15	15	5	10	10	5	10	15	15	10	10	5
AVERAGE	3	3	1	2	2	1	2	3	3	2	2	1

3 – Strong, 2- Medium, 1- Low

SEMESTER III
SKILL ENHANCEMENT COURSE SEC II: PRINCIPLES OF COMPUTER
ARCHITECTURE

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU243SEC1	1	1	-	-	2	2	30	25	75	100

Pre-requisite:

Basic understanding of digital logic design and programming concepts.

Learning Objectives:

1. To understand the core principles of computer architecture and organization.
2. To analyze instruction sets and control unit operations in modern processors.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	understand the basic structure and functionality of computer systems.	K1&K2
2.	analyze the performance of different instruction set architectures (ISA) and identify their impact on processing efficiency.	K4
3.	apply pipelining and parallel processing techniques to improve computational performance.	K3
4.	evaluate memory hierarchy strategies and propose solutions for optimizing data access.	K5
5.	design simple processor architectures and simulate their functionality.	K6

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

Units	Contents	No. of Hours
I	Introduction to Computer Architecture: Basic Computer Organization and Design: Instruction Codes- Computer Registers- Computer Instructions- Timing and Control, Instruction Cycle, Memory-Reference Instructions- Input Output Interrupt- Complete Computer Description- Design of Basic Computer.	6
II	Central Processing Unit: Introduction- General Register Organization- Stack Organization- Instruction Formats- Addressing Modes- Data Transfer and Manipulation- Program Control.	6
III	Combinational Circuits: Half Adder and Full Adder- Flip-Flops- SR Flip-Flop- D Flip-Flop- J-K Flip-Flop- T Flip-Flop- Sequential Circuits- Flip-Flop input equations- State Table- State Diagram and problems. Digital Components: Integrated Circuits- Decoders-3-to-8-line decoder- Multiplexers: 4-to-1 line Multiplexer- Demultiplexer.	6
IV	Memory Hierarchy and Storage Systems: Cache Memory- Mapping Techniques and Replacement Policies- Virtual Memory and Paging- Main Memory Organization Secondary Storage and RAID Levels- Memory Access Optimization Techniques.	6
V	Input/Output Systems and Interfacing: I/O Devices and Interfaces- Interrupt Handling and Direct Memory Access (DMA)- Buses: Structure, Types, and Arbitration- Peripheral Communication (PCI, USB, SATA)- Modern Trends in Computer Architecture (GPUs, TPUs, Quantum Computing)	6
	Total	30

Self-study	I/O Devices
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Textbooks:

1. M. Morris Mano, 2019. *Computer System Architecture*, 3rd Edition, Pearson India.
2. Ramesh Gaonkar, 2007. *Microprocessor Architecture, Programming and Applications with the 8085*, 5th Edition, Penram International Publishing (India) Private Limited .
3. Andrew S. Tanenbaum, Todd Austin, 2013. *Structured Computer Organization*, PHI Pearson 6th Edition.

Reference Books

1. David Money Harris and Sarah L. Harris , 2012. *Digital Design and Computer Architecture*, 2nd Edition, Morgan Kaufmann.
2. Mark Burrell, 2004. *Fundamentals of Computer Architecture*, 1st Edition, Palgrave Macmillan.
3. David A. Patterson and John L. Hennessy, 2014. *Computer Organization and Design: The Hardware/Software Interface*, 5th Edition, Morgan Kaufmann.
4. John L. Hennessy and David A. Patterson, 2017. *Computer Architecture: A Quantitative Approach*, 6th Edition, Morgan Kaufmann.
5. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, and Naraig Manjikian, 2012. *Computer Organization and Embedded Systems*, 6th Edition, McGraw-Hill.

Web Resources:

1. <https://www.coursera.org/courses?query=computer%20architecture>
2. <https://www.edx.org/cs50>
3. <https://www.khanacademy.org/computing/computer-science>
4. <https://www.edx.org/>
5. <https://ocw.mit.edu/courses/6-823-computer-system-architecture-fall-2005/>

**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	3	2	1	2	2	1	2	3	2	2	2	1
CO4	3	2	1	2	2	1	2	3	2	2	2	1
CO5	3	2	1	2	2	1	2	3	2	2	2	1
TOTAL	15	10	5	10	10	5	10	15	10	10	10	5
AVERAGE	3	2	1	2	2	1	2	3	2	2	2	1

3 – Strong, 2- Medium, 1- L

SEMESTER III**SKILL ENHANCEMENT COURSE SEC III: FITNESS FOR WELLBEING**

Course Code	L	T	P	S	Credits	Total Hours	Marks		
							CIA	External	Total
UG24CSE1	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, 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.	6
	Total	30

Self-study	balance diet and basic exercises
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Textbook:

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 Sleight. 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/11YOAwwAABAJ?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: MICROSOFT POWERBI

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU243V01	1	1	-	-	1	2	30	25	75	100

Pre-requisite:

Familiarity with installing software and navigating Windows.

Learning Objectives:

1. To be proficient in creating dynamic reports and dashboards.
2. To deploy and share reports securely.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	understand the fundamentals of Power BI and its applications in data analysis.	K1&K2
2.	learn to import, clean, and transform data for effective visualization.	K2
3.	apply Power BI skills to real-world projects and make data-driven decisions.	K3
4.	utilize advanced analytics features.	K4
5.	develop interactive reports and dashboards to derive insights.	K4 & K6

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

Units	Contents	No. of Hours
I	Introduction to Power BI -Overview of Business Intelligence and Power BI-Installation and Setup- Understanding Power BI Ecosystem (Power BI Desktop, Service, Mobile)- Data Sources and Connectivity- Introduction to Power BI Interface.	6
II	Data Preparation and Transformation -Power Query Editor: Importing Data-Data Cleaning Techniques- Merging and Appending Queries- Handling Errors and Data Types- Creating Data Models and Relationships.	6
III	Data Visualization and Reporting - Creating Visualizations: Charts, Graphs, and Maps- Custom Visuals and Formatting Options- Interactive Reports with Filters and Slicers- Building Dynamic Dashboards- Best Practices in Data Visualization.	6
IV	Advanced Analytics and DAX - Introduction to DAX (Data Analysis Expressions)-Calculated Columns and Measures- Time Intelligence Functions- Creating Hierarchies and Drill-Throughs- Leveraging AI Visuals and Analytics Pane.	6
V	Deployment and Project Work - Publishing Reports to Power BI Service- Creating and Managing Workspaces- Sharing and Embedding Reports- Row-Level Security and Data Privacy- Capstone Project: Real-World Business Scenario.	6

	Total	30
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Self-study	Introduction to Power BI Interface.
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Textbooks:

1. Brett Powell, 2018. *Mastering Microsoft Power BI: Expert techniques for effective data analytics and business intelligence*, 1st Edition, Packt Publishing.
2. Greg Deckler, 2022. *Learn Power BI - Second Edition: A comprehensive, step-by-step guide for beginners to learn real-world business intelligence*, 2nd Edition, Packt Publishing.

Reference Books

1. Greg Deckler, 2021. *Microsoft Power BI Cookbook: Convert raw data into business insights with updated techniques, use cases, and best practices*, 2nd Edition, Packt Publishing.
2. Teo Lachev, 2015. *Applied Microsoft Power BI: Bring your data to life!*, Prologika Press.
3. Suren Machiraju, 2018. *Power BI Data Analysis and Visualization*, 1st Edition, De-G-Press.
4. Alberto Ferrari and Marco Russo, 2017. *Analyzing Data with Power BI and Power Pivot for Excel*, 1st Edition, Microsoft Press.
5. Gil Raviv, 2018. *Collect, Combine, and Transform Data Using Power Query in Excel and Power BI*, 1st Edition, Microsoft Press.

Web Resources:

1. <https://learn.microsoft.com/en-us/power-bi/>
2. <https://www.sqlbi.com/>
3. <https://www.coursera.org/>
4. <https://www.edx.org/>
5. <https://enterprisedna.co/>

**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	2.5	2	1
CO2	3	2	1	2	2	1	2	3	2	2.5	2	1
CO3	3	2	1	2	2	1	2	3	2	2.5	2	1
CO4	3	2	1	2	2	1	2	3	2	2.5	2	1
CO5	3	2	1	2	2	1	2	3	2	2.5	2	1
TOTAL	15	10	5	10	10	5	10	15	10	12.5	10	5
AVERAGE	3	2	1	2	2	1	2	3	2	2.5	2	1

3 – Strong, 2- Medium, 1- Low

SEMESTER III
SPECIFIC VALUE-ADDED COURSE II: FUNDAMENTALS OF COMPUTER NETWORKS

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU243V02	1	1	-	-	1	2	30	25	75	100

Pre-requisite:

Basic understanding of computer systems and familiarity with binary numbers.

Learning Objectives:

1. To understand the fundamentals of networking concepts and protocols.
2. To learn about data transmission methods and network architectures.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	understand the key networking concepts, architectures, and protocols.	K1&K2
2.	describe data communication and transmission methods.	K2
3.	troubleshoot common networking issues effectively.	K3
4.	identify security risks and apply basic security measures.	K4
5.	analyze and design network solutions for real-world scenarios.	K4 & K6

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

Units	Contents	No. of Hours
I	Introduction to Computer Networks: Basics of Computer Networks: Definition and Importance- Applications of Computer Networks- Network Types and Topologies- Types of Networks (LAN, MAN, WAN)- Peer-to-Peer vs. Client-Server Networks- Network Topologies (Bus, Star, Ring, Mesh)- Networking Models: OSI Model –TCP/IP Model.	6
II	Data Communication and Transmission Media: Data Communication Concepts- Analog vs. Digital Communication- Bandwidth, Throughput, Latency- Transmission Modes: Simplex, Half-Duplex, and Full-Duplex. Transmission Media: Guided Media (Twisted Pair, Coaxial, Fiber Optic)- Unguided Media (Wireless, Infrared, Radio Waves). Error Detection and Correction.	6
III	Network Protocols and Architecture: IP Addressing: IPv4 and IPv6 Addressing- Subnetting and CIDR. Routing Concepts: Static and Dynamic Routing- Routing Protocols (RIP, OSPF, BGP). Transport Layer Protocols: TCP and UDP – Application Layer Protocols: HTTP, HTTPS, FTP, SMTP, DNS.	6
IV	Network Security and Wireless Networks: Introduction to Network Security: Importance of Network Security- Common Security Threats (Malware, Phishing, DoS Attacks). Security Mechanisms: Firewalls and Intrusion Detection Systems (IDS)- Virtual Private Networks (VPN)- Encryption Techniques (SSL/TLS)- Wireless Networks.	6

V	Network Management and Troubleshooting: Network Management Tools: SNMP (Simple Network Management Protocol)- Network Monitoring Tools - Troubleshooting Techniques- Introduction to Network Virtualization: Concept of Virtual Networks- Future Trends in Networking: Internet of Things (IoT)- 5G and Beyond.	6
	Total	30
Self-study	Applications of Computer Networks	

Textbooks:

1. James F. Kurose, Keith W. Ross , 2020. *Computer Networking: A Top-Down Approach*, 8th Edition, Pearson Publication.
2. Andrew S. Tanenbaum, David J. Wetherall, 2010. *Computer Networks*, 5th Edition, Pearson Publisher.

Reference Books

1. Behrouz A. Forouzan ,2012. *Data Communications and Networking*, 5th Edition, McGraw-Hill
2. William Stallings, 2020. *Network Security Essentials: Applications and Standards*, 6th Edition, Pearson Publisher.
3. Kevin R. Fall, W. Richard Stevens, 2011. *TCP/IP Illustrated*, Volume 1: The Protocols, 2nd Edition, Addison-Wesley Publisher.
4. Douglas E. Comer, 2013. *Internetworking with TCP/IP*, 6th Edition, Pearson Publisher.
5. Gary A. Donahue, 2011. *Network Warrior*, 2nd Edition, O'Reilly Media.

Web Resources:

1. <https://www.netacad.com/>
2. <https://www.w3schools.com/>
3. <https://www.geeksforgeeks.org/>
4. <https://networklessons.com/>
5. <https://www.rfc-editor.org/>

**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	2.5	2	1
CO2	3	2	1	2	2	1	2	3	2	2.5	2	1
CO3	3	2	1	2	2	1	2	3	2	2.5	2	1
CO4	3	2	1	2	2	1	2	3	2	2.5	2	1
CO5	3	2	1	2	2	1	2	3	2	2.5	2	1
TOTAL	15	10	5	10	10	5	10	15	10	12.5	10	5
AVERAGE	3	2	1	2	2	1	2	3	2	2.5	2	1

3 – Strong, 2- Medium, 1- Low

SEMESTER III**SPECIFIC VALUE-ADDED COURSE III: IBM CLOUD ESSENTIALS**

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU243V03	1	1	-	-	1	2	30	25	75	100

Pre-requisite:

Basic understanding of computer systems and networking concepts.

Learning Objectives:

1. To understand core concepts of cloud computing and IBM Cloud offerings.
2. To develop skills to deploy and manage applications on IBM Cloud.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	explain the core concepts of cloud computing and describe IBM Cloud's key features and services.	K2
2.	deploy virtual servers, storage solutions, and networking components on IBM Cloud.	K3
3.	assess different IBM Cloud deployment models and select appropriate services for various use cases.	K4
4.	examine security policies, implement access controls, and monitor cloud infrastructure for compliance.	K5
5.	design and deploy end-to-end cloud-based applications leveraging IBM Cloud services and best practices.	K6

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

Units	Contents	No. of Hours
I	Introduction to Cloud Computing and IBM Cloud: Overview of Cloud Computing - Definition and Characteristics- Cloud Deployment Models: Public, Private, Hybrid, and Multi-Cloud-Introduction to IBM Cloud - Key Features and Offerings- IBM Cloud Account Setup and Navigation.	6
II	IBM Cloud Infrastructure: Virtual Servers and Bare Metal Servers - Provisioning Virtual Machines- Managing Compute Resources- Networking and Connectivity - Virtual Private Cloud (VPC)- Load Balancers and VPN Access.	6
III	IBM Cloud Services and Management: Storage Services - Object Storage- Block and File Storage- Identity and Access Management (IAM) - User Roles and Permissions- Access Policies.	6
IV	Application Development and Deployment: IBM Cloud Foundry and Kubernetes -Deploying Applications- Managing Containers- Serverless Computing - IBM Cloud Functions- Event-driven Architecture.	6
V	Security, Compliance, and Monitoring: Security in IBM Cloud- Encryption and Key Management- Compliance Standards- Monitoring and Support - IBM Cloud Monitoring- Support Options and Best Practices.	6

	Total	30
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Self-study	Virtual Private Cloud (VPC)
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Textbooks:

1. Michael Friedel, 2020. *Cloud Computing with IBM*, 2nd Edition, Packt Publishing.
2. Chris Bailey, 2021. *Mastering IBM Cloud Kubernetes Service*, 1st Edition, O'Reilly Media.

Reference Books

1. Ritch Seagraves, 2021. *IBM Cloud Essentials*, 1st Edition, IBM Press.
2. Ahmed Azraq, 2019. *Practical IBM Cloud Solutions*, 1st Edition, Packt Publishing.
3. Sangram Rath, 2022. *IBM Cloud for Dummies*, 1st Edition, Wiley.
4. Andrew F. Fritz, 2020. *IBM Cloud Security Essentials*, 1st Edition, IBM Press.
5. Pedro A. Hernandez, 2021. *Hands-On IBM Cloud Infrastructure*, 1st Edition, Apress.
6. Judith Hurwitz, 2020. *Cloud Computing for Dummies*, 2nd Edition, Wiley.

Web Resources:

1. <https://cloud.ibm.com/docs>
2. <https://www.ibm.com/cloud/learn>
3. <https://www.ibm.com/cloud/architecture>
4. <https://developer.ibm.com/>
5. <https://github.com/IBM-Cloud>

**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	2.5	2	1
CO2	3	2	1	2	2	1	2	3	2	2.5	2	1
CO3	3	2	1	2	2	1	2	3	2	2.5	2	1
CO4	3	2	1	2	2	1	2	3	2	2.5	2	1
CO5	3	2	1	2	2	1	2	3	2	2.5	2	1
TOTAL	15	10	5	10	10	5	10	15	10	12.5	10	5
AVERAGE	3	2	1	2	2	1	2	3	2	2.5	2	1

3 – Strong, 2- Medium, 1- Low

SEMESTER III/V
SELF-LEARNING COURSE I: DATA SECURITY

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU243SL1/IU245SL1	-	-	-	-	1	-	-	25	75	100

Pre-requisite:

Basic knowledge of computers and networking.

Learning Objectives:

- 1.To understand fundamental concepts in data security.
- 2.To explore various threats and mitigation strategies.

Course Outcomes

On the successful completion of the course, students will be able to:		
1	understand the principles of data security and its importance.	K1
2	identify security threats and apply mitigation techniques.	K2
3	implement strong authentication and access control mechanisms.	K3
4	secure network communications and prevent cyber-attacks.	K4
5	develop secure storage and encryption techniques for data protection.	K6

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

Units	Contents
I	Introduction to Data Security: Importance of data security- common threats - CIA (Confidentiality, Integrity and availability) Triad- Real-world breaches- ethical hacking basics.
II	Authentication & Access Control: Password security- Multi-Factor Authentication- identity management-biometric authentication- authorization models – Role-based Access Control (RBAC)- Attribute-based Access Control (ABAC).
III	Network Security: Firewalls- VPNs, Secure Sockets Layer (SSL) security- Transport Layer (TLS) security- Wi-Fi security- intrusion detection & prevention- safe browsing practices.
IV	Data Encryption & Secure Storage: Symmetric Vs asymmetric encryption-AES – Advanced Encryption Standard- RSA – Rivest- Shamir- Adleman- hashing, Secure Hash Algorithm (SHA-256)- secure file storage- blockchain basics for security.
V	Cybersecurity Best Practices & Case Studies: Data backup strategies- phishing & social engineering- incident response- hands-on security lab activities.

Self-study	Basics of cryptography, role of Artificial Intelligence in cybersecurity, fundamentals of security policies.
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Textbooks:

- 1.William Stallings, 2022. Cryptography and Network Security: Principles and Practice, Pearson, 7th Edition.

2.Charles P. Pfleeger, Shari Lawrence Pfleeger, Jonathan Margulies, 2015. Security in Computing, Pearson, 5th Edition.

Reference Books

1.Ross J. Anderson, 2020. Security Engineering: A Guide to Building Dependable Distributed Systems, Wiley, 3rd Edition.

2.Dieter Gollmann,2011, Computer Security, Wiley, 3rd Edition.

3.Michael E. Whitman & Herbert J. Mattord, 2017. Principles of Information Security, Cengage Learning, 6th Edition.

4.Douglas R. Stinson & Maura Paterson, 2018. Cryptography: Theory and Practice, CRC Press, 4th Edition.

5.Richard E. Smith, 2015. Elementary Information Security, Jones & Bartlett Learning, 2nd Edition.

Web Resources:

1.<https://www.cybrary.it>

2.<https://www.nist.gov/cybersecurity>

3.<https://www.owasp.org>

4.<https://www.sans.org>

5.<https://www.enisa.europa.eu>

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	2	2	3	3	2	3	1
CO2	3	3	1	2	2	2	2	3	3	3	3	1
CO3	3	2	1	2	2	2	2	3	3	2	3	1
CO4	3	2	1	2	2	2	3	3	3	2	3	1
CO5	3	2	1	2	3	3	2	3	3	2	3	1
TOTAL	15	11	5	10	11	11	11	15	15	11	15	5
AVERAGE	3	2.2	1	2	2.2	2.2	2.2	3	3	2.2	3	1

3 – Strong, 2- Medium, 1- Low

SEMESTER IV**CORE COURSE IV: MACHINE LEARNING TECHNIQUES**

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU244CC1	4	1	-	-	5	5	75	25	75	100

Pre-requisite:

Basic knowledge of python programming, mathematical and statistical foundations.

Learning Objectives:

1. To facilitate the basics of machine learning concepts.
2. To learn to build a machine learning model from the scratch.

Course Outcomes

On the successful completion of the course, students will be able to:		
1	explain fundamental machine learning concepts.	K1& K2
2	implement machine learning algorithms such as linear regression, decision trees, and neural networks using Python and relevant libraries.	K3
3	analyze datasets to preprocess, visualize, and extract meaningful patterns for model training and evaluation.	K4
4	evaluate and compare the performance of different machine learning models using appropriate metrics such as accuracy, precision, and recall.	K5
5	design and optimize machine learning models for real-world applications such as classification, regression, clustering, and recommendation systems.	K6

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

Units	Contents	No. of Hours
I	Introduction to Machine Learning: Introduction- Human Vs Machine Learning- Well posed Learning Problem- Types of Machine Learning- Supervised- Unsupervised- Reinforcement- Comparison- Applications of Machine Learning- Languages/Tools in Machine Learning -Challenges in Machine Learning.	15
II	Feature Engineering: Introduction- Feature Transformation-Feature Subset Selection- Importance of Statistical Tools in Machine Learning- Concept of Probability- Random variables- Bernoulli- Binomial Distributions-Poisson- Gaussian Distributions- Multiple Random Variables- Sampling Distributions- Hypothesis testing.	15
III	Supervised learning: Introduction- Regression- Linear regression- Classification: Decision trees- k-Nearest Neighbours- Support Vector Machine- Logistic regression- Random Forest. Artificial Neural Network: Introduction- Perceptrons- Multi-layer networks- Back propagation.	15
IV	Unsupervised learning: Introduction- Supervised vs Unsupervised – Application of Unsupervised Learning- Clustering Analysis, K-means clustering, Hierarchical clustering- Association Rule- Dimension reduction: Principal Component Analysis, Linear Discriminant Analysis.	15

V	Preparing to Model: Introduction- Machine Learning Activities- Basic type of data in Machine Learning- Exploring Structure of Data- Data Quality and Remediation- Data Preprocessing. Modelling and Evaluation: Selecting a model- Training a model- Model Representation- Evaluating Performance of a model.	15
	Total	75

Self-study	Human Vs Machine Learning
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Textbooks:

1. Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, 2017. *Machine Learning*, Pearson Education.
2. Ethem Alpaydin, 2014. *Introduction to Machine Learning*, MIT Press, Prentice Hall of India, Third Edition.

Reference Books:

1. Shai Shalev-Shwartz, Shai Ben-David, 2014. *Understanding Machine Learning: From Theory to Algorithms*, Cambridge University Press.
2. T. Hastie, R. Tibshirani and J. Friedman, 2020. *Elements of Statistical Learning*, Springer.
3. Charu C. Aggarwal, 2014. *Data Clustering Algorithms and Applications*, CRC Press.
4. C. Bishop, 2006. *Pattern Recognition and Machine Learning*, Springer.
5. Sebastian Raschka and Vahid Mirjalili, 2019. *Python Machine Learning*, Packt Publishing, Third Edition.

Web Resources:

1. <https://cs229.stanford.edu/>
2. <https://hastie.su.domains/ElemStatLearn/>
3. <https://developers.google.com/machine-learning/crash-course>
4. <https://github.com/ageron/handson-ml2>
5. <https://www.kaggle.com/>

**MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	1	2	2	1	3	3	3	3	1	2
CO2	3	1	1	2	2	1	3	3	3	3	2	3
CO3	3	2	1	2	3	1	3	3	3	2	3	2
CO4	3	3	2	2	2	2	3	3	3	2	3	3
CO5	3	3	1	2	3	1	3	3	3	2	2	2
TOTAL	15	10	6	10	12	6	15	15	15	12	11	12
AVERAGE	3	2	1.2	2	2.4	1.2	3	3	3	2.4	2.5	2.4

3 – Strong, 2- Medium, 1- Low

SEMESTER IV
CORE LAB COURSE IV: MACHINE LEARNING LAB

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU244CP1	-	1	4	-	5	5	75	25	75	100

Pre-requisite:

Basic knowledge of Python programming language.

Learning Objectives:

1. To introduce the basic concepts and techniques of machine learning.
2. To apply machine learning to learn, predict and classify the real-world problems.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	understand the basic concepts and techniques of Machine Learning and the need of Machine Learning techniques in real-world problems.	K1& K2
2.	apply Machine Learning to learn, predict and classify the real-world problems in the Supervised Learning paradigms as well as discover the Unsupervised Learning paradigms of Machine Learning.	K3
3.	analyze the concept of Reinforcement Learning and Ensemble Methods	K4
4.	evaluate performance of the Machine Learning algorithms.	K5
5.	design Artificial Neural Networks of Supervised Learning for the selected problems.	K6

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

List of Exercises	
<p>Implement the following exercises:</p> <ol style="list-style-type: none"> 1. Implementation of Python Basic Libraries such as Statistics, Math, Numpy and Scipy. 2. Implementation of Python Libraries for ML application such as Pandas and Matplotlib. 3. a) Creation and Loading different types of datasets in Python using the required libraries. <ol style="list-style-type: none"> i. Creation using pandas ii. Loading CSV dataset files using Pandas iii. Loading datasets using sklearn b) Write a python program to compute Mean, Median, Mode, Variance, Standard Deviation using Datasets. 4. Implement Dimensionality reduction using Principal component Analysis method on IRIS dataset. 5. Write a program to demonstrate the working of the decision tree based ID3 algorithm by considering a dataset. 6. Consider a dataset, use Random Forest to predict the output class. Vary the number of trees as follows and compare the results: <ol style="list-style-type: none"> i. 20 ii. 50 iii. 100 iv. 200 v. 500 7. Write a Python program to implement Simple Linear Regression and plot the graph. 8. Write a Python program to implement Simple Linear Regression for iris using sklearn and plot the confusion matrix. 9. Build KNN Classification model for a given dataset. Vary the number of k values as follows and compare the results: <ol style="list-style-type: none"> i. 1 ii. 3 iii. 5 iv. 7 v. 11 	75

10. Implement Support Vector Machine for a dataset and compare the accuracy by applying the following kernel functions: i. Linear ii. Polynomial iii. RBF	
11. Write a python program to implement K-Means clustering Algorithm. Vary the number of k values as follows and compare the results: i. 1 ii. 3 iii. 5	

Textbooks:

1. Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, 2017. *Machine Learning*, Pearson Education.
2. Ethem Alpaydin, 2014. *Introduction to Machine Learning*, MIT Press, Prentice Hall of India, Third Edition.

Reference Books:

1. Shai Shalev-Shwartz, Shai Ben-David, 2014. *Understanding Machine Learning: From Theory to Algorithms*, Cambridge University Press.
2. T. Hastie, R. Tibshirani and J. Friedman, 2020. *Elements of Statistical Learning*, Springer.
3. Charu C. Aggarwal, 2014. *Data Clustering Algorithms and Applications*, CRC Press.
4. C. Bishop, 2006. *Pattern Recognition and Machine Learning*, Springer.
5. Sebastian Raschka and Vahid Mirjalili, 2019. *Python Machine Learning*, Packt Publishing, Third Edition.

Web Resources:

1. <https://www.microsoft.com/en-us/research/people/cmbishop/prml-book/>
2. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-036-introduction-to-machine-learning-fall-2020/>
3. <https://www.youtube.com/c/joshstarmmer/>
4. <https://github.com/ageron/handson-ml3>
5. <https://madewithml.com/>

**MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	1	2	2	1	3	3	3	3	3	2
CO2	3	1	1	2	2	1	3	3	3	3	3	3
CO3	3	2	1	2	3	1	3	3	3	3	3	2
CO4	3	3	2	2	2	2	3	3	3	3	3	3
CO5	3	3	1	2	3	1	3	3	3	3	3	2
TOTAL	15	10	6	10	12	6	15	15	15	15	15	12
AVERAGE	3	2	1.2	2	2.4	1.2	3	3	3	3	3	2.4

3 – Strong, 2- Medium, 1- Low

SEMESTER IV
ELECTIVE COURSE IV: HUMAN COMPUTER INTERACTION

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU244EC1	4	-	-	-	3	4	60	25	75	100

Pre-requisite:

Basic understanding of design principles.

Learning Objectives:

1. To learn the foundations of Human Computer Interaction.
2. To learn the guidelines for user interface.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	understand the basics of HCI.	K1& K2
2.	design effective HCI for individuals and persons with disabilities.	K3
3.	assess the importance of user feedback.	K4
4.	explain the HCI implications for designing multimedia / ecommerce / e-learning Web sites.	K3
5.	develop meaningful user interface.	K3

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

Self-study	I/O Devices
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Units	Contents	No. of Hours
I	FOUNDATIONS OF HCI: The Human: I/O channels – Memory – Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; Metaphor- Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity-Paradigms – Personna- Case Studies.	12
II	DESIGN & SOFTWARE PROCESS: Interactive Design: Basics – process –scenarios – navigation – compatibility design – Iteration and prototyping. HCI in software process: Software life cycle – usability engineering – Prototyping in practice (Wireframe, Low Fidelity) – design rationale- - Design rules: principles, standards, guidelines, rules.	12
III	MODELS AND THEORIES HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements – Communication and collaboration models- Testing and its types- When to test? - Testing methods- Think Aloud Test Protocol.	12
IV	INTERFACE DESIGN PRINCIPLES: Elements of GUI: General Principles- User Centered Design - Interface Design Principles- Shneidermans 8 Principles – Nielsen Norman Usability Heuristic Principles- Donald Norman Principles.	
V	WEB INTERFACE DESIGN: Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow – Emerging Technologies in HCI- Challenges in HCI- Case Studies.	12
Total		60

Textbooks:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, 2004. *Human Computer Interaction*, 3rd Edition, Pearson Education.
2. Brian Fling, 2009. *Mobile Design and Development*, First Edition, O'Reilly Media Inc.
3. Bill Scott and Theresa Neil, 2009. *Designing Web Interface*, First Edition, O'Reilly.

Reference Books:

1. Gerard Jounghyun Kim, 2015. *Human-Computer Interaction: Fundamentals and Practice*, CRC Press.
2. M.G. Helander, 2014. *Handbook of Human-Computer Interaction*, Elsevier Science.
3. Kim, Gerard Jounghyun, 2015. *Human-Computer Interaction: Fundamentals and Practice*, CRC Press.
4. Biele, Cezary, 2021. *Human Movements in Human-Computer Interaction (HCI)*, Springer International Publishing.
5. Sandeep Kumar, Rohit Raja et al., 2021. *Cognitive Behavior and Human Computer Interaction Based on Machine Learning Algorithms*, Wiley.

Web Resources:

1. <https://sigchi.org/>
2. <https://www.interaction-design.org/>
3. <https://hci.stanford.edu/>
4. <https://uxdesign.cc/>
5. <https://www.interaction-design.org/>

**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	3	1	3	3	3	3	3	2
CO2	3	3	1	2	3	1	3	3	3	3	3	3
CO3	3	3	1	2	3	1	3	3	3	3	3	2
CO4	3	3	1	2	3	1	3	3	3	3	3	3
CO5	3	3	1	2	3	1	3	3	3	3	3	2
TOTAL	15	15	5	10	15	5	15	15	15	15	15	12
AVERAGE	3	3	1	2	3	1	3	3	3	3	3	2.4

3 – Strong, 2- Medium, 1- Low

SEMESTER IV
SKILL ENHANCEMENT COURSE SEC IV: DIGITAL FLUENCY

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
UG24CSE2	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	6

	Functions. Creating Powerful and Persuasive Charts: Creating, Laying Out, and Formatting a Chart.	
IV	Microsoft PowerPoint 2010: Creating a Presentation - Changing the Slide Size and 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.	6
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
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Textbooks:

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
UG244EV1	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	6

	technology in environment and human health. Consumerism and waste products. Climate change - global warming, acid rain and ozone layer depletion. 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
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Textbooks:

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 IV/VI
SELF LEARNING COURSE II: DATA ANALYTICS USING PYTHON

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
IU244SL1/IU246SL1		-	-	-	1	-	-	25	75	100

Pre-requisites:

Basic knowledge of programming and databases.

Learning Objectives:

1. To understand the fundamentals of python programming and data analytics.
2. To explore various data processing, analysis, and visualization techniques.

Course Outcomes

On the successful completion of the course, students will be able to:		
1	understand fundamental python syntax and basic data types.	K1 & K2
2	understand the functionality and purpose of control structures.	K1 & K2
3	implement basic functions, the basic datatypes – lists, tuples and dictionaries.	K3
4	apply data visualization and make data-driven decisions in business and research contexts.	K3
5	understand and analyze the different types of data analytics, data wrangling and preprocessing.	K4

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

Units	Contents
I	Basics of Python Programming: History of Python – Features of Python – Literal – Constants – Variables – Identifiers – Keywords - Built-in Data Types – Output Statements – Input Statements - Comments – Indentation - Operators-Expressions - Type Conversions. Python Arrays: Defining and Processing Arrays – Array methods.
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.
III	Functions: Function Definition – Function Call – Variable Scope and its Lifetime - Return Statement. Lists: Creating a list - Access values in List - Updating values in Lists - Nested Lists - Basic List Operations. Tuples: Creating, Accessing, Updating and Deleting Elements in a tuple – Nested tuples – Difference between Lists and Tuples. Dictionaries: Creating, Accessing, Updating and Deleting Elements in a Dictionary - Difference between Lists and Dictionaries.
IV	Introduction to Data Analytics: Importance, types of data analytics (descriptive, predictive, prescriptive), applications, data lifecycle. Data Wrangling and Preprocessing: Handling missing data, outlier detection, data transformation, feature engineering, data cleaning with Python/R.
V	Exploratory Data Analysis (EDA): Summary statistics, data distributions, correlation, hypothesis testing, introduction to statistical methods. Data

	Visualization: Principles of effective visualization, tools (Matplotlib, Seaborn, Power BI, Tableau), dashboard design.
	Total

Self-study	Time series analysis, big data analytics, ethical considerations in data analytics.
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Textbooks:

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

Reference Books:

1. Vamsi Kurama, 2016. *Python Programming: A Modern Approach*, Pearson Education.
2. Adam Stewarts, 2017, *Python Programming*, Online.
3. Fabio Nelli, 2016. *Python Data Analytics*, APress.
4. Trevor Hastie, Robert Tibshirani, Jerome Friedman, 2009. *The Elements of Statistical Learning*, Springer, 2nd Edition.
5. Alberto Boschetti, Luca Massaron, 2018. *Python Data Science Essentials*, Packt Publishing, 2nd Edition.

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.kaggle.com>
5. <https://datacamp.com>
6. <https://towardsdatascience.com>

**MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	1	2	2	1	3	3	3	3	1	1
CO2	3	1	1	2	2	1	3	3	3	3	2	1
CO3	3	2	1	2	3	1	3	3	3	2	3	1
CO4	3	3	2	2	2	2	3	3	3	2	3	1
CO5	3	3	1	2	3	1	3	3	3	2	2	3
TOTAL	15	10	6	10	12	6	15	15	15	12	11	7
AVERAGE	3	2	1.2	2	2.4	1.2	3	3	3	2.4	2.5	1.4

3 – Strong, 2- Medium, 1- Low

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, student 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

Valvukku Valikattuvom, Christian Life Committee, Kottar Diocese
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, student 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

“Munaetrathin Mugavari”, G. Chandran, Vaigarai Publisher.