Holy Cross College (Autonomous), Nagercoil

Kanyakumari District, Tamil Nadu.
Accredited with A⁺ by NAAC - IV cycle – CGPA 3.35

Affiliated to

Manonmaniam Sundaranar University, Tirunelveli

Semester I & II

Guidelines & Syllabus

DEPARTMENT OF COMPUTER SCIENCE

2023-2026

(With effect from the academic year 2023-2024)

Issued from

THE DEANS' OFFICE

Vision

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

Mission

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

Programme Educational Objectives (PEOs)

PEOs	Upon completion of B.A/B.Sc. degree programme, the graduates will be able to	Mission addressed
PEO 1	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
PEO 2	inculcate practical knowledge for developing professional empowerment and entrepreneurship and societal services.	M2, M3, M4 & M5
PEO 3	pursue lifelong learning and continuous improvement of the knowledge and skills with the highest professional and ethical standards.	M3, M4, M5 & M6

Programme Outcomes (POs)

POs	Upon completion of B.Sc. Degree Programme, the graduates will be able to:	Mapping with PEOs
PO1	obtain comprehensive knowledge and skills to pursue higher studies in the relevant field of science.	PEO 1
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.	PEO 2
PO4	enhance leadership qualities, team spirit and communication skills to face challenging competitive examinations for a better developmental career.	PEO 1 & PEO 3
PO5	communicate effectively and collaborate successfully with	PEO 2 &

	peers to become competent professionals.	PEO 3
PO6	absorb ethical, moral and social values in personal and social life leading to highly cultured and civilized personality	**PEO 2 & PEO 3**
PO7	participate in learning activities throughout life , through self-paced and self-directed learning to develop knowledge and skills.	**PEO 1 & PEO 3**

Programme Specific Outcomes (PSOs)

PSOs	Upon completion of the B.Sc. Computer Science Programme, the graduates will be able to:	Mapping with POs
PSO – 1	obtain sufficient knowledge and skills enabling them to undertake further studies in Computer Science and its allied areas on multiple disciplines linked with Computer Science.	**PO1**
PSO – 2	evaluate and apply emerging technologies in computer science to develop innovative solutions for real-world problems	**PO2**
PSO – 3	develop a range of generic skills helpful in team building, problem solving, technical ability, employment, internships, communication and societal activities.	**PO4 & PO7**
PSO – 4	communicate effectively, work collaboratively, and demonstrate ethical and professional attitudes in diverse settings.	**PO5 & PO6**
PSO – 5	sensitize various economic issues related to Development, Growth, International Economics, Sustainable Development and Environment	**PO3**

Mapping of PO'S and PSO'S

POs	PSO1	PSO 2	PSO3	PSO4	PSO5
PO 1	M	S	S	S	S
PO 2	S	M	S	S	S
PO 3	M	S	S	S	M
PO4	S	S	M	S	S
PO5	S	M	S	M	S
PO6	M	S	S	M	S
PO7	S	S	M	S	S

Eligibility Norms for Admission

Those who seek admission to B.Sc. Computer Science must have passed the Higher Secondary Examination (10+2) (Academic / Vocational Stream) conducted by the Government of Tamil Nadu **with Computer Science or Mathematics as one of the subjects** or an examination accepted as equivalent thereto by the syndicate of Manonmaniam Sundaranar University, Tirunelveli, is eligible for admission and the medium of instruction is English.
Duration of the Programme: 3 years

Medium of Instruction: English

Passing Minimum

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

Components of the B.Sc. Computer Science Programme

Part III (Core and Elective Courses)

Core Courses	Core – Theory papers	8 x100	800
	Practical (Core applied)	6 x100	600
	Discipline Specific Elective - Theory papers	4 x 100	400
	Project	1 x 100	100
	Total marks		**1900**
Elective Courses	Theory	4x100	400
	Total marks		**400**
Part III - Total marks			**2300**

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

Course Structure

Distribution of Hours and Credits

Curricular Courses:

Course	S I	S II	S III	S IV	S V	S VI	Total	
							H	**C**
Part I Language	6 (3)	6 (3)	6 (3)	6 (3)			24	**12**
Part II English	6 (3)	6 (3)	6 (3)	6 (3)			24	**12**
Part III Core Course	5(5)	5(5)	5(5)	5(5)	5(4) + 5(4)	6(5)+ 6(4)	78	**69**
Core Lab Course	5(5)	5(5)	5(5)	5(5)	5(4)	6(4)		
Project					5(4)			
Elective /Discipline Specific Elective Courses	4 (3)	4 (3)	4 (3)	4 (3)	4 (3)+ 4 (3)	5 (3)+ 5(3)	34	**24**
Part IV								
Non-major Elective Course	2 (2)	2 (2)	-	-	-	-	4	4
Skill Enhancement Course	-	2 (2)	1 (1) 2 (2)	1 (1) 2 (2)	-		8	8
Foundation Course	2(2)	-	-	-	-	-	2	2
Value Education	-	-	-	-	2 (2)	-	2	2
Summer Internship /Industrial Training					(2)			2
Environmental Studies	-	-	1	1 (2)	-	-	2	2
Extension activity	-	-	-	-	-	(1)	-	1
Professional Competency Skill						2 (2)	2	2
Total	**30(23)**	**30(23)**	**30(22)**	**30 (24)**	**30 (26)**	**30 (22)**	**180**	**140**

Total number of Hours   =   **180**

Co-curricular Courses

Course	S I	S II	S III	S IV	S V	S VI	Total
LST (Life Skill Training)	-	(1)	-	(1)			2
Skill Development Training (Certificate Course)	(1)						1
Field Project		(1)					1
Specific Value-added Course	(1)		(1)				2
Generic Value-added Course				(1)		(1)	2
MOOC		(1)		(1)		(1)	3
Student Training Activity: Clubs & Committees / NSS				(1)			1
Community Engagement Activity: RUN				(1)			1
Human Rights Education					(1)		1
Gender Equity Studies						(1)	1
Total							**15**

Courses Offered
Semester I

Course	Course Code	Title of the Course	Credits	Hours/Week
Part I	TU231TL1 FU231FL1	Language: Tamil French	3	6
Part II	EU231EL1	English	3	6
Part III	SU231CC1	Core Course I: Python Programming	5	5
	SU231CP1	Core Lab Course I: Python Programming Lab	5	5
	SU231EC1	Elective Course I: Numerical Methods	3	4
Part IV	SU231NM1	Non Major Elective NME I: Office Automation	2	2
	SU231FC1	Foundation Course: Problem Solving Techniques	2	2
		Total	**23**	**30**

Semester II

Course	Course Code	Title of the Course	Credits	Hours/Week
Part I	TU232TL1 FU232FL1	Language: Tamil French	3	6
Part II	EU232EL1	English	3	6
Part III	SU232CC1	Core Course II: Data Structure and Algorithms	5	5
	SU232CP1	Core Lab Course II: Data Structure and Algorithms Lab	5	5
	SU232EC1	Elective Course II: Discrete Mathematics	3	4
Part IV	SU232NM1	Non Major Elective NME II: Introduction to HTML	2	2
	SU232SE1	Skill Enhancement Course SEC - I: Advanced Excel	2	2
		Total	**23**	**30**

Semester III

Course	Course Code	Title of the Course	Credits	Hours/Week
Part I	TU233TL1 FU233FL1	Language: Tamil French	3	6
Part II	EU233EL1	English	3	6
Part III	SU233CC1	Core Course III: Microprocessor and Microcontroller	5	5
	SU233CP1	Core Lab Course III: Microprocessor and Microcontroller Lab	5	5
	SU233EC1	Elective Course III: Robotics & its Applications	3	4
Part IV	SU233SE1	Skill Enhancement Course SEC - II: (Entrepreneurial Skills): Web Designing	1	1
	SU233SE2	Skill Enhancement Course SEC - III: Quantitative Aptitude	2	2
	UG234EV1	Environmental Studies	-	1
		Total	**22**	**30**

Semester IV

Course	Course Code	Title of the Course	Credits	Hours/Week
Part I	TU234TL1 FU234FL1	Language: Tamil French	3	6
Part II	EU234EL1	English	3	6
Part III	SU234CC1	Core Course IV: Java Programming	5	5
	SU234CP1	Core Lab Course IV: Java Programming Lab	5	5
	SU234EC1	Elective Course IV: Big Data Analytics	3	4
Part IV	SU234SE1	Skill Enhancement Course SEC – IV (Entrepreneurial Skills): UNIX Programming	1	1
	SU234SE2	Skill Enhancement Course SEC - V: Multimedia Systems	2	2
	UG234EV1	Environmental Studies	2	1
		Total	**24**	**30**

Semester V

Course	Course Code	Title of the Course	Credits	Hours/Week
Part III	SU235CC1	Core Course V: Software Engineering	4	5
	SU235CC2	Core Course VI: Database Management System	4	5
	SU235CP1	Core Lab Course V: Database Management System Lab	4	5
	SU235PW1	Core Project	4	5
	SU235DE1	Discipline Specific Elective Course I : (a) Cloud Computing	3	4
	SU235DE2	Discipline Specific Elective Course I : (b) Computational Intelligence		
	SU235DE3	Discipline Specific Elective Course I : (c) Quantum Computing		
	SU235DE4	Discipline Specific Elective Course II : (a) Virtual Reality	3	4

Course	Course Code	Title of the Course	Credits	Hours/Week
	SU235DE5	Discipline Specific Elective Course II: (b) Image Processing		
	SU235DE6	Discipline Specific Elective Course II : (c) Data Mining and Warehousing		
Part IV	SU235VE1	Value Education	2	2
	SU235SI1 / SU235IT1	Summer Internship/Industrial Training	2	-
		Total	**26**	**30**

Semester VI

Course	Course Code	Title of the Course	Credits	Hours/Week
Part III	SU236CC1	Core Course VII: Computer Networks	5	6
	SU236CC2	Core Course VIII: .NET Programming	4	6
	SU236CP1	Core Lab Course VI: .NET Programming Lab	4	6
	SU236DE1	Discipline Specific Elective Course III: a) IOT and its Applications	3	5
	SU236DE2	Discipline Specific Elective Course III: b) Natural Learning Processing		
	SU236DE3	Discipline Specific Elective Course III: c) Artificial Intelligence		
	SU236DE4	Discipline Specific Elective Course IV : a) Cryptography	3	5
	SU236DE5	Discipline Specific Elective Course IV: b) Network Security		
	SU236DE6	Discipline Specific Elective Course IV: c) Information Security		
	SU236EA1	Extension Activity	1	-
	SU236PS1	Professional Competency Skill Enhancement Course: PHP Programming	2	2
		Total	**22**	**30**
		TOTAL	**140**	**180**

Co-curricular Courses

Part	Semester	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 –UG231C--	Skill Development Training (SDT) - Certificate Course	1
	II	SU232FP1	Field Project	1
	I & III	SU231V01- SU231V--/ SU233V01 – SU233V--	Specific Value-added Course	1+1
	II, IV& VI	-	MOOC	1+1+1
	III & IV	UG234LC1	Life Skill Training II: Catechism	1
		UG234LM1	Life Skill Training II: Moral	
	IV & VI	UG234V01- UG234V--/ UG236V01- UG236V--	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 Education	1
	VI	UG236GS1	Gender Equity Studies	1
			Total	**15**

Specific Value added Course

S. No.	Course code	Title of the course	Credit	Total hours
I	SU231V01	Procedural Language	1	30

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.

a. 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 3 x 4(Internal choice)	12	Part B 5 x 6 (Internal choice)	30
Part C 3 x 8 (Internal choice)	24	Part C 5 x 12(Internal choice)	60
Total	**40**	**Total**	100

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	
Minor Practical / Spotters /Record	75
Total	**75**

Core Project

Ratio of Internal and External = 25:75

Components	Marks
Internal	25
External	
Report	40
Viva voce	35

Part - IV

i.   Non-major Elective, Foundation Course, Skill Enhancement Course, Value Education, Professional Competency Skill
Ratio of Internal and External = 2**5: 75**

Internal Components and Distribution of Marks

Components	Marks
Internal test (2)	10
Quiz (2)	5
Assignment: (Model Making, Exhibition, Role Play, Album, Group Activity (Mime, Skit, Song) (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 5 (Open choice any **Five** out **of Eight**)	25
Part C 1 x 9 (Open choice **One** out of **Three**)	9	Part C 5 x 8 (Open choice any **Five** out **of Eight**)	40
Total	**25**	**Total**	**75**

ii.   Environmental Studies

Internal Components

Component	Marks
Project Report	15
Viva voce	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 5 (Open choice any **Five** out **of Eight**)	25
Part C 1 x 9 (Open choice **One** out of **Three**)	9	Part C 5 x 8 (Open choice any **Five** out **of Eight**)	40
Total	**25**	**Total**	**75**

iii. Summer Internship/Industrial Training

Components	Marks
Industry Contribution	50
Report & Viva-voce	50

Co-Curricular Courses:

i. Life Skill Training: Catechism & Moral, Human Rights Education & Gender Equity Studies

Internal Components

Component	Marks
Project - Album on current issues	25
Group Song/ Mime/ Skit	25
Total	**50**

External Components

Component	Marks
Quiz	20
Written Test: Open choice – 5 out of 7 questions (5 x 6)	30
Total	**50**

ii. Skill Development Training (SDT) - Certificate Course:

Components	Marks
Attendance & Participation	50
Skill Test	50

iii. Field Project:

Components	Marks
Field Work	50
Report & Viva-voce	50

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

Components	Marks
Internal	25
External	75

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

Components	Marks
Attendance & Participation	50
Field Project	50

vi. Student Training Activity: Clubs and Committees

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

Component	Marks
Attendance	25
Participation	25
Total	**50**

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

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	2		1	1	1	1	-	2	-	-	-	10
	External	5	2	1	3	2	2	2	1	2	-	-	-	20
II UG	Internal	1	-	1	1	2		1	-	1	1	1	1	10
	External	5	1	1	4	1	1	-	3	1	1	-	2	20
III UG	Internal	1	1	-	-	1	-	1	-	1	2	1	2	10

(ii) Weightage of K – Levels in Question Paper
Number of questions for each cognitive level:

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

Evaluation

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

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

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

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

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

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

Conferment of Bachelor's Degree

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

Grading System

For the Semester Examination:

Calculation of Grade Point Average for End Semester Examination:

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

For the entire programme:

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

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

Where

C_i - Credits earned for course i in any semester

G_i - Grade point obtained for course i in any semester

n   - semester in which such courses were credited

Final Result

Conversion of Marks to Grade Points and Letter Grade

Range of Marks	Grade Points	Letter Grade	Description
90-100	9.0-10.0	O	Outstanding
80-89	8.0-8.9	D+	Excellent
75-79	7.5-7.9	D	Distinction
70-74	7.0-7.4	A+	Very Good
60-69	6.0-6.9	A	Good
50-59	5.0-5.9	B	Average
40-49	4.0-4.9	C	Satisfactory
00-39	0.0	U	Re-appear
ABSENT	0.0	AAA	ABSENT

Overall Performance

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

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

Core Course I: Python Programming

Course Code	L	T	P	S	Credits	Inst. Hours	Total	Marks		
								CIA	External	Total
SU231CC1	4	1	-	-	5	5	75	25	75	100

Prerequisite:
> Basic Knowledge of Programming concept.

Learning Objectives:
1. To understand the syntax and semantics of Python programming language.
2. To know the usage of packages and Dictionaries

Course Outcomes

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

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

Units	Contents	No. of Hours
I	**Basics of Python Programming:** History of Python – Features of Python – Literal – Constants – Variables – Identifiers – Keywords - Built-in Data Types – Output Statements – Input Statements - Comments – Indentation - Operators-Expressions - Type Conversions. **Python Arrays:** Defining and Processing Arrays – Array methods.	15
II	**Control Statements:** Selection/Conditional Branching Statements: if, if-else, nested if and if-elif-else Statements. Iterative Statements: while loop, for loop, else suite in loop and nested loops. **Jump Statements:** break, continue and pass Statements.	15
III	**Functions:** Function Definition – Function Call – Variable Scope and its Lifetime - Return Statement. **Function Arguments**: Required Arguments, Keyword Arguments, Default Arguments and Variable Length Arguments - Recursion. **Python Strings:** String Operations - Immutable Strings - Built-in String Methods and Functions - String Comparison. **Modules**: Import Statement - The Python Module – dir() Function – Modules and Namespace – Defining our own Modules.	15
IV	**Lists:** Creating a list - Access values in List - Updating values in Lists - Nested Lists - Basic List Operations - List Methods. **Tuples:** Creating, Accessing, Updating and Deleting Elements in a tuple – Nested tuples – Difference	15

	between Lists and Tuples. **Dictionaries:** Creating, Accessing, Updating and Deleting Elements in a Dictionary – Dictionary Functions and Methods - Difference between Lists and Dictionaries.	
V	**Python File Handling:** Types of files in Python - Opening and Closing Files - Reading and Writing Files: write() and writelines() Methods - append() Method – read() and readlines() Methods – with keyword – Splitting words – File methods - File Positions - Renaming and Deleting Files.	15

Self Study	Operators

Text Books
1. ReemaThareja, (2017). *Python Programming using problem solving approach*. (1st edition). Oxford University Press.
2. Dr. R. NageswaraRao, (2017). *Core Python Programming*. (1st edition). Dream tech Publishers.

Reference Books
1. VamsiKurama, *Python Programming: A Modern Approach*, Pearson Education.
2. Mark Lutz, *Learning Python*, Orielly.
3. Adam Stewarts, *Python Programming*, Online.
4. Fabio Nelli, *Python Data Analytics*, APress.
5. Kenneth A. Lambert, *Fundamentals of Python – First Programs*, CENGAGE Publication.

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

MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES

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

3 – Strong, 2- Medium, 1- Low

Core Lab Course I: Python Programming Lab

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

Prerequisite:
> Basic Knowledge of Programming skill.

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

Course Outcomes

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

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

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

Text Books
1. ReemaThareja, (2017). *Python Programming using problem solving approach*. (1st edition). Oxford University Press.
2. Dr. R. NageswaraRao, (2017). *Core Python Programming*. (1st edition). Dream tech Publishers.

Reference Books
1. VamsiKurama, *Python Programming: A Modern Approach*, Pearson Education.
2. Mark Lutz, *Learning Python*, Orielly.
3. Adam Stewarts, *Python Programming*, Online.

4. Fabio Nelli, *Python Data Analytics*, APress.
5. Kenneth A. Lambert, *Fundamentals of Python – First Programs*, CENGAGE Publication.

Web Resources

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

MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES

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

3 – Strong, 2- Medium, 1- Low

Elective Course I: Numerical Methods

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

Pre-requisite:
Students should know the basic knowledge of programming concept.

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

Course Outcomes

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

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

Units	Contents	No. of Hours
I	**Fundamentals of Algebraic Equation**: Solution of Algebraic and Transcendental Equations - Bisection Method – Fixed Point Iteration Method – Newton Raphson Method – Linear System of Equations – Gauss Elimination Method. **Chapter 1:** 1.0, 1.3,1.4, 1.6, 2.3	12
II	**Iterative, Interpolation and Approximation:** Iterative Methods - Gauss Jacobi and Gauss Seidel – Interpolation with Unequal Intervals – Lagrange's Interpolation – Newton's Divided Difference Interpolation. **Chapter 2:** 2.5 - 2.7, 4.3 - 4.5	12
III	**Interpolation with Equal Interval:** Difference Operators and Relations. - Interpolation with equal Intervals – Newton's Forward and Backward Difference Formulae. **Chapter 4:** 4.6 **Chapter 5:** 5.1 – 5.2	12
IV	**Numerical Differentiation And Integration:** Approximation of	12

	Derivatives using Interpolation Polynomials – Numerical Integration using Trapezoidal, Simpson's 1/3 Rule, Simpson's 1/3 Rule. **Chapter 5:** 5.3 **Chapter 6:** 6.3 - 6.4	
V	**Initial Value Problems for Ordinary Differential Equations:** Single Step Methods – Taylor's Series Method – Euler's Method – Modified Euler's Method - Runge Kutta Method for solving (first, second, Third) Order Equations. **Chapter 7:** 7.1 -7.4	**12**

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

Text Book

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

Reference Books

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

Web Resources

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

MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES

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

3 – Strong, 2- Medium, 1- Low

SEMESTER I
Non Major Elective NME I: Office Automation

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

Pre-requisite:
 Basic skills in Computer operations.
Learning Objectives:
 1. To impart training for students in Microsoft Office which has different components like MS Word, MS Excel, MS Access and Power point.
 2. To acquire knowledge on editor, spread sheet and presentation software.

Course Outcomes

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

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

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

Self study	Keyboard, Monitor

Text Book

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

Reference Book

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

Web Resources

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

MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES

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

3 – Strong, 2- Medium, 1- Low

Foundation Course (FC): Problem Solving Techniques

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

Pre-requisite:
Students should know the basic of Problem-solving skills.

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

Course Outcomes

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

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

Units	Contents	No. of Hours
I	**Introduction:** History, Characteristics and Limitations of Computer. Hardware/Anatomy of Computer: CPU, Memory, Secondary Storage Devices, Input Devices and Output Devices. Types of Computers: PC, Workstation, Minicomputer, Main Frame and Supercomputer. Software: System Software and Application Software. **Programming Languages:** Machine Language, Assembly Language, High-level Language, 4GL and 5GL - Features of Good Programming Language. Translators: Interpreters and Compilers.	6
II	**Data:** Data Types, Input, Processing of Data, Arithmetic Operators, Hierarchy of Operations and Output. Different Phases in Program Development Cycle (PDC). **Structured Programming: Algorithm:** Features of Good Algorithm, Benefits and Drawbacks of Algorithm. **Flowcharts:** Advantages and Limitations of Flowcharts, When to use Flowcharts, Flowchart Symbols and Types of Flowcharts. **Pseudocode:** Writing a Pseudocode. Coding, Documenting and Testing a Program: Comment Lines and Types of Errors. **Program design:** Modular Programming.	6
III	**Selection Structures:** Relational and Logical Operators - Selecting from Several Alternatives – Applications of Selection Structures. **Repetition Structures:** Counter Controlled Loops – Nested Loops – Applications of Repetition Structures.	6
IV	**Data:** Numeric Data and Character Based Data. **Arrays:** One Dimensional Array - Two Dimensional Arrays – Strings as Arrays	6

	of Characters.	
V	**Data Flow Diagrams:** Definition, DFD Symbols and Types of DFDs. **Program Modules:** Subprograms - Value and Reference Parameters - Scope of a Variable - Functions – Recursion. **Files:** File Basics - Creating and Reading a Sequential File - Modifying Sequential Files.	**6**

Self study	DFD symbols and types of DFDs

Text book

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

Reference Books

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

Web Resources

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

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

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

3 – Strong, 2- Medium, 1- Low

SEMESTER I
SPECIFIC VALUE ADDED COURSE I: PROCEDURAL LANGUAGE

Course Code	Credit	Total Hours	Total Marks
SU231V01	**1**	**30**	**100**

Prerequisite:

Basic knowledge of programming concept.

Learning Objectives:

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

Course Outcomes

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

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

Units	Contents	No. of Hours
I	**Introduction to Computing:** Introduction – Components of a Computer – Concept of Hardware and Software – Art of Programming through Algorithms and Flowcharts. **Overview of C:** History of C – Importance of C – Sample Programs 1, 2, 3, 4, 5 – Basic Structure – Programming Style – Executing a C Program**.**	**6**
II	**Control Statements:** Conditional execution – Iterations – Multiple Selection. Expressing Computations. **Basic Values and Data:** The abstract state machine – Basic types – Specifying values – Implicit conversions – Binary representations.	**6**
III	**Derived Data Types:** Arrays – Structures. **Functions:** Simple functions – main is special – Recursion. **C Libra r y Functions:**	**6**

	General properties of the C library and its functions – String processing and conversion – Runtime environment settings – Program termination and assertions.	
IV	**Pointers:** Pointer operations – Pointers and Structures – Pointers and arrays – Function pointers. **Function – Like Macros:** Working of function-like macros – Argument checking – Accessing the calling context – Default arguments.	**6**
V	**Files:** Introduction - Defining and opening a file – Closing a file – Input/Output operations on files – Error handling during I/O operations – Random access to files.	**6**

Text Book

1. Jens Gustedt (2019), *Modern C*. (2nd Edition). Publisher(s): Manning Publications. ISBN: 9781617295812.

2. Balagurusamy, E. (2019). Programming in ANSI C. (8th edition). New Delhi: Tata McGraw Hill Education Private Limited.

Reference Books

1. King, K.N. (2008). *C Programming: A Modern Approach.* (2nd edition). New York: W.W. Norton & Company.

2. Stephen Prata, (2004). *C Primer Plus.* (5th edition). New York: Addison-Wesley Publication.

3. Paul Deitel, & Harvey Deitel, (2009). *How to Program C.* (6th edition). New Delhi: PHI Learning Private Limited.

Core Course II: Data Structure and Algorithms

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU232CC1	4	1	-	-	5	5	75	25	75	100

Pre-requisite:

Students should know the basic knowledge in data and representations.

Learning Objectives:

1. To impart the basic concepts of data structure and algorithms.
2. To acquaint the student with the basics of the various data structures and make the students knowledgeable in the area of data structures.

Course Outcomes

On the successful completion of the course, student will be able to:		
1.	recall the basic data structures like arrays, linked lists, stacks, queues, trees and graphs.	K1
2.	understand and apply basic sorting and searching algorithms.	K2 & K3
3.	apply data structures and algorithms to solve real-world problems in different domains like databases, and networking.	K3

K1 - Remember; K2 - Understand; K3 - Apply

Units	Contents	No. of Hours
I	Abstract Data Types (ADTs) - List ADT - Array-based Implementation - Linked List Implementation Singly Linked Lists - Circular Linked Lists - Doubly-linked Lists – Applications of Lists - Polynomial Manipulation - All Operations – Insertion – Deletion – Merge – Traversal.	15
II	Stack ADT–Operations – Applications - Evaluating Arithmetic Expressions - Conversion of Infix to Postfix Expression - Queue ADT-Operations -Circular Queue - Priority Queue - deQueue Applications of Queues.	15
III	Tree ADT - Tree Traversals - Binary Tree ADT - Expression Trees - Applications of Trees - Binary Search Tree ADT - Threaded Binary Trees - AVL Trees - B-Tree - B+ Tree – Heap - Applications of Heap.	15

IV	Definition - Representation of Graph - Types of Graph - Breadth First Traversal – Depth First Traversal - Topological Sort - Bi-connectivity – Cut Vertex - Euler Circuits - Applications of Graphs.	15
V	Searching - Linear Search - Binary Search – Sorting - Bubble Sort - Selection Sort - Insertion Sort - Shell Sort - Radix Sort – Hashing - Hash Functions - Separate Chaining - Open Addressing - Rehashing Extendible Hashing.	15

Text books

1. Mark Allen Weiss, 2014. *Data Structures and Algorithm Analysis in C++,* (4th Edition). Pearson Education.

2. ReemaThareja, 2014. *Data Structures Using C*, (2nd Edition), Oxford Universities Press.

Reference Books

1. Sharma A. K, 2011. *Data Structures using C, (3rd Edition),* Pearson Education India.

2. Mark Allen Weiss, 2018. *Data Structures and Algorithms Analysis in Java, (3rd Edition)*, Pearson, Boston, USA.

3. Brassard G. and Bratley P, 2014. *Fundamentals of Algorithms,* (3rd Edition), PHI, New Delhi.

4. Thomas H. Cormen, Chales E. Leiserson, Ronald L. Rivest, Clifford Stein, 2009. *Introduction to Algorithms,* (3rd Edition). McGraw Hill.

5. Aho, Hopcroft and Ullman, 2003. *Data Structures and Algorithms*, (2nd Edition), Pearson Education.

Web Resources

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

MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES

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

3 – Strong, 2- Medium, 1- Low

Core Lab Course II: Data Structure and Algorithms Lab

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

Pre-requisite:

Students should know the basic skills in problem solving.

Learning Objectives:

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

Course Outcomes

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

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

Units	Contents	No. of Hours
	1. Write a program to implement the List ADT using arrays and linked lists.	
	2. Write a programs to implement the following using a singly linked list.	
	Stack ADT	
	Queue ADT	
	3. Write a program that reads an infix expression, converts the expression to postfix form and then evaluates the postfix expression (use stack ADT).	
	4. Write a program to implement priority queue ADT.	
	5. Write a program to perform the following operations:	75
	Insert an element into a binary search tree.	
	Delete an element from a binary search tree.	
	Search for a key element in a binary search tree.	

6. Write a program to perform the following operations

   Insertion into an AVL-tree

   Deletion from an AVL-tree

7. Write a programs for the implementation of BFS and DFS for a given graph.

8. Write a program for implementing the following searching methods:

   Linear search

   Binary search.

9. Write a program for implementing the following sorting methods:

   Bubble sort

   Selection sort

   Insertion sort

   Radix sort

Text books

1. Mark Allen Weiss, 2014. *Data Structures and Algorithm Analysis in C++,* (4th Edition), Pearson Education.

2. Reema Thareja, 2014. *Data Structures Using C*, (2nd Edition), Oxford Universities Press.

Reference Books

1. Sharma A. K, 2011. *Data Structures using C, (3rd Edition),* Pearson Education India.

2. Mark Allen Weiss, 2018. *Data Structures and Algorithms Analysis in Java, (3rd Edition)*, Pearson, Boston, USA.

3. Brassard G. and Bratley P, 2014. *Fundamentals of Algorithms,* (3rd Edition), PHI, New Delhi.

4. Thomas H. Cormen, Chales E. Leiserson, Ronald L. Rivest, Clifford Stein, 2009. *Introduction to Algorithms,* (3rd Edition). McGraw Hill.

5. Aho, Hopcroft and Ullman, 2003. *Data Structures and Algorithms*, (2nd Edition), Pearson Education.

Web Resources

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

MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES

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

3 – Strong, 2- Medium, 1- Low

SEMESTER II

Elective Course II: Discrete Mathematics

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

Pre-requisite:

Basic Concepts in Algebra and Set Theory

Learning Objectives:

1. To learn the concepts of Logic, Functions, Permutations, Combinations and Graph models

2. To motivate the students to solve practical problems using Discrete Mathematics.

Course Outcomes

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

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

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

Self study	Unit 1: Truth Table Unit 2: Functions

Text books

1. Kenneth H. Rosen, 2012. *Discrete Mathematics and Its Applications*, (7th Edition), McGraw Hill.

2. Geetha P, 2023. *Discrete Mathematics*, (2nd Edition), SciTech Publications (India) PVT . LTD.

Reference Books

1. C L Liu, 2018. *Elements of Discrete Mathematics,* (2nd Edition), McGraw Hill.

2. Norman L Biggs, 2011. *Discrete Mathematics,* (1st Edition), Pearson, USA.

2. Kenneth Bogart and Robert L Drysdale, 2014. *Discrete Mathematics for Computer Science,* (3rd Edition), Addison-Wesley.

3. Kenneth H. Rosen, 2011. *Discrete Mathematics and its Applications*, (7th Edition), McGraw-Hill.

4. Gupta P.P, Malik G.S, Sanjay Gupta, 1992. *Calculus of Finite Differences and Numerical Analysis*, (16th Edition), Bombay: Krishna Prakashan Mandir.

5. Kenneth H. Rosen, 2022. *Discrete Mathematics and its Applications*, (8th Edition), McGraw-Hill.

Web Resources

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

MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES

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

3 – Strong, 2- Medium, 1- Low

SEMESTER II

Non Major Elective NME II: Introduction to HTML

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

Prerequisite:

Basic knowledge in creating websites.

Learning Objectives:

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

Course Outcomes

On the successful completion of the course, student will be able to:

1.	recall and recognize HTML tags and their syntax.	**K1 & K2**
2.	understand the use of HTML elements like headings, paragraphs, lists and links.	**K2**
3.	apply the concepts in creating web pages and formatting it.	**K3**

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

Units	Contents	No. of Hours
I	**Introduction: Web Basics:** Define Internet – Web Browsers – Define Webpage – **HTML Basics:** Understanding Tags.	**6**
II	Tags for Document Structure (HTML, Head, BodyTag). **Block Level Text Elements:** Headings Paragraph (<p> tag) – Font Style Elements: (bold, italic, font, small, strong, strike, big tags).	**6**
III	**Lists: Types of Lists:** Ordered, Unordered – Nesting Lists – **Other Tags:** Marquee, HR, BR – Using Images – Creating Hyperlinks.	**6**
IV	**Tables:** Creating Basic Table, Table Elements, Caption – Table and	**6**

	Cell Alignment – Rowspan, Colspan – Cellpadding.	
V	**Frames:** Frameset – Targeted Links – Noframe – Forms: Input, Textarea, Select, Option.	**6**

Text Books

1. Smashing Magazine, 2014. *Mastering HTML5 and CSS3 Made Easy*, Teach U Comp

Self Study	**Unit I:** HTML Basics
	Unit IV: Tables

Inc.

2. Thomas Michaud, 2013. *Foundations of Web Design: Introduction to HTML & CSS*, Pearson Education.

Reference Books

1. Jon Duckett, 2010. *Beginning HTML, XHTML, CSS and Java Script*, (2nd Edition), Wiley Publishing.

2. Jennifer Niederst Robbins, 2013. *HTML5 Pocket Reference*, (5th Edition), O'Reilly Media.

3. Jennifer Niederst Robbins, 2018. *Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics, (5th E*dition), O'Reilly Media.

4. Mark Pilgrim, 2010. *HTML5: Up and Running, (1st E*dition), O'Reilly Media.

5. Elisabeth Robson, Eric Freeman, 2012. *Head First HTML and CSS, (2nd E*dition), O'Reilly Media.

Web Resources

1. https://www.placementpreparation.io/blog/best-books-to-learn-quantitative-aptitude/

2. https://www.exambazaar.com/blogpost/quantitative-aptitude-books

3. https://www.amazon.in/Quantitative-Aptitude-Competitive-Examinations-Aggarwal/dp/9352534026

4. https://www.w3schools

5. https://www.Learn-HTML.org

MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES

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

3 – Strong, 2- Medium, 1- Low

SEMESTER II
Skill Enhancement Course SEC - I: Advanced Excel

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

Pre-requisite:

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

Learning Objectives:

1. To learn the advanced features of Excel.

2. To summarise, analyse, explore, and present visualisations of data in the form of charts, graphs.

Course Outcomes

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

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

Units	Contents	No. of Hours
I	Basics of Excel - Customizing Common Options - Absolute and Relative Cells- Protecting and Un-protecting Worksheets and Cells - Working with Functions - Writing Conditional Expressions - Logical Functions - Lookup and Reference Functions - VlookUP with Exact Match, Approximate Match - Nested VlookUP with Exact Match - VlookUP with Tables, Dynamic Ranges - Nested VlookUP with Exact Match - Using VLookUP to Consolidate Data from Multiple Sheets.	6
II	Data Validations - Specifying a Valid Range of Values - Specifying a List of Valid Values- Specifying Custom Validations based on Formula - Working with Templates - Designing the Structure of a Template - Templates for Standardization of Worksheets - Sorting and Filtering Data -Sorting Tables - Multiple-level Sorting - Custom Sorting - Filtering Data for Selected View -	6

	Advanced Filter Options - Working with Reports Creating Subtotals - Multiple-level Subtotal.	
III	Creating Pivot Tables: Formatting and Customizing Pivot Tables - Advanced Options of Pivot Tables - Pivot Charts - Consolidating Data from Multiple Sheets and Files using Pivot Tables - External Data Sources - Data Consolidation Feature to Consolidate Data - Show Value as % of Row, % of Column, Running Total, Compare with Specific Field - Viewing Subtotal Under Pivot - Creating Slicers.	6
IV	More Functions: Date and Time Functions - Text Functions - Database Functions - Power Functions – Formatting using Auto Formatting Option for Worksheets - Using Conditional Formatting Option for Rows, Columns and Cells - WhatIf Analysis - Goal Seek - Data Tables - Scenario Manager.	6
V	Charts - Formatting Charts - 3D Graphs - Bar and Line Chart Together - Secondary Axis in Graphs - Sharing Charts with PowerPoint / MS Word, Dynamically - New Features of Excel Sparklines, Inline Charts, Data Charts - Overview of all the New Features.	6

Text book

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

Self study	Unit V: Formatting Charts

Reference Book

1. Bill Jelen and Michael Alexander, 2019. *Microsoft Excel 2019 Pivot Table Data Crunching,* (1st Edition), McGraw-Hill.

2. Michael Alexander and Richard Kusleika, 2018. *Excel 2019 Bible*, (1st Edition), Wiley.

3. Paul McFedries, 2019. *Excel 2019 Formulas and Functions*, (1st Edition), Microsoft Press.

4. Curtis Frye, 2019. *Microsoft Excel 2019 Step by Step*, (1st Edition). Microsoft Press.

5. Ken Bluttman, 2015. *Excel Formulas and Functions for Dummies*. (1st Edition), For Dummies.

Web Resources

1. https://www.shastacoe.org/uploaded/Dept/it/training_docs/Excel/Excel_Advanced_Training_Packet.pdf

2. https://sscstudy.com/advance-excel-notes-pdf-download/

3. https://www.tutorialspoint.com/advanced_excel/advanced_excel_tutorial.pdf

4. http://www.mcrhrdi.gov.in/group1-2019/Reading%20Material/IT/Adv.Excel%20-%20Handbook(7-6-17).pdf

5. https://www.guru99.com/introduction-to-microsoft-excel.html

MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES

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

3 – Strong, 2- Medium, 1- Low

Life Skill Training I: Catechism
Course Code: UG232LC1

Hours	Credit	Total Hours	Total Marks
1	1	30	100

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

Course Outcome	Upon completion of this course the students will be able to
CO-1	understand the aim and significance of value education
CO-2	develop individual skills and act confidently in the society
CO-3	learn how to live lovingly through family values
CO-4	enhance spiritual values through strong faith in God
CO-5	learn good behaviours through social values

Unit I
Value Education:
        Human Values – Types of Values – Growth – Components – Need and Importance
Bible Reference: Matthew: 5:3-16
Unit II
Individual Values: Esther
        Vanishing Humanity – Components of Humanity – Crisis – Balanced Emotion – Values of Life
Bible Reference: Esther 8:3-6
Unit 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
Unit 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
Unit 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
Text Book
Humane and Values. Holy Cross College (Autonomous), Nagercoil
The Holy Bible

Life Skill Training I: Moral
Course Code: UG232LM1

Hours	Credit	Total Hours	Total Marks
1	1	30	100

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

Course Outcome	Upon completion of this course the students will be able to
CO-1	understand the aim and significance of value education
CO-2	develop individual skills and act confidently in the society
CO-3	learn how to live lovingly through family values
CO-4	enhance spiritual values through strong faith in God
CO-5	learn good behaviours through social values

Unit I
Value Education:
        Introduction – Limitations – Human Values – Types of Values – Aim of Value Education – Growth – Components – Need and Importance
Unit II
Individual Values:
        Individual Assessment – Vanishing Humanity – Components of Humanity – Crisis – Balanced Emotion – Values of Life
Unit III
Family Values:
        Life Assessment – Respecting Parents – Loving Everyone – Confession – True Love
Unit IV
Spiritual Values:
        Faith in God – Wisdom – Spiritual Discipline – Fear in God – Spiritually Good Deeds

Unit V
Social Values:
        Good Behaviour – Devotion to Teachers – Save Nature – Positive Thoughts – Drug Free Path – The Role of Youth in Social Welfare
Unit VI
Cultural Values:
        Traditional Culture – Changing Culture – Food – Dress – Habit – Relationship – Media – The Role of Youth
Text Book
Humane and Values. Holy Cross College (Autonomous), Nagercoil

Employability

Entrepreneurship

Skill Development
** All the Courses focused on Skill Development

Holy Cross College (Autonomous), Nagercoil
Kanyakumari District, Tamil Nadu.
Accredited with A+ by NAAC - IV cycle – CGPA 3.35

Affiliated to

Manonmaniam Sundaranar University, Tirunelveli

Semester I & II

Guidelines & Syllabus

DEPARTMENT OF COMPUTER SCIENCE

2023-2026

(With effect from the academic year 2023-2024)

Issued from

THE DEANS' OFFICE

Vision

To provide a high-quality postgraduate education in computer science that prepares students for productive careers and lifelong learning.

Mission

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

Programme Educational Objectives (PEOs)

PEO	Upon completion of M.Sc Computer Science Degree Programme, the graduates will be able to:	Mapping with Mission
PEO-1	apply scientific and computational technology to solve socio ecological issues and pursue research.	M1, M2
PEO-2	continue to learn and advance their career in industry both in private and public sectors	M4 & M5
PEO-3	develop leadership, teamwork, and professional abilities to become a more cultured and civilized person and to tackle the challenges in serving the country.	M2, M5 & M6

Programme Outcomes (POs)

PO	Upon completion of M.Sc. Degree Programme, the graduates will be able to:	Mapping with PEOs
PO1	apply their knowledge, analyze complex problems, think independently, formulate and perform quality research.	PEO1 & PEO2
PO2	carry out internship programmes and research projects to develop scientific and innovative ideas through effective communication.	PEO1, PEO2 & PEO3
PO3	develop a multidisciplinary perspective and contribute to the knowledge capital of the globe.	PEO 2
PO4	develop innovative initiatives to sustain ecofriendly environment	PEO1, PEO 2
PO5	through active career, team work and using managerial skills guide people to the right destination in a smooth and efficient way.	PEO 2

| PO6 | employ appropriate analysis tools and ICT in a range of learning scenarios, demonstrating the capacity to find, assess, and apply relevant information sources. | **PEO1, PEO 2 & PEO3** |
| PO7 | learn independently for lifelong to execute professional, social and ethical responsibilities promoting sustainable development. | **PEO3** |

Programme Specific Outcomes (PSOs)

PSO	Upon completion of M.Sc. Degree Programme, the graduates will be able to:	Mapping with POs
PSO 1	apply profound knowledge to analyze and design software and systems containing hardware and software components of varying complexity.	PO1
PSO 2	apply mathematical model, algorithmic principles, and computer science theory in the design of real-time applications	PO2
PSO 3	apply knowledge of computing to produce effective designs and solutions for specific problems.	PO4 & PO7
PSO 4	identify, analyze, design, optimize and implement system solutions using appropriate algorithms of varying complexity.	PO5 & PO 6
PSO 5	work in multidisciplinary teams in small- and large-scale projects by utilizing modern software tools and emerging technologies to develop complex products for the societal needs.	PO3

Mapping of PO'S and PSO'S

POs	PSO1	PSO 2	PSO3	PSO4	PSO5
PO 1	S	S	M	S	S
PO 2	S	M	S	S	S
PO 3	S	M	M	S	M
PO4	S	S	M	S	S
PO5	S	S	S	M	S
PO6	M	S	S	M	S
PO7	S	S	M	S	S

1. Eligibility

(i) **For Admission:** A pass in B.Sc Computer Science as per the norms of Manonmaniam Sundaranar University, Tirunelveli

Passing Minimum

Minimum pass mark in each course is 50.

ii)Degree

The candidates shall have subsequently undergone the prescribed Programme of study in Holy Cross College (Autonomous) affiliated to the Manonmaniam Sundaranar University for a period of not less than two academic years comprising four semesters, passed the examinations prescribed and fulfilled such conditions as have been prescribed there of.

2. Duration: Duration of the programme: 2 Years

Components

Courses	No of Courses	Maximum marks	Total Marks
Core Courses	10	100	1000
Core Lab Courses	4	100	400
Project	1	100	100
Elective courses	5	100	500
Elective Lab Course	1	100	100
		Total	**2100**

Course Structure
(i) Curricular Courses:
Distribution of Hours and Credits

Course	SEMESTER				Total	
	I	II	III	IV	Hours	Credits
Core Course – Theory	6(5) + 6(4) +	6(5)+ 6(5)+	6(5) + 6(5) + 6(5) +	6(5) + 6 (5)	74	58
Core Course -Lab	5(3)	6(4)	6 (4) 3 (3)			
Elective Course	5 (3) + 5 (3)	4 (3) + 4 (3)	-	4 (3) -	22	15
Elective Lab Course	3(2)				3	2
Core Project		-		10 (7)	10	7
Skill Enhancement Course		4 (2)	3 (2)	4 (2)	11	6
Internship/ Industrial Activity			(2)		-	2
Extension Activity				(1)	-30	1
Total	**30 (20)**	**30 (22)**	**(26)**	**30 (23)**	**120**	**91**

(ii) Co-curricular Courses

Course	SEMESTER				Total
	I	II	III	IV	Credits
Life Skill Training –I	-	(1)	-	-	1
Life Skill Training –II	-	-	-	(1)	1
Field Project	(1)		-(1)		1
Specific Value-Added Courses	(1)	(1)		(1)	2
Generic Value-Added Courses		(1)		(1)	2
MOOC		(1)			2
Community Engagement Activity (UBA)					1

Total Number of Hours   =120
Total Number of Credits   =91 + (10)
Non-academic courses are mandatory and conducted outside the regular working hours.

4

Courses Offered
Semester I

Course Code	Title of the Course	Credits	Hours / Week
SP231CC1	Core Course I: Analysis & Design of Algorithms	5	6
SP231CC2	Core Course II: Object Oriented Analysis and Design & C++	4	6
SP231CP1	Core Lab Course: Algorithm and OOPS Lab	3	5
SP231EC1	Elective Course I: a) Python Programming		
SP231EC2	Elective Course I: b) Multimedia and its Applications	3	5
SP231EC3	Elective Course I: c) Embedded System		
SP231EC4	Elective Course II: a) Advanced Software Engineering		
SP231EC5	Elective Course II: b) Internet of Things	3	5
SP231EC6	Elective Course II: c) Critical Thinking, Design Thinking and Problem Solving		
SP231EP1	Elective Lab Course I: Python Programming Lab	2	3
	Total	**20**	**30**

Semester II

Course Code	Title of the Course	Credits	Hours / Week
SP232CC1	Core Course III: Data Mining and Warehousing	5	6
SP232CC2	Core Course IV: Advanced Java Programming	5	6
SP232CP1	Core Lab Course II: Advanced Java Programming Lab	4	6
SP232EC1	Elective Course III: a) Advanced Operating Systems		
SP232EC2	Elective Course III: b) Mobile Computing	3	4
SP232EC3	Elective Course III: c) Block Chain Technology		
SP232EC4	Elective Course IV: a) Artificial Intelligence & Machine Learning		
SP232EC5	Elective Course IV: b) Web Services	3	4
SP232EC6	Elective Course IV: c) Robotic Process Automation for Business		
SP232SE1	Skill Enhancement Course I : Practical: Data Mining Lab using R	2	4
	Total	**22**	**30**

Semester III

Course Code	Title of the Course	Credits	Hours / Week
SP233CC1	Core Course V: Digital Image Processing	5	6
SP233CC2	Core Course VI: Cloud Computing	5	6
SP233CC3	Core Course VII: Network Security and Cryptography	5	6
SP233CC4	Core Course VIII: Data Science & Analytics	4	6
SP233CP1	Core Lab Course III: Digital Image Processing Lab using MATLAB	3	3
SP233SE1	Skill Enhancement Course II: Practical: Cloud Computing Lab	2	3
SU233SI1 /SU233IT1	Internship/ Industrial Activity	2	-
	Total	**26**	**30**

Semester IV

Course Code	Title of the Course	Credits	Hours / Week
SP234CC1	Core Course IX: Big Data Analytics	5	6
SP234CC2	Core Course X: Web Application development & hosting Practical	5	6
SP234EC1	Elective Course V: a) Dot Net Programming	3	4
SP234EC2	Elective Course V: b) Advanced Machine Learning Technologies		
SP234EC3	Elective Course V: c) Soft Computing		
SP234PW1	Core Project	7	10
SP234SE1	Skill Enhancement Course III: Professional Competency Skill	2	4
SP234EA1	Extension Activity	1	-
	Total	**23**	**30**
	TOTAL	**91**	**120**

Co-curricular Courses

Semester	Code	Title of the Course	Credit
I & II	PG23LST1	Life Skill Training	1
II & IV	-	MOOC	1+1
II	PG232CE1	Community Engagement Course (CEC)	1
III & IV	PG23LST2	Life Skill Training	1
I	BP231FP1	Field Project	1
I & III	BP231V01 / BP233V01	Specific Value-added Course	1+1
II & IV	PG232V01- PG232V12/ PG234V01- PG234V12	Generic Value-added Course	1+1
		Total	**10**

Specific Value added Course

S. No.	Course code	Title of the course	Total hours
I	SP231V01	Website Creation	30

Examination Pattern

i) Core Course / Elective Course

Internal: 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
Seminar (10 marks)	5
Assignment: (Model Making, Exhibition, Role Play, Group Discussion, Problem Solving, Class Test, Open Book Test (Minimum three items per course) (30 marks)	5
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 3 x 4(Internal choice)	12	Part B 5 x 6 (Internal choice)	30
Part C 3 x 8 (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**

iii) Skill Enhancement Course

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

Internal Components and Distribution of Marks

Components	Marks
Internal test (2)	10
Quiz (2)	5
Assignment: (Model Making, Exhibition, Role Play, Album, Group Activity (Mime, Skit, Song) (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 5 (Open choice any **Five** out **of Eight**)	25
Part C 1 x 9 (Open choice O**ne** out of **Three**)	9	Part C 5 x 8 (Open choice any **Five** out **of Eight**)	40
Total	**25**	**Total**	**75**

iv) Internship/ Industrial Activity

Components	Marks
Industry Contribution	50
Report & Viva-voce	50

v) Core Project:

Ratio of Internal and External 25 : 75

Internal (Supervisor)	Marks
I Review	5
II Review	5
Report	15
External (External Examiner)	
Report	40
Viva-voce (individual, open viva-voce)	35
Total	**100**

Co-Curricular Courses:
　　(i) Life Skill Training
　　Internal Component

Components		Marks
Life Skill Training -I	Album (20 pages)	30
	Group Song, Mime, Skit (Group of 5students)	20
	Total	**50**
Life Skill Training -II	Case Study (30 pages)	50
	Total	**50**

External Component

Written Test	Five out of Seven (5 x 10)	50
	Total	**50**

(ii) Field Project:

Components	Marks
Field Work	50
Report & Viva-voce	50

(iii) Specific Value-Added Courses & Generic Value-Added Courses:

Components	Marks
Internal	25
External	75

(iv) Community Engagement Activity-UBA

Internal Component	
Component	**Marks**
Attendance (Field Work)	30
Participation	20
Total	**50**

External Component

Component	**Marks**
Group Project Report/ Case Study (10-15 pages in print)	50
Total	**50**

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

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

(ii) Weightage of K – levels in Question Paper
Number of questions for each cognitive level:

Assessment	Cognitive Level	KI			K2			K3			K4, K5, K6			Total
Internal Test	Part	A	B	C	A	B	C	A	B	C	A	B	C	
	No. Of Questions	1	1			1		1		1	2	1	2	10
External Examination	Part	A	B	C	A	B	C	A	B	C	A	B	C	
	No. Of Questions	3	-	1	3	1	1	1	2	1	3	2	2	20

Evaluation

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

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

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

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

iv. Viva- voce: Each candidate shall be required to appear for Viva-voce Examination in defense of the Project.

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

Conferment of the Master's Degree

A candidate shall be eligible for the conferment of the Degree of Master of Arts / Science / Commerce only if the minimum required credits for the programme thereof (91 +10 credits) is earned.

Grading System
For a semester examination:
Calculation of Grade Point Average for End Semester Examination:
GPA = $\dfrac{\text{Sum of the multiplication of grade points by the credits of the course}}{\text{Sum of the credits of the courses (passed) in a semester}}$

For the entire programme:

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

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

Where
C_i - Credits earned for course i in any semester
G_i - Grade point obtained for course i in any semester
n - semester in which such courses were credited

Final Result
Conversion of Marks to Grade Points and Letter Grade

Range of Marks	Grade Points	Letter Grade	Description
90-100	9.0-10.0	O	Outstanding
80-89	8.0-8.9	D+	Excellent
75-79	7.5-7.9	D	Distinction
70-74	7.0-7.4	A+	Very Good
60-69	6.0-6.9	A	Good
50-59	5.0-5.9	B	Average
00-49	0.0	U	Re-Appear
ABSENT	0.0	AAA	ABSENT

Overall Performance

CGPA	Grade	Classification of Final Results
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+	
6.0and above but below 6.5	A	
5.5and above but below 6.0	B+	Second Class
5.0 and above but below 5.5	B	
0.0 and above but below 5.0	U	Re-appear

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

SEMESTER I
CORE COURSE I: ANALYSIS & DESIGN OF ALGORITHMS

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks e		
								CIA	Ext rnal	Total
SP231CC1	6		-	-	5	6	90	25	75	100

Pre-requisite:

Understand the concepts of Basic Data Structures & Algorithms

Learning Objectives:

1. Enable the students to learn the Elementary Data Structures and algorithms.
2. Presents an introduction to the algorithms their analysis and design
3. Discuss various methods like Basic Traversal and Search Techniques, divide and conquer method, Dynamic programming, backtracking.
4. Understood the various design and analysis of the algorithms.

Course Outcomes

	On the successful completion of the course, student will be able to:	
1	get knowledge about algorithms and determines their time complexity.	**K1, K2**
2	gain good understanding of Greedy method and its algorithm.	**K2, K3**
3	able to describe about graphs using dynamic programming technique.	**K3, K4**
4	demonstrate the concept of backtracking &branch and bound technique.	**K5, K6**
5	explore the traversal and searching technique and apply it for trees and graphs.	**K6**

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

Units	Contents	No. of Hours
I	**Introduction**: - Algorithm Definition and Specification – Space complexity- Time Complexity- Asymptotic Notations - Elementary Data Structure: Stacks and Queues – Binary Tree - Binary Search Tree - Heap – Heapsort- Graph.	18
II	**Basic Traversal And Search Techniques**: Techniques for Binary Trees- Techniques for Graphs -Divide and Conquer: - General Method – Binary Search – Merge Sort – Quick Sort.	18
III	**The Greedy Method**: - General Method–Knapsack Problem Minimum Cost Spanning Tree– Single Source Shortest Path	18
IV	**Dynamic Programming**- General Method–Multistage Graphs–All Pair Shortest Path–Optimal Binary Search Trees – 0/1 Knapsacks – Traveling Salesman Problem – Flow Shop Scheduling.	18
V	**Back tracking**: -General Method–8-Queens Problem–Sum of Subsets–Graph Coloring – Hamiltonian Cycles – Branch and Bound: - The Method – Traveling Salesperson.	18

Self Study	Stacks and Queues, Quick Sort,Traveling Salesperson

Text book

1. Ellis Horowitz."*Computer Algorithms*", Galgotia Publications
2. Alfred V.Aho, John E.Hopcroft, Jeffrey D.Ullman, "*Data Structures and Algorithms*".

Reference Book

1. Goodrich, *Data Structures & Algorithms in Java*, (Third edition). Published by Wiley
2. Skiena, 2008.*The Algorithm Design Manual* (Second Edition), Springer.
3. Anany Levith, 2003. *Introduction to the Design and Analysis of algorithm*, Pearson Education Asia.
4. Robert Sedgewick, Phillipe Flajolet. 1996. *An Introduction to the Analysis of Algorithms*, Addison-Wesley Publishing Company

Web Resources

1. https://nptel.ac.in/courses/106/106/106106131/
2. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm
3. https://www.javatpoint.com/daa-tutorial

MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	2	3	1	3	3	3	3
CO4	3	3	2	3	3	3	3	3	3	2	3	2
CO5	3	2	2	2	2	2	2	2	2	1	2	1
Total	15	14	13	15	15	13	15	12	14	12	14	12
Average	3	2.8	2.6	3	3	2.6	3	2.4	2.8	2.4	2.8	2.4

S-Strong (3)   M-Medium (2) L-Low(1)

SEMESTER I
CORE COURSE II: OBJECT ORIENTED ANALYSIS AND DESIGN & C++

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	Ext nal	Total
SP231CC2	6		-	-	4	6	90	25	75	100

Pre-requisite:
Basics of C++ and Object-Oriented Concepts.

Learning Objectives:
1. Present the object model, classes and objects, object orientation, machine view and model management view.
2. Enable the students to learn the basic function, principles and concepts of object-oriented analysis and design.
3. Enable the students to understand C++ language with respect to OOAD

Course Outcomes

On the successful completion of the course, student will be able to:	
1	understand the concept of object-oriented development and modelling techniques	**K1, K2**
2	gain knowledge about the various steps performed during object design	**K2, K3**
3	abstract object-based views for generic software systems	**K3**
4	link OOAD with C++ language	**K4, K5**
5	apply the basic concept of OOPs and familiarize to write C++ program	**K5, K6**

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

Units	Contents	No. of Hours
I	The Object Model: The Evolution of the Object Model – Elements of the Object Model – Applying the Object Model. Classes and Objects: The Nature of an Object – Relationship among Objects**.**	18
II	**Classes and Object**: Nature of Class – Relationship Among classes – The Interplay of classes and Objects. Classification: The importance of Proper Classification –identifying classes and objects –Key Abstractions and Mechanism.	18
III	**Introduction to C+:** Input and output statements in C++-Declarations-control structures– Functions in C++.	18
IV	**Inheritance and overloading:** Classes an Objects–Constructors and Destructors–operators overloading–Type Conversion- Inheritance – Pointers and Arrays.	18
V	**Memory Management Operators** -Polymorphism–Virtual functions–Files– Exception Handling – String Handling -Templates.	18

Self Study	Relationship among Objects, Key Abstractions and Mechanism, Exception Handling

Text books
1. Grady Booch. *Object Oriented Analysis and Design with Applications*. (Second Edition) Pearson Education.
2. Ashok N. Kamthane. 2003. *Object Oriented Programming with ANSI & Turbo C++*.First Indian Print, Pearson Education.

Reference Books
Balagurusamy. 2003.*Object Oriented Programming with C++*. (Second Edition). TMH.

Web Resources

1. https://onlinecourses.nptel.ac.in/noc19_cs48/preview
2. https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs19/
3. https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_object_oriented_analysis.htm

MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	2	3	3	3
CO2	2	3	2	3	3	3	2	3	2	3	1	3
CO3	3	3	2	3	3	3	3	2	2	3	2	3
CO4	3	3	3	1	2	2	3	3	1	2	1	3
CO5	3	3	3	3	3	3	13	2	3	2	3	2
Total	14	15	13	13	14	14	2.6	13	10	13	10	14
Average	2.8	3	2.6	2.6	2.8	2.8	3	2.6	2	2.6	2	2.8

S-Strong (3)   M-Medium (2)   L-Low(1)

CORE LAB COURSE– I: ALGORITHM AND OOPS LAB

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SP231CP1	-		5	-	3	5	75	25	75	100

Prerequisite:
Basic Programming of C++language

Learning Objectives:

1. This course covers the basic data structures like Stack, Queue, Tree, List.
2. This course enables the students to learn the applications of the data structures using various techniques
3. It also enables the students to understand C++language with respect to OOAD concepts

Course Outcomes

On the successful completion of the course, student will be able to:	
1	understand the concepts of object oriented with respect to C++	**K1, K2**
2	able to understand and implement OOPS concepts	**K3, K4**
3	implementation of data structures like Stack, Queue, Tree, List using C++	**K4, K5**
4	application of the data structures for Sorting, Searching using different techniques.	**K5, K6**
5	create an application using inheritance	**K5, K6**

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

Contents
1. Write a program to solve the tower of Hanoi using recursion.
2. Write a program to traverse through binary search tree using traversals.
3. Write a program to perform various operations on stack using linked list.
4. Write a program to perform various operation in circular queue.
5. Write a program to sort an array of an elements using quick sort.
6. Write a program to solve number of elements in ascending order using heap sort.
7. Write a program to solve the knapsack problem using greedy method
8. Write a program to search for an element in a tree using divide& conquer strategy.
9. Write a program to place the 8 queens on an 8X8 matrix so that no two queens Attack.
10. Write a C++ program to perform Virtual Function
11. Write a C++ program to perform Parameterized constructor
12. Write a C++ program to perform Friend Function
13. Write a C++ program to perform Function Overloading

14. Write a C++program to perform Single Inheritance

15. Write a C++program to perform Employee Details using files.

Text Books
1. Goodrich. *Data Structures &Algorithms in Java.* Wiley3rd edition.
2. Skiena.2008. *The Algorithm Design Manual* (Second Edition), Springer.

Reference Books
1. Anany Levith. 2003. *Introduction to the Design and Analysis of algorithm*, Pearson Education Asia.
2. Robert Sedgewick, Phillipe Flajolet,. 1996. *An Introduction to the Analysis of Algorithms*, Addison-Wesley Publishing Company.

Web Resources
1. https://onlinecourses.nptel.ac.in/noc19_cs48/preview
2. https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs19/
3. https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_object_oriented_analysis.htm

MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO 6	PO 7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	2	3	3	2	2	2	3	2
CO2	3	3	2	2	3	3	3	3	2	3	2	3
CO3	2	2	3	3	3	3	3	2	3	3	3	3
CO4	3	3	3	3	3	2	2	2	3	3	3	1
CO5	3	3	2	3	2	2	2	3	1	2	3	2
Total	14	14	11	14	11	13	13	11	9	13	14	9
Average	2.8	2.8	2.3	2.8	2.2	2.6	2.6	2.3	2.1	2.6	2.8	7.5

S-Strong (3)   M-Medium (2)   L-Low(1)

SEMESTER I
ELECTIVE COURSE I: a) PYTHON PROGRAMMING

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	Ext rnal	Total
SP231EC1	5	-	-	-	3	5	75	25	75	100

Pre-requisite:

Basics of any OO Programming Language

Learning Objectives:

1. Presents an introduction to Python, creation of web applications, network applications and working in the clouds
2. Use functions for structuring Python programs
3. Understand different Data Structures of Python
4. Represent compound data using Python lists, tuples and dictionaries

Course Outcomes

On the successful completion of the course, student will be able to:	
1	understand the basic concepts of Python Programming	**K1, K2**
2	understand File operations, Classes and Objects	**K2, K3**
3	acquire Object Oriented Skills in Python	**K3, K4**
4	develop web applications using Python	**K5**
5	develop Client Server Networking applications	**K5, K6**

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

Units	Contents	No. of Hours
I	**Python:** Introduction – Numbers – Strings – Variables – Lists – Tuples – Dictionaries–Sets– Comparison.	15
II	**Code Structures:** if, else if, and else – Repeat with while – Iterate with for – Comprehensions – Functions – Generators – Decorators – Namespaces and Scope – Handle Errors with try and except – User Exceptions.	15
III	**Modules, Packages, and Programs:** Standalone Programs – Command-Line Arguments – Modules and the import Statement – The Python Standard Library. **Objects and Classes:** Define a Class with class – Inheritance – Override a Method – Add a Method – Get Help from Parent with super–Inself Defense –Get and Set Attribute Values with Properties –Name Mangling for Privacy – Method Types – Duck Typing – Special Methods –Composition.	15
IV	**Data Types:** Text Strings Binary Data. **Storing and Retrieving Data:** File Input/Output– Structured Text Files – Structured Binary Files - Relational Databases – No SQL Data Stores. **Web:** Web Clients –Web Servers–Web Services and Automation	15
V	**Systems:** Files–Directories–Programs and Processes– Calendars and Clocks. **Concurrency:** Queues– Processes–Threads–Green Threads and event–twisted– Redis. **Networks:** Patterns – The Publish-Subscribe Model – TCP/IP – Sockets – ZeroMQ –Internet Services – Web Services and APIs – Remote Processing – Big Fat Data and Map Reduce – Working in the Clouds.	15

Text books

1. Bill Lubanovic. 2014. *Introducing Python* (First Edition). O'Reilly, Second Release,2014.
2. MarkLutz, 2013. *Learning Python* (Fifth Edition). O'Reilly.

Reference Books

1. David M. Beazley. 2009 .*Python Essential Reference (*FourthEdition). Developer's Library
2. Sheetal Taneja,Naveen Kumar, *Python Programming –A Modular Approach*. Pearson Publications.

Web Resources

1. https://www.programiz.com/python-programming/
2. https://www.tutorialspoint.com/python/index.htm
3. https://onlinecourses.swayam2.ac.in/aic20_sp33/preview

MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO 6	PO 7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	1	3	3	3	3
CO4	3	3	2	3	3	2	3	3	3	2	3	2
CO5	3	2	2	2	2	2	2	2	2	1	2	1
Total	15	14	13	15	15	13	15	12	14	12	14	12
Average	3	2.8	2.6	3	3	2.6	3	2.4	2.8	2.4	2.8	2.4

S-Strong (3)   M-Medium (2) L-Low(1)

SEMESTER I
ELECTIVE COURSE I: b) MULTIMEDIA AND ITS APPLICATIONS

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	Ext rnal	Total
SP231EC2	5	-	-	-	3	5	75	25	75	100

Pre-requisite:
   Basics of Multimedia
Learning Objectives:
1. To introduce the students the concepts of Multimedia, Images &Animation.
2. To introduce Multimedia authoring tools
3. To understand the role of Multimedia ibn Internet
4. To know about High Definition Television and Desktop Computing–Knowledge based Multimedia systems

Course Outcomes

On the successful completion of the course, student will be able to:		
1	understand the basic concepts of Multimedia	**K1, K2**
2	demonstrate multimedia authoring tools	**K2, K3**
3	analyze the concepts of Sound, Images, Video &Animation	**K3, K4**
4	apply and analyze the role of Multimedia in Internet and real time applications	**K5**
5	analyze multimedia applications using HDTV	**K5, K6**

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

Units	Contents	No. of Hours
I	What is Multimedia? –Introduction to making Multimedia–Macintosh and Windows Production platforms – Basic Software tools.	15
II	Making Instant Multimedia –Multimedia authoring tools–Multimedia building blocks –Text– Sound.	15
III	Images–how to create image, Text coloring Animation: Animating the images-motion- Video: Create videos of images.	15
IV	Multimedia and the Internet –The Internet and how it works–Tools for World Wide Web– Designing for the World Wide Web.	15
V	High Definition Television and Desktop Computing –Knowledge based Multimedia systems.	15

Text books
1. Tay Vaughan, "*Multimedia making it work*", Fifth Edition, Tata McGraw Hill.
2. John F. Koegel Bufford, "*Multimedia Systems*", Pearson Education.

Reference Books
1. Judith Jeffloate, 2003, "Multimedia in Practice (Technology and Applications)", PHI.

Web Resources
1. https://www.tutorialspoint.com/multimedia/index.htm
2. https://www.tutorialspoint.com/basics_of_computer_science/basics_of_computer_science_multimedia.htm
3. https://nptel.ac.in/courses/117/105/117105083/

MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO 6	PO 7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	1	3	3	3	3
CO4	3	3	2	3	3	2	3	3	3	2	3	2
CO5	3	2	2	2	2	2	2	2	2	1	2	1
Total	15	14	13	15	15	13	15	12	14	12	14	12
Average	3	2.8	2.6	3	3	2.6	3	2.4	2.8	2.4	2.8	2.4

S-Strong (3)   M-Medium (2) L-Low(1)

ELECTIVE COURSE I: c) EMBEDDED SYSTEM

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	Exte nal	Total
SP231EC3	5	-	-	-	3	5	75	25	75	100

Pre-requisite:
Basics of Micro Controller
Learning Objectives:
1. Present the introduction to 8051 Microcontroller Instruction Set, concepts on RTOS &Software tools.
2. Gain knowledge about the embedded software development.
3. Learn about Microcontroller and software tools in the embedded systems.

Course Outcomes

On the successful completion of the course, student will be able to:	
1	understand the concept of 8051 microcontroller	**K1, K2**
2	understand the Instruction Set and Programming	**K2, K3**
3	analyze the concepts of RTOS	**K3, K4**
4	analyze and design various real time embedded systems using RTOS	**K5**
5	debug the malfunctioning system using various debugging techniques	**K5, K6**

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

Units	Contents	No. of Hours
I	8051 Microcontroller: Introduction- 8051 Architecture-Input/Output Pins, Ports and Circuits- External Memory - Counters / Timers - Serial Data Input / Output –Interrupts	15
II	Instruction Set and Programming Moving Data-Addressing Modes-Logical operations- Arithmetic Operation-Jump and Call Instructions-Simple Program. Applications: Keyboard Interface- Display Interface-Pulse Measurements-DIA and AID Conversions-Multiple Interrupts.	15
III	CONCEPTS ON RTOS: Introduction to RTOS-Selecting an RTOS-Task and Task states - Tasks and data- Semaphores and shared data. MORE operating systems services: Interrupt Process communication - Message Queues, Mailboxes and pipes- Timer Functions-Events - Memory Management-Interrupt Routines in an RTOS Environment.	15
IV	Basic Design using a RTOS: Principles - Encapsulating semaphores and Queues-Hard real time scheduling considerations-Saving memory space and power- introductions to RTL &QNX.	15
V	SOFTWARE TOOLS: software Development Tools: Hosts and Target Machines- Linker/Locators for Embedded software-getting Embedded software into the Target systems. Debugging Techniques: Testing on your Host machine -Instruction set simulators- The assert macro- using laboratory tools.	15

Text books
1. David E.Simon, 2003.“*An Embedded Software primer* ”Pearson Education Asia.
2. Kenneth J Ayala, “*The 8051 Microcontroller and Architecture programming and application*”, Second Edition, Penram International.

Reference Books

1.RajKamal, 2003, "*Embedded Systems – Architecture, programming and design*", Tata McGraw– Hill

Web Resources

1. https://www.javatpoint.com/embedded-system-tutorial
2. https://onlinecourses.nptel.ac.in/noc20_cs14/preview
3. https://www.tutorialspoint.com/embedded_systems/index.htm

MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES

Cos	PO1	PO2	PO3	PO4	PO5	PO 6	PO 7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	1	3	3	3	3
CO4	3	3	2	3	3	2	3	3	3	2	3	2
CO5	3	2	2	2	2	2	2	2	2	1	2	1
Total	15	14	13	15	15	13	15	12	14	12	14	12
Average	3	2.8	2.6	3	3	2.6	3	2.4	2.8	2.4	2.8	2.4

S-Strong (3)   M-Medium (2) L-Low(1)

SEMESTER I
ELECTIVE COURSE II: a) ADVANCED SOFTWARE ENGINEERING

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	Ext rnal	Total
SP231EC4	5	-	-	-	3	5	75	25	75	100

Pre-requisite:
Basics of Software Engineering &SPM

Learning Objectives:
1. To introduce Software Engineering, Design, Testing and Maintenance.
2. Enable the students to learn the concepts of Software Engineering.

Course Outcomes

	On the successful completion of the course, student will be able to:	
1	understand about Software Engineering process	**K1, K2**
2	understand about Software project management skills, design and quality management	**K2, K3**
3	analyze on Software Requirements and Specification	**K3, K4**
4	analyze on Software Testing, Maintenance and Software Re-Engineering	**K4, K5**
5	design and conduct various types and levels of software quality for a software project	**K5, K6**

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

Units	Contents	No. of Hours
I	**Introduction**: The Problem Domain – Software Engineering Challenges - Software Engineering Approach – Software Processes: Software Process – Characteristics of a Software Process – Software Development Process Models – Other software processes.	15
II	**Software Requirements Analysis and Specification**: Requirement engineering – Type of Requirements – Feasibility Studies – Requirements Elicitation – Requirement Analysis – Requirement Documentation – Requirement Validation – Requirement Management – SRS - Formal System Specification – Axiomatic Specification – Algebraic Specification - Case study: Student Result management system. Software Quality Management –Software Quality, Software Quality Management System, ISO 9000, SEI CMM.	15
III	**Software Project Management:** Responsibilities of a software project manager – Project planning – Metrics for Project size estimation – Project Estimation Techniques – Empirical Estimation Techniques – COCOMO – Halstead‥s software science – Staffing level estimation – Scheduling– Organization and Team Structures – Staffing – Risk management – Software Configuration Management – Miscellaneous Plan.	15
IV	**Software Design:** Outcome of a Design process – Characteristics of a good software design – Cohesion and coupling - Strategy of Design – Function Oriented Design – Object Oriented Design - Detailed Design - IEEE Recommended Practice for Software Design Descriptions.	15

	Software Testing: A Strategic approach to software testing – Terminologies – Functional testing– Structural testing – Levels of testing – Validation testing - Regression testing – Art of Debugging–Testingtools-Metrics-ReliabilityEstimation.SoftwareMaintenance -Maintenance Process - Reverse Engineering – Software Re-engineering - Configuration Management Activities	
V		**15**

Text books
1. Pankaj Jalote, Narosa, *An Integrated Approach to Software Engineering*(Third Edition)Publishing House, Delhi.
2. Fundamentals of Software Engineering (Third Edition)–Rajib Mall, PHI Publication,

Reference Books
1. K.K.Agarwal and Yogesh Singh. *Software Engineering* (Third Edition)–,New Age International Publishers.
2. R.S.Pressman.*A Practitioners Approach-Software Engineering,* McGraw Hill.
3. Carlo Ghezzi, M.Jarayeri, D. Manodrioli, *Fundamentals of Software Engineering*, PHI Publication.

Web Resources
1. https://www.javatpoint.com/software-engineering-tutorial
2. https://onlinecourses.swayam2.ac.in/cec20_cs07/preview
3. https://onlinecourses.nptel.ac.in/noc19_cs69/preview

MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO 6	PO 7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3	3	3	3	3	3	3	3
CO2	3	3	2	3	3	3	3	3	2	3	2	3
CO3	2	3	3	3	3	3	3	2	2	3	2	3
CO4	3	3	3	2	2	2	3	3	2	2	2	3
CO5	3	3	3	3	3	2	2	3	3	2	3	2
Total	14	15	13	13	14	13	15	14	10	13	10	14
Average	2.8	3	2.6	2.6	2.8	2.6	3	2.8	2	2.6	2	2.8

S-Strong (3) **M-Medium (2)** **L-Low(1)**

SEMESTER I
ELECTIVE COURSE II: b) INTERNET OF THINGS

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		r	
								CIA	Exte nal	Total	
SP231EC5	5	-	-	-	3	5	75	25	75	100	

Pre-requisite:
Basics of Sensors & its Applications

Learning Objectives:
1. About Internet of Things where various communicating entities are controlled and managed for decision making in the application domain.
2. Enable students to learn the Architecture of IoT and IoT Technologies
3. Developing IoT applications and Security in IoT, Basic Electronics for IoT, Arduino IDE, Sensors and Actuators Programming NODEMCU using Arduino IDE.

Course Outcomes

On the successful completion of the course, student will be able to:		
1	understand about IoT, its Architecture and its Applications	**K1, K2**
2	understand basic electronics used in IoT & its role	**K2, K3**
3	develop applications with C using Arduino IDE	**K4**
4	analyze about sensors and actuators	**K5, K6**
5	design IoT in real time applications using today's internet &wireless technologies	**K6**

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

Units	Contents	No. of Hours
I	Introduction to IoT: Evolution of IoT – Definition & Characteristics of IoT - Architecture of IoT– Technologies for IoT – Developing IoT Applications – Applications of IoT – Industrial IoT – Security in IoT	15
II	Basic Electronics for IoT: Electric Charge, Resistance, Current and Voltage – Binary Calculations – Logic Chips – Microcontrollers – Multipurpose Computers – Electronic Signals – A/D and D/A Conversion – Pulse Width Modulation	15
III	Programming Fundamentals with C using Arduino IDE: Installing and Setting up the Arduino IDE – Basic Syntax – Data Types/ Variables/ Constant – Operators – Conditional Statements and Loops – Using Arduino C Library Functions for Serial, delay and other invoking Functions – Strings and Mathematics Library Functions.	15
IV	Sensors and Actuators: Analog and Digital Sensors–Interfacing temperature senso ultrasound sensor and infrared (IR) sensor with Arduino– Interfacing LED and Buzzer with Arduino	15
V	Sending Sensor Data Over Internet: Introduction to ESP8266 NODEMCU WiFi Module – Programming NODEMCU using Arduino IDE – Using WiFi and NODEMCU to transmit data from temperature sensor to Open Source IoT cloud platform (Thing Speak).	15

Text books
1. Arshdeep Bahga, ,Vijay Madisetti, 2014 "Internet of Things: A Hands-On Approach". ISBN: 978-0996025515
2. Boris Adryan, Dominik Obermaier, Paul Fremantle, "The Technical Foundations of IoT", Artech Houser Publishers, 2017

Reference Books
1. Michael Margolis,2011, "*Arduino Cook book*",O"Reilly.
2. Marco Schwartz, 2016 ,"*Internet of Things with ESP 8266*",Packt Publishing.
3. Dhivya Bala, 2018, "*ESP 8266:Step by Step Tutorial for ESP 8266 IoT, Arduino NODE MCU Dev. Kit*", 2018.

Web Resources
1. https://onlinecourses.nptel.ac.in/noc20_cs66/preview
2. https://www.javatpoint.com/iot-internet-of-things
3. https://www.tutorialspoint.com/internet_of_things/index.htm

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO 6	PO 7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3	3	3	3	3	3	3	3
CO2	3	3	2	3	3	3	3	3	2	3	2	3
CO3	2	3	3	3	3	3	3	2	2	3	2	3
CO4	3	3	3	2	2	2	3	3	2	2	2	3
CO5	3	3	3	3	3	2	2	3	3	2	3	2
Total	14	15	13	13	14	13	15	14	10	13	10	14
Average	2.8	3	2.6	2.6	2.8	2.6	3	2.8	2	2.6	2	2.8

S-Strong (3)   M-Medium (2)   L-Low(1)

SEMESTER I
ELECTIVE COURSE II: c) CRITICAL THINKING, DESIGN THINKING AND PROBLEM SOLVING

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	Ext rnal	Total
SP231EC6	5	-	-	-	3	5	75	25	75	100

Pre-requisite:
 Basics of Logical &Reasoning Skills

Learning Objectives:
 1. Learn critical thinking and its related concepts
 2. Learn design thinking and its related concepts
 3. Develop Thinking patterns, Problem solving & Reasoning.

Course Outcomes

On the successful completion of the course, student will be able to:	
1	understand the concepts of Critical thinking and its related technology	**K1, K2**
2	focus on the explicit development of critical thinking and problem solving skills	**K2, K3**
3	apply design thinking in problems	**K3, K4**
4	make a decision and take actions based on analysis	**K4, K5**
5	analyze the concepts of Thinking patterns, Problem solving & Reasoning in real time applications	**K5, K6**

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

Units	Contents	No. of Hours
I	**Critical Thinking**: Definition, Conclusions and Decisions, Beliefs and Claims, Evidence –finding, evaluation, Inferences, Facts – opinion, probable truth, probably false, Venn diagram. Applied critical thinking: Inference, Explanation, Evidence, Credibility, Two Case Studies, critical thinking and science, critical evaluation, self assessment.	15
II	**Design Thinking**: Introduction, Need of Design Thinking, problem to question - design thinking process, Traditional Problem Solving versus Design Thinking, phases of Design Thinking, problem exploration, Stake holder assessment, design thinking for manufacturers, smart Idea to implementation.	15
III	**CASE STUDY:** Thinking to confidence, fear management, duty Vs passion, Team management, Tools for Thinking, prototype design, Relevance of Design and Design Thinking in engineering, human centered design, case study: apply design thinking in problem.	15
IV	**Problem solving:** problem definition, problem solving methods, selecting and using information, data processing, solution methods, solving problems by searching, recognizing patterns, spatial reasoning necessity and sufficiency, closing and using models, making choice and decisions	15

V	**Reasoning:** Deductive and hypothetical reasoning, computational problem solving; generating, implementing, and evaluating solutions, interpersonal problem solving. Advanced problem solving: Combining skills – using imagination, developing models, Carrying out investigations, Data analysis and inference. Graphical methods of solution, Probability, tree diagrams and decision trees	15

Text books
1. John Butterworth and Geoff Thwaites, 2013, *Thinking skills: Critical Thinking and Problem Solving*, Cambridge University Press.
2. H.S.Foglerand S.E.LeBlanc, 2008, *Strategies for Creative Problem Solv*ing, 2nd edition, Pearson, Upper Saddle River, NJ.

Reference Books
1 A. Whimbey and J. Lochhead, Lawrence Erlbaum, Mahwah, N. 1999, *Problem Solving & Comprehension*, 6th edition, Lawrence Erlbaum, Mahwah, N..
2 M. Levine,1994, *Effective Problem Solving*, 2nd edition, Prentice Hall, Upper Saddle River, NJ.
3 Michael Baker, 2015, *The Basic of Critical Thinking*, The Critical Thinking Co press.
4 David Kelley and Tom Kelley, 2013,Creative Confidence.

Web Resources
1. https://www.tutorialspoint.com/critical_thinking/index.htm
2. https://www.tutorialspoint.com/design_thinking/design_thinking_quick_guide.htm
3. https://nptel.ac.in/courses/109/104/109104109/

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

COs	PO1	PO2	PO3	PO4	PO5	PO 6	PO 7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3	3	3	3	3	3	3	3
CO2	3	3	2	3	3	3	3	3	2	3	2	3
CO3	2	3	3	3	3	3	3	2	2	3	2	3
CO4	3	3	3	2	2	2	3	3	2	2	2	3
CO5	3	3	3	3	3	2	2	3	3	2	3	2
Total	14	15	13	13	14	13	15	14	10	13	10	14
Average	2.8	3	2.6	2.6	2.8	2.6	3	2.8	2	2.6	2	2.8

S-Strong (3)   M-Medium (2)   L-Low(1)

SEMESTER I
ELECTIVE LAB COURSE I: PYTHON PROGRAMMING LAB

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	Exte nal	Total
SP231EP1	-		3	-	2	3	45	25	75	100

Prerequisite:
> Basics of any OO Programming Language.

Learning Objectives:
1. Presents an overview of elementary data items, lists, dictionaries, sets and tuples
2. To understand and write simple Python programs.

Course Outcomes

On the successful completion of the course, student will be able to:		
1	write programs in Python using OOPS concepts	**K1, K2**
2	to understand the concepts of File operations and Modules in Python	**K3, K4**
3	implementation of lists, dictionaries, sets and tuples as programs	**K4, K5**
4	to develop web applications using Python	**K5, K6**
5	develop the programs using polymorphism	**K6**

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

Contents

1) Programs using elementary data items, lists, dictionaries and tuples
2) Programs using conditional branches,
3) Programs using loops.
4) Programs using functions
5) Programs using exception handling
6) Programs using inheritance
7) Programs using polymorphism
8) Programs to implement file operations.
9) Programs using modules.
10) Programs for creating dynamic and interactive web pages using forms.

Text Books
1. Bill Lubanovic. 2014. *Introducing Python* (First Edition). O'Reilly, Second Release,2014
2. Mark Lutz, 2013.*Learning Python* (Fifth Edition). O'Reilly

Reference Books
1. David   M. Beazley. 2009. *Python   Essential   Reference* (Fourth   Edition) Developer's Library
2. Sheetal Taneja, Naveen Kumar, *Python Programming –A Modular Approach*. Pearson Publications.

Web Resources
1. https://www.programiz.com/python-programming/
2. https://www.tutorialspoint.com/python/index.htm
3. https://onlinecourses.swayam2.ac.in/aic20_sp33/preview

MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES

COs	PO 1	PO2	PO3	PO4	PO5	PO 6	PO 7	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	2	3	2	3	3	2	2	2	3	2
CO2	3	3	2	2	3	3	3	3	2	3	2	3
CO3	2	2	3	3	3	3	3	2	3	3	3	3
CO4	3	3	3	3	3	2	3	2	3	3	3	1
CO5	3	3	2	3	2	2	2	3	1	2	3	2
Total	14	14	11	14	11	13	15	11	9	13	14	9
Average	2.8	2.8	2.3	2.8	2.2	2.6	3	2.3	2.1	4.3	2.8	7.5

S-Strong (3)   M-Medium (2)   L-Low (1)

SEMESTER I
SPECIFIC VALUE ADDED COURSE I: WEBSITE CREATION

Course Code	Credits	Total Hours	Total Marks
SP231V01	**1**	**30**	**100**

Pre-requisite:

1. Basic knowledge in HTML tags & skill of creating web pages should be known

2. Knowledge of basic Computer hardware & software is also necessary.

Learning Objectives:

1. Define the principle of Web page design.
2. Visualize the basic concept of HTML.
3. Introduce basics concept of CSS.

Course Outcomes

	On the successful completion of the course, student will be able to:	
1	develop the skill & knowledge of Web page design.	**K1,K3**
2	understand and can function either as an entrepreneur or can take up jobs in the multimedia	**K2,K4**
3	create a Web site development studio.	**K5,K6**
4	develop the concept of web publishing	**K5,K6**
5	create attractive web pages	**K6**

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

Units	Contents	No. of Hours
I	**Web Design Principles**: Basic principles involved in developing a web site - Planning process -Five Golden rules of web designing -Designing navigation bar - Page design - Home Page Layout -Design Concept.	**6**
II	**Basics in Web Design:** Brief History of Internet -What is World Wide Web -Why create a web site- Web Standards	**6**
III	**Introduction to HTML:** What is HTML - HTML Documents -Basic structure of an HTML document - Creating an HTML document-Mark up Tags -Heading-Paragraphs- Line Breaks -HTML Tags.	**6**
IV	**Elements of HTML:** Introduction to elements of HTML-Working with Text - Working with Lists, Tables and Frames - Working with Hyperlinks, Images and Multimedia -Working with Forms and controls.	**6**
V	**Introduction to Cascading Style Sheets:** Concept of CSS -Creating Style Sheet - CSS Properties -CSS Styling (Background, Text Format, Controlling Fonts) Working with block elements and objects -Working with Lists and Tables -CSS Id and Class-Box Model (Introduction, Border properties, Padding Properties, Margin properties)	**6**

Text Books

1. Kogent. *HTML 5 in simple steps* . published by Dreamtech Press, Learning Solutions Inc.
2. Murray, Tom/Lynchburg. 2002. *Creating a Web Page and Web Site.*

Reference Books

1. Steven M. Schafer. *HTML, XHTML, and CSS Bible* (Fifth Edition) published by Wiley India.
2. Ian Pouncey, Richard York. *Beginning CSS: Cascading Style Sheets for Web Design* published by Wiley India

32

Web Resources

1. https://egyankosh.ac.in/bitstream/123456789/72091/1/Unit-7.pdf
2. https://www.bdu.ac.in/cde/SLM/B.Com%20C.A%20III%20Year%20/Web%20Designing/ WEB%20DESIGNING.pdf
3. https://dribbble.com/stories/2021/09/29/ethical-web-design-rules

SEMESTER II
CORE COURSE III: DATA MINING AND WAREHOUSING

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SP232CC1	6	-	-	-	5	6	90	25	75	100

Pre-requisite:
Basics of RDBMS &Algorithms.

Learning Objectives:
1. To enable the students to learn the concepts of Mining tasks, classification, clustering and Data Warehousing.
2. To develop skills of using recent data mining software for solving practical problems.

Course Outcomes

On the successful completion of the course, student will be able to:		
1	understand the basic data mining techniques and algorithms	**K1,K2**
2	understand the Association rules, Clustering techniques and Data warehousing contents	**K2,K3**
3	compare and evaluate different data mining techniques like classification, prediction, Clustering and association rule mining	**K4,K5**
4	design data warehouse with dimensional modeling and apply OLAP operations	**K5,K6**
5	identify appropriate data mining algorithms to solve real world problems	**K6**

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

Units	Contents	No. of Hours
I	**BASICS AND TECHNIQUES:** Basic data mining tasks – data mining versus knowledge discovery in databases – data mining issues – data mining metrics – social implications of data mining – data mining from a database perspective. Data mining techniques: Introduction – a statistical perspective on data mining – similarity measures – decision trees – neural networks – genetic algorithms.	18
II	**ALGORITHMS:** Classification: Introduction –Statistical –based algorithms-Regression and Bayesian -distance–based algorithms-Hamming distance - Euclidean Distance- decision tree-based algorithms- Use of A Decision Tree-Decision Tree Induction- neural network–based algorithms -	18

	Neural Network Architecture-Neural Network Method in Data Mining – rule-based algorithms–Combining Techniques.	
III	**CLUSTERING AND ASSOCIATION:** Clustering: Introduction– Similarity and Distance Measures–Outliers–Hierarchical Algorithms - Partitional Algorithms. Association rules: Introduction - large item sets - basic algorithms – parallel & distributed algorithms – comparing approaches- incremental rules.Advanced Association rules and Techniques -Measuring the quality of Rules.	18
IV	**DATA WAREHOUSING AND MODELING** Data warehousing: Introduction-characteristics of a data warehouse–data marts– other aspects of data mart. Online analytical processing: introduction –OLTP & OLAP systems Data modeling –star schema for multidimensional view –data modeling – multifact star schema or snow flake schema – OLAP TOOLS – State of the market – OLAP TOOLS and the internet.	18
V	**APPLICATIONS OF DATA WAREHOUSE:** Developing a data Warehouse: why and how to build a data warehouse –data warehouse architectural strategies and organization issues - design consideration – data content – metadata distribution of data – tools for data warehousing – performance considerations – crucial decisions in designing a data warehouse. Applications of data warehousing and data mining in government: Introduction - national data warehouses – other areas for data warehousing and data mining	18

Self Study	**Decision Trees OLAP Tools**

Textbooks

1. Margaret H.Dunham, (2003). *Data Mining: Introductory and Advanced Topics* . Pearson education.
2. C.S.R. Prabhu. *Data Warehousing Concepts,Techniques, Products and Applications*. PHI, (2nd edition).

Reference Books

1. Arun K. Pujari.(2003). *Data Mining Techniques*. Universities Press (India)Pvt. Ltd.

2. Alex Berson, Stephen J.Smith, (2001). *Data Warehousing, Data Mining and OLAP*,TMCH, Jiawei Han & MichelineKamber, Academic press.

3. Jiawei Han, Micheline Kamber ,2011 "*Data Mining: Concepts and Techniques*"

4. David L. Olson, Dursun Delen , 2008, "*Advanced Data Mining Techniques"*

5. Parteek Bhatia, 2019. "*Data Mining and Data Warehousing Principles and Practical Techniques"*

Web Resources

1. https://www.javatpoint.com/data-warehouse

2. https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs12/

3. https://www.btechguru.com/training--it--database-management-systems--file-structures--introduction-to-data-warehousing-and-olap-2-video-lecture--12054--26--151.html

4. https://www.google.co.in/books/edition/Data_Mining_and_Data_Warehousing/bF6NDwAAQBAJ?hl=en&gbpv=0

5. https://www.google.co.in/books/edition/DATA_WAREHOUSING/rv-Xb6EgO6AC?hl=en&gbpv=1&dq=data+warehousing++techniques&printsec=frontcover

MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	3	3	3	2	2	2	2
CO2	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	2	3	3
Total	15	14	15	15	15	15	14	10	14	14
Average	3	2.8	3	3	3	3	2.8	2	2.8	2.8

3-Strong; 2-Medium; 1-Low

SEMESTER II
CORE COURSE IV: ADVANCED JAVA PROGRAMMING

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SP232CC2	6	-	-	-	5	6	90	25	75	100

Pre-requisite:

Basics of Java and its usage.

Learning Objectives:

1. Enable the students to learn the basic functions, principles and concepts of advanced java programming.

2. Learn JDBC, Servlet packages, JQuery, Java Server Pages and JAR file format.

Course Outcomes

On the successful completion of the course, student will be able to:	
1	understand the advanced concepts of Java Programming	**K1,K2**
2	understand JDBC and RMI concepts	**K2,K3**
3	apply and analyze Java in Database	**K3,K4**
4	handle different event in java using the delegation event model, event listener and class	**K5**
5	design interactive applications using Java Servlet, JSP and JDBC	**K5,K6**

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

Units	Contents	No. of Hours
I	**BASICS OF JAVA:** Java Basics Review: Components and event handling-Types of Exceptions–Threading – Concurrency-Synchronization–Networking features- java.net Package, Client and Server Programs, Content and Protocol Handlers-Network Class Overview-Java Security and the Network classes-Java Socket Programming-Media Techniques-Applet-Java Graphics-Basic Animation	18
II	**REMOTE METHOD INVOCATION:** Remote Method Invocation-Working of RMI- Distributed Application Architecture- Creating stubs and skeletons-Defining Remote objects- Remote Object Activation-Object Serialization-Java Spaces- Benefits and Limitations of Java Spaces	18

III	**DATABASE:** Java in Databases- java. sql package -JDBC Driver- JDBC principles–JDBC API-database access-Interacting-database search–Meta Data Interfaces-Stored Procedures-Extending JDBC-Creating multimedia databases– Database support in web applications- Components of Web Based Database Applications	**18**
IV	**SERVLETS:** Java Servlets: Java Servlet and CGI programming- A simple java Servlet- Anatomy of a java Servlet - Reading data from a client-Reading http request header-sending data to a client and writing the http response header-working with cookies Java Server Pages: JSP Overview- Installation- JSP tags-Components of a JSP page-Expressions- Script lets -Directives-Declarations-A complete example	**18**
V	**ADVANCED TECHNIQUES:** JAR file format creation–Internationalization–Locales-Resource Bundles-MVC Architecture-Swing Programming–Swing Components: Text Fields, Buttons, Toggle Buttons, Check Boxes and Radio Buttons-Advanced java Techniques	**18**
Self Study	**Java Spaces Internationalization**	

Textbooks
  3. Jamie Jaworski, (1999). *Java Unleashed*. SAMS Techmedia Publications.
  4. Campione, Walrath and Huml, (1999). *The Java Tutorial*, Addison Wesley.

Reference Books
  3. Jim Keogh, (2010). *The Complete Reference J2EE*. Tata McGraw Hill Publishing Company Ltd.
  4. David Sawyer McFarland, (2011). *JavaScript And JQuery- The Missing Manual*, Oreilly Publications, (3rd edition).
  5. Deitel and Deitel, *Java How to Program* .(3rd edition) ,PHI/Pearson Education Asia.
  6. Dr. R. Nageswara Rao, 2008,"*Core and Advanced Java (Black Book)*"
  7. George Reese, 2000, "*Database Programming with JDBC & Java"*, Second Edition published by O'Reilly Media, Inc.

Web Resources
  1. https://www.javatpoint.com/servlet-tutorial
  2. https://www.tutorialspoint.com/java/index.htm
  3. https://onlinecourses.nptel.ac.in/noc19_cs84/preview
  4. https://www.javatpoint.com/multithreading-in-java
  5. https://www.javatpoint.com/java-jdbc

MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES

Cos	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	2	2	2	3
CO2	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	2	3	3
Total	15	15	15	15	15	15	14	10	14	15
Average	3	3	3	3	3	3	2.8	2	2.8	3

3 – Strong, 2- Medium, 1- Low

SEMESTER II
CORE COURSE LAB II: ADVANCED JAVA PROGRAMMING LAB

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	Ext nal	Total
SP232CP1	-	-	6	-	4	6	90	25	75	100

Pre- requisite:
  Basics in Java Programming.
Learning Objectives:
  1. To enable the students to implement the simple programs using JSP,JAR
  2. To provide knowledge on using Servlets, Applets.

Course Outcomes

	On the successful completion of the course, student will be able to**:**	
1	underst nd the imp ement conc pts of Ja a using HTML forms, JSP&J R	**K1,K2**
2	must be capable of implementing JDBC and RMI concepts	**K3,K4**
3	able to write Applets with Event handling mechanism	**K4,K5**
4	create interactive web based applications using servlets and jsp	**K5,K6**
5	able to do Socket programming	**K2, K6**

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

Units	List of Exercises	No. of Hours
	Implement the following problems	
	1. Display a welcome message using Servlet.	
	2. Design a Purchase Order form using Html form and Servlet.	
	3. Develop a program for calculating the percentage of marks of a student using JSP.	
	4. Design a Purchase Order form using Html form and JSP.	
	5. Prepare a Employee payslip using JSP.	
	6. Write a program using JDBC for creating a table, Inserting, Deleting records and list out the records.	**90**
	7. Write a program using Java servlet to handle form data.	
	8. Write a simple Servlet program to create a table of all the headers it receives along with their associated values.	
	9. Write a program in JSP by using session object.	
	10. Write a program to build a simple Client Server application using RMI.	
	11. Create an applet for a calculator application.	
	12. Program to send a text message to another system and receive the text message from the system (use socket programming).	

Textbooks
  1. Jamie Jaworski, (1999). *Java Unleashed*. SAMS Techmedia Publications.

2. Campione, Walrath and Huml, (1999). *The Java Tutorial*. Addison Wesley.

Reference Books
1. Jim Keogh, (2010). *The Complete Reference J2EE*, Tata McGraw Hill Publishing Company Ltd.
2. David Sawyer McFarland, (2011). *JavaScript And JQuery-The Missing Manual.* Oreilly Publications, (3rd edition).

Web Resources
1. https://www.javatpoint.com/servlet-tutorial
2. https://www.tutorialspoint.com/java/index.htm
3. https://onlinecourses.nptel.ac.in/noc19_cs84/preview

MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES

Cos	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	2	2	3
CO2	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	2	3	3
Total	15	15	15	15	15	15	15	11	14	15
Average	3	3	3	3	3	3	3	2.2	2.8	3

3 – Strong, 2- Medium, 1- Low

SEMESTER II
ELECTIVE COURSE III: A) ADVANCED OPERATING SYSTEMS

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SP232EC1	4	-	-	-	3	4	60	25	75	100

Pre-requisite:
   Basics of OS & its functioning.

Learning Objectives:
1. Enable the students to learn the different types of operating systems and their functioning.
2. Gain knowledge on Distributed Operating Systems

Course Outcomes

	On the successful completion of the course, student will be able to:	
1	understand the design issues associated with operating systems	**K1,K2**
2	master various process management concepts including scheduling, deadlocks and distributed file systems	**K3,K4**
3	prepare Real Time Task Scheduling	**K4,K5**
4	analyze Operating Systems for Handheld Systems	**K5**
5	analyze Operating Systems like LINUX and iOS	**K5,K6**

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

Units	Contents	No. of Hours
I	**BASICS OF OPERATING SYSTEMS:** Basics of Operating Systems: What is an Operating System? – Main frame Systems –Desktop Systems – Multiprocessor Systems – Distributed Systems – Clustered Systems –Real-Time Systems – Handheld Systems –Process: Process Scheduling – Algorithms - Cooperating Processes – Inter Process Communication: Shared Memory-Message Passing System.	12
II	**DISTRIBUTED OPERATING SYSTEMS:** Distributed Operating Systems: Issues – Communication Primitives - Deadlock – Resource-Necessary conditions for a deadlock – Resource Allocation graph - Deadlock handling strategies - deadlock detection- Deadlock Avoidance - Deadlock Recovery - distributed file systems –design issues – Case studies – The Sun Network File System.	12
III	**REAL TIME OPERATING SYSTEM (RTOS):** Real time Operating Systems: Introduction – Types of Real time OS- Hard Real time - Firm Real Time- Soft Real Time Systems - Difference between Hard and Real - Advantages Disadvantages of RTOS - Applications of Real Time Systems	12

	– Basic Model of Real Time System – Characteristics – Safety and Reliability - Real Time Task Scheduling	
IV	**HANDHELD SYSTEMS:** Features of Handheld Operating System-Types of Handheld Operating Systems- Operating Systems for Handheld Systems: Requirements–Technology Overview–Handheld Operating Systems –Palm OS - Symbian Operating System-Android OS – Architecture of android - Applications of Android OS – Securing handheld systems -Advantages - Disadvantages	12
V	**CASE STUDIES:** Case Studies : Linux System: Introduction – Memory Management –Contiguous memory management -paging-Segmentation-Disk Scheduling- Algorithms- First Come First Serve - Shortest Seek Time First - SCAN- CSCAN Scheduling - Managing I/O devices – Accessing Files- iOS: Architecture and SDK Framework - Media Layer - Services Layer - Core OS Layer - File System.	12

Self Study	Distributed File Systems Core OS Layer

Textbooks
1. Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, (2004). *Operating System Concepts*, (7th edition), John Wiley & Sons.
2. Mukesh Singhal and Niranjan G. Shivaratri, (2001). *Advanced Concepts in Operating Systems –Distributed, Database, and Multiprocessor Operating Systems*. Tata McGraw-Hill.

Reference Books
1. RajibMall, (2006). *Real-Time Systems: Theory and Practice*, Pearson Education India.
2. Pramod Chandra P. Bhatt, (2010). *An introduction to operating systems, concept and practice, PHI*, (3rd edition).
3. Daniel.P.Bovet & Marco Cesati, (2005). *Understanding the Linux kernel*. ,(3rdedition),O"Reilly.
4. NeilSmyth, (2011). *iPhone iOS 4 Development Essentials–Xcode*. (4th edition),Payload media.
5. Abraham Silberschatz .6th edition, "*operating system concepts*"

Web Resources
1. https://onlinecourses.nptel.ac.in/noc20_cs04/preview
2. https://www.udacity.com/course/advanced-operating-systems--ud189
3. https://minnie.tuhs.org/CompArch/Resources/os-notes.pdf
4. https://os.ecci.ucr.ac.cr/slides/Abraham-Silberschatz-Operating-System-Concepts-10th-2018.pdf
5. https://www.amazon.in/Operating-System-Concepts-Abraham-Silberschatz/dp/1118129385

MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	3	3	3	2	2	2	2
CO2	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	2	3	3
Total	15	14	15	15	15	15	14	11	14	14
Average	3	2.8	3	3	3	3	2.8	2.2	2.8	2.8

3-Strong; 2-Medium; 1-Low

SEMESTER II
ELECTIVE COURSE III: B)MOBILE COMPUTING

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	Ext nal	Total
SP232EC2	4	-	-	-	3	4	60	25	75	100

Pre-requisite:
> Basics of Mobile Communication

Learning Objectives:
1. Present the overview of Mobile computing, Applications and Architectures.
2. Enable to understand the futuristic computing challenges.

Course Outcomes

On the successful completion of the course, student will be able to:	
1	understand the need and requirements of mobile communication	**K1,K2**
2	focus on mobile computing applications and techniques	**K2,K3**
3	demonstrate satellite communication in mobile computing	**K4**
4	analyze about wireless local loop architecture	**K5,K6**
5	analyze various mobile communication technologies	**K6**

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

Units	Contents	No. of Hours
I	**INTRODUCTION:** Introduction: Advantages of Digital Information - Introduction to Telephone Systems –Mobile communication: Need for Mobile Communication –-Requirements of Mobile Communication – History of Mobile Communication- Properties of Wireless medium.	12
II	**MOBILE COMMUNICATION:** Introduction to Cellular Mobile Communication – Mobile Communication Standards –Mobility Management –Hand off- Radio link transfer-Roaming Management- Frequency Management – Cordless Mobile Communication Systems- Cordless-Multichannel-Wireless Communications.	12
III	**MOBILE COMPUTING:** Mobile Computing: History of data networks – Classification of Mobile data networks - CDPD System – Satellites in Mobile Communication: Satellite classification – Global Satellite Communication – Changeover from one satellite to other – Global Mobile Communication – Interferences in Cellular Mobile Communication.	12
IV	**MOBILE COMMUNICATION SYSTEM:** Important Parameters of Mobile Communication System – Mobile Internet: Working of Mobile IP – Wireless Network Security – Wireless Local Loop Architecture: Components in WLL – Problems in WLL – Modern Wireless Local Loop – Local Multipoint Distribution Service – Wireless Application Protocol.	12

V	**COMMUNICATION TECHNOLOGY:** WCDMA Technology and Fiber Optic Microcellular Mobile Communication – Ad hoc Network and Bluetooth technology – Intelligent Mobile Communication system-Power Delivery-Processing Gain – Fourth Generation Mobile Communication systems.	**12**

Self Study	**Satellites in Mobile Communication** **Bluetooth Technology**

Textbooks
1. T.G.Palanivelu,R.Nakkeeran, (2009). "Wireless and Mobile Communication",PHI Limited.
2. Jochen Schiller, (2007). Mobile Communications.,(2nd edition),Pearson Education.

Reference Books
1. Asoke K Talukder, Hasan Ahmed,RoopaYavagal,(2010). *Mobile Computing*. TMH.

Web Resources
1. https://www.tutorialspoint.com/mobile_computing/index.htm
2. https://www.javatpoint.com/mobile-computing
3. https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs13/

MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES

Cos	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	2	2	3
CO2	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	2	3	3
Total	15	15	15	15	15	15	15	10	14	15
Average	3	3	3	3	3	3	3	2	2.8	3

3 – Strong, 2- Medium, 1- Low

ELECTIVE III: c)BLOCKCHAIN TECHNOLOGY

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SP232EC3	4	-	-	-	3	4	60	25	75	100

Pre-requisite:

Basics of BlockChain & Crypto Currency

Learning Objectives:

1. Understand the fundamentals of blockchain and cryptocurrency.
2. Identify problems & challenges posed by Block Chain

Course Outcomes

	On the successful completion of the course, student will be able to:	
1	demonstrate blockchain technology and crypto currency	**K1,K2**
2	understand the mining mechanism in blockchain **K2**	
3	apply and identify security measures, and various types of services that allow people to trade and transact with bitcoins	**K3,K4**
4	apply and analyze Blockchain in healthcare industry	**K4,K5**
5	analyze security, privacy, and efficiency of a given Blockchain system **K5,K6**	

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

Units	Contents	No. of Hours
I	**INTRODUCTION:** Introduction to Blockchain - The big picture of the industry – size, growth, structure, players. Bitcoin versus Cryptocurrencies versus Blockchain - Distributed Ledger Technology (DLT). Strategic analysis of the space – Blockchain platforms, regulators, application providers. The major application: currency, identity, chain of custody.	**12**
II	**NETWORKAND SECURITY:** Advantage over conventional distributed database, Blockchain Network- Certificate Authorities-Adding Network Administrators- Consortium-Mining Mechanism-Distributed Consensus-Blockchain 1.0, 2.0 and 3.0 – transition, advancements and features. Privacy-Security issues in Blockchain.	**12**
III	**CRYPTOCURRENCY:** Cryptocurrency - History, Distributed Ledger, Bitcoin protocols -Symmetric-key cryptography - Public-key cryptography - Digital Signatures -High and Low trust societies - Types of Trust model: Peer-to-Peer, Leviathan, and Intermediary. Application of Cryptography to Blockchain	**12**
IV	**CRYPTO CURRENCY REGULATION:** Cryptocurrency Regulation-Stakeholders, Roots of Bitcoin, Legal views- exchange of cryptocurrency-Foreign Exchange Market-Medium of exchange-Black Market-Global Economy. Cyrpto economics–assets, supply and demand-inflation and deflation – Regulation	**12**

V	**CHALLENGESINBLOCKCHAIN:** <mark>Opportunities and challenges in Block Chain – Application of block chain: Industry 4.0 – machine to machine communication –Datamanagementinindustry4.0–future prospects.</mark> Block chain in Health 4.0 - Blockchain properties - Healthcare Costs - Healthcare Quality - Healthcare Value - Challenges for using blockchain for healthcare data	12

Self Study	Types of Trust model Blockchain properties

Textbooks

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Gold feder,(July 19, 2016). "*Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction*", Princeton University Press
2. Antonopoulos, "*Mastering Bitcoin*:Unlocking Digital Crypto currencies".

Reference Books

1.Satoshi Nakamoto,"*Bitcoin: APeer-to-PeerElectronicCashSystem*"
2. Rodrigoda Rosa Righi, AntonioMarcos Alberti, MadhusudanSingh,2020,"*Blockchain Technology for Industry 4.0*" Springer ..

Web Resources

1. https://www.javatpoint.com/blockchain-tutorial
2. https://www.tutorialspoint.com/blockchain/index.htm
3. https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs01/

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

Cos	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	2	2	3
CO2	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	2	3	3
Total	15	15	15	15	15	15	15	10	14	15
Average	3	3	3	3	3	3	3	2	2.8	3

3 – Strong, 2- Medium, 1- Low

SEMESTER II
ELECTIVE COURSE IV: A) ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SP232EC4	4	-	-	-	3	4	60	25	75	100

Pre-requisite:
   Basics of AI & an Introduction about ML

Learning Objectives:
   1. Enable the students to learn the basic functions of AI, Heuristic Search Techniques.
   2. Provide knowledge on concepts of Representations and Mappings and Predicate Logic.

Course Outcomes

On the successful completion of the course, student will be able to:	
1	demonstrate AI problems and techniques	**K1,K2**
2	understand machine learning concepts	**K2,K3**
3	apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning	**K3,K4**
4	analyze the impact of machine learning on applications	**K4,K5**
5	analyze and design a real world problem for implementation and understand the dynamic behavior of a system	**K5,K6**

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

Units	Contents	No. of Hours
I	**INTRODUCTION:** Introduction: History of AI - AI Problems - AI techniques - Criteria for success. Problems, Problem Spaces, Search: State space search - Production Systems - Problem Characteristics - Issues in design of Search - Building AI Systems – Intelligent Agents.	**12**
II	**SEARCH TECHNIQUES:** Heuristic Search techniques: Generate and Test - Hill Climbing- Best-First, Problem Reduction, Constraint Satisfaction, Means-end analysis. Knowledge representation issues: Representations and mappings -Approaches to Knowledge representations -Issues in Knowledge representations - Frame Problem.	**12**
III	**PREDICATE LOGIC:** Using Predicate logic: Representing simple facts in logic - Representing Instance and Is a relationships - Computable functions and predicates - Resolution - Natural deduction. Representing knowledge using rules: Procedural Vs Declarative knowledge- Logic programming Forward Vs Backward reasoning -Matching-Control knowledge.	**12**
IV	**MACHINE LEARNING:** Understanding Machine Learning: What Is Machine Learning?-Defining Big Data- Big Data in Context with Machine Learning-The Importance of the Hybrid Cloud-Leveraging the Power of Machine Learning-The Roles of Statistics and Data Mining with Machine	**12**

	Learning-Putting Machine Learning in Context-Approaches to Machine Learning.	
V	**APPLICATIONS OF MACHINE LEARNING:** <mark>Applying Machine Learning: Getting Started with a Strategy – Understanding Machine Learning Techniques – Tying Machine Learning Methods to Outcomes</mark> – Applying Machine Learning to Business Needs. Looking Inside Machine Learning: The Impact of Machine Learning on Applications-Data Preparation-The Machine Learning Cycle.	**12**

Self Study	Logic Programming The Machine Learning Cycle

Textbooks
1. Elaine Richand Kevin Knight, (1991). *Artificial Intelligence*. Tata McGraw Hill Publishers company Pvt Ltd, (2nd edition).
2. George FLuger, 2002,"*Artificial Intelligence*",4thEdition, Pearson Education Publ,

Reference Books
1. Judith Hurwitz,Daniel Kirsch. *Machine ,"Learning For Dummies®*", IBM Limited Edition
2. Dr. Dheeraj Mehrotra, "*Basics of Artificial Intelligence And Machine Learning"* Notion Press
3. Mariya Yao, Adelyn Zhou, 2018. Marlene Jia, "*Applied Artificial Intelligence: A Handbook for Business Leaders"*
4. Peter Norvig and Stuart J. Russell, "*Artificial Intelligence: A Modern Approac*h", Third Edition.
5. Glaé Bassens, Grant Beyleveld, and Jon Krohn, 2019. "*Deep Learning Illustrated is a visual, interactive introduction to artificial intelligence***"** published by Pearson's Addison-Wesley.

Web Resources
1. https://www.ibm.com/downloads/cas/GB8ZMQZ3
2. https://www.javatpoint.com/artificial-intelligence-tutorial
3. https://nptel.ac.in/courses/106/105/106105077/
4. **https://books.google.co.in/books/about/Applied_Artificial_Intelligence.html?id= qZ5vuAEACAAJ&source=kp_cover&redir_esc=y**
5. **https://people.engr.tamu.edu/guni/csce421/files/AI_Russell_Norvig.pdf**

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

Cos	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	2	2	3
CO2	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	2	3	3
Total	15	15	15	15	15	15	15	10	14	15
Average	3	3	3	3	3	3	3	2	2.8	3

3 – Strong, 2- Medium, 1- Low

SEMESTER II
Elective Course IV: b)WEB SERVICES

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SP232EC5	4	-	-	-	3	4	60	25	75	100

Pre-requisite:

Basics of Distributed Computing

Learning Objectives:

1. Present the Web Services , Building real world Enterprise applications using Web Services with Technologies XML, SOAP , WSDL , UDDI

2. Get overview of Distributed Computing,XML,and its technologies

Course Outcomes

On the successful completion of the course, student will be able to:	
1	understand web services and its related technologies	K1,K2
2	understand XML concepts	K2,K3
3	analyze on SOAP and UDDI model	K4,K5
4	demonstrate the road map for the standards and future of web services	K5
5	analyze QoS enabled applications in web services	K5,K6

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

Units	Contents	No. of Hours
I	**INTRODUCTION:** Introduction to web services – Overview of Distributed Computing- Evolution and importance of web services-Industry standards, Technologies and concepts underlying web services-Web services and enterprises-web services standards organization-web services platforms.	12
II	**XML FUNDAMENTALS:** XML Fundamentals – XML documents: XML Syntax, XML Elements, XML Attributes, XML Namespaces – XML DOM - Validation of XML Documents - XML DTD - XML Schema – XML Server - Processing XML – XML XSLT – XML XQuery – XML XLink.	12
III	**SOAP MODEL:** SOAP: The SOAP model- SOAP messages-SOAP encoding- WSDL: WSDL structure- interface definitions-bindings-services-Using SOAP and WSDL- UDDI: About UDDI- UDDI registry Specification-Core data structures-Accessing UDDI	12
IV	**TECHNOLOGIES AND STANDARDS:** Advanced web services technologies and standards: Conversations overview-web services conversation language- WSCL interface components. Workflow: business process management- workflows and workflow management systems Security: Basics-data handling and forwarding- data storage-errors-Web services security issues.	12

51

V	**QUALITYOFSERVICE:** Quality of Service: Importance of QoS for web services- QoS metrics-holes-design patterns- QoS enabled web services- QoS enabled applications. Web services management-web services standards and future trends..	**12**

Self Study	**Logic Programming** **The Machine Learning Cycle**

Textbooks

1. Sandeep Chatterjee, James Webber, "*Developing Enterprise Web Services: An Architects Guide*", Prentice Hall, Nov 2003.

2. Keith Ballinger, "*NET Web services: Architecture and Implementation with .Net*", Pearson Education, First Edition, Feb 2003

Reference Books

1. Ramesh Nagappan,Feb 2003,"*Developing Java Web Services: Architecting and developing secure Web Services Using Java*", John Wiley and Sons, first Edition .

2. Eric A Marks and Mark J Werrell, March 2003, "*Executive Guide to Web services*", John Wileyand sons.

3.Anne Thomas Manes,"*Web Services: Amanagers Guide*",Addison Wesley,June2003.

Web Resources

1. https://www.tutorialspoint.com/webservices/index.htm

2. https://www.javatpoint.com/web-services-tutorial

3. https://www.btechguru.com/training--programming--xml--web-services--web-services-part-1-video-lecture--11801--24--147.html

MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES

Cos	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	2	2	3
CO2	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	2	3	3
Total		15	15	15	15	15	15	10	14	15
15			3	3	3	3	3	2	2.8	3
Average	3	3								

3 – Strong, 2- Medium, 1- Low

ELECTIVE COURSE IV: c) ROBOTIC PROCESS AUTOMATION FOR BUSINESS

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	Ext rnal	Total
SP232EC6	4	-	-	-	3	4	60	25	75	100

Pre-requisite:

Basics of Robots & its Applications

Learning Objectives:

1. Learn the concepts of RPA ,its benefits ,types and models.
2. Gain the knowledge in application of RPA in Business Scenarios.

Course Outcomes

On the successful completion of the course, student will be able to:	
1	demonstrate the benefits and ethics of RPA	**K1,K2**
2	understand the Automation cycle and its techniques	**K2**
3	draw inferences and information processing of RPA	**K3,K4**
4	implement& Apply RPA in Business Scenarios	**K5**
5	analyze on Robots& leveraging automation	**K5,K6**

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

Units	Contents	No. of Hours
I	**INTRODUCTION:** Introduction to RPA -Overview of RPA -Benefits of RPA in a business environment -Industries & domains fit for RPA - Identification of process for automation - Types of Robots - Ethics of RPA & Best Practices - Automation and RPA Concepts - Different business models for implementing RPA -Centre of Excellence –Types and their applications -Building an RPA team -Approach for implementing RPA initiatives.	**12**
II	**AUTOMATION:** RoleofaBusinessManagerinAutomationinitiatives-SkillsrequiredbyaBusinessManagerfor successful automation - The importance of a Business Manager in automation - Analyzing different business processes - Process Mapping frameworks - Role of a Business Manager in successful implementation – Part 1 - Understanding the Automation cycle – First 3 automation stages and activities performed by different people.	**12**
III	**AUTOMATIONIMPLEMENTATION:** Evaluating the Automation Implementation Detailed description of last 3 stages and activities performed by different people - Role of a Business Manager in successful completion – Part 2 - Activities to be performed post-implementation - Guidelines for tracking the implementation success - Metrics/Parameters to be considered for gauging success - Choosing the right licensing option - Sending emails - Publishing and Running Workflows.	**12**
IV	**ROBOT:** Ability to process information through scopes/systems - Understand the skill of information processing and its use in business -	**12**

	Leveraging automation - Creating a Robot - New Processes. Establish causality by variable behavior - Understand the skill of drawing inference or establishing causality by tracking the behavior of a variable as it varies across time/referenced variable - Leveraging automation for this skill - Robot & new process creation.	
V	**ROBOTSKILL:** Inference from snapshots of curated terms – Omni-source data curation - Multisource trend tracking - Understand the skill of drawing inference from the behavior of curated terms by taking snapshots across systems in reference to time/variable(s) - Leveraging automation for this skill – Robot creation and new process creation for this skill.	**12**

Self Study	Publishing and Running Workflows Multi source trend tracking

Textbooks

1. Alok Mani Tripathi, 2018." *Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool*" Packet Publishing Limited March

2. TomTaulli February 2020,"*The Robotic Process Automation Handbook*" A press,

Reference Books

1. Steve Kaelble 2018, "*Robotic Process Automation*" John Wiley &Sons,Ltd.,

Web Resources

1. https://www.tutorialspoint.com/uipath/uipath_robotic_process_automation_introduction.htm

2. https://www.javatpoint.com/rpa

3. https://onlinecourses.nptel.ac.in/noc19_me74/preview

MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES

Cos	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	2	2	3
CO2	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	2	3	3
Total	15	15	15	15	15	15	15	10	14	15
Average	3	3	3	3	3	3	3	2	2.8	3

3 – Strong, 2- Medium, 1- Low

SEMESTER II
Skill Enhancement Course I : Practical: Data Mining Lab using R

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	Ext nal	Total
SP232SE1	-	-	4	-	2	4	60	25	75	100

Pre-requisite:
> Basics of DM Algorithms & R Programming.

Learning Objectives:
1. To enable the students to learn the concepts of Data Mining algorithms namely classification, clustering, regression.
2. To understand & write programs using the DM algorithms.

Course Outcomes

	On the successful completion of the course, student will be able to:	
1	write programs using R for Association rules, Clustering techniques	**K1,K2**
2	implement data mining techniques like classification, prediction	**K2,K3**
3	use different visualizations techniques using R	**K4,K5**
4	pply dif rent data mining algorithms to solve real wo ld applica ions a fe r t	**K5,K6**

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

Units	List of Exercises	No. of Hours
	Implement the following problems using Python Programming 1. Implement Apriori algorithm to extract association rule of data mining. 2. Implement k-means clustering technique. 3. Implement any one Hierarchical Clustering. 4. Implement Classification algorithm. 5. Implement Decision Tree. 6. Linear Regression. 7. Data Visualization.	**60**

Textbooks
1. Margaret H. Dunham, (2003). *Data Mining: Introductory and Advanced Topics*. Pearson education.
2. C.S.R. Prabhu, *Data Warehousing Concepts, Techniques, Products and Applications*, PHI, (2nd edition)

Reference Books
1. Arun K.Pujari,(2003). *Data Mining Techniques*. Universities Press(India)Pvt. Ltd.
2. Alex Berson,Stephen J.Smith, (2001). *Data Warehousing, Data Mining and OLAP*,TMCH.

Web Resources
1. https://www.javatpoint.com/data-warehouse
2. https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs12/
3. https://www.btechguru.com/training--it--database-management-systems--file-structures--
4. introduction-to-data-warehousing-and-olap-2-video-lecture--12054--26--151.html

MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES

Cos	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	2	2	3
CO2	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	2	3	3
Total	15	15	15	15	15	15	15	10	14	15
Average	3	3	3	3	3	3	3	2	2.8	3

3 – Strong, 2- Medium, 1- Low

SEMESTER – I & II

LIFE SKILL TRAINING – I ETHICS

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
PG23LST1	1				1	1	15	-	50	100

Prerequisites: Value education-its purpose and significance in the present world

Learning Objectives

1. To familiarize students with values of the individual, society, culture, one's own health and life philosophy,

2. To impart knowledge of professional ethical standards, codes of ethics, obligations, safety, rights, and other worldwide challenges.

Course Outcomes	On completion of this course the student will be able to	
CO1	understand deeper insight of the meaning of their existence.	**K1**
CO2	recognize the philosophy of life and individual qualities	**K2**
CO3	acquire the skills required for a successful personal and professional life.	**K3**
CO4	develop as socially responsible citizens.	**K4**
CO5	create a peaceful, communal community and embrace unity.	**K3**

Unit	Contents	No. of Hours
I	**Goal Setting:** Definition - Brainstorming Session – Setting Goals – Few components of setting goals.	3
II	**Group Dynamics:** Definition - Nature of Groups – Types of Groups – Determinants of group behavior	3
III	**Conflict Resolution:** Definition – What is a conflict resolution – Why should conflicts be resolved? - Lessons for life	3

IV	**Decision Making:** Definition – 3C's of decision making – Seven Steps to effective decision making – Barriers in effective decision making	3
V	**Anger Management:** Effects of anger – Tips to reduce anger – Anger warning signs – Identify your triggers – Ways to cool down your anger.	3
	TOTAL	15

Self-Study Portion: Salient values for life, Human Rights, Social Evils and how to tackle them, Holistic living, Duties and responsibilities.

Textbooks

Life Skill Training – I Ethics, Holy Cross College (Autonomous), Nagercoil

Reference Books

1. Holy Cross College (Autonomous), Nagercoil (2007). Foundation Course Life's Challenges. Sipca Computers.

2. Mathew, Sam (2010). Self Help Life Book. Opus Press Publisher.

3. Swati Mehrotra. (2016). Inspiring Souls Moral Values and Life Skills (1st ed.) [English]. Acevision Publisher Pvt. Ltd.

4. Irai Anbu, v. (2010, August). Random Thoughts (1st ed.) [English]. THG Publishing Private Limited, 2019.

5. Holy Cross College (Autonomous), Nagercoil (2007). Foundation Course Life's Challenges. Sipca Computers.

Web Resources

1. https://positivepsychology.com/goal-setting-exercises/

2. https://www.gov.nl.ca/iet/files/CCB_GroupDynamicsGuide.pdf

3. https://en.wikipedia.org/wiki/Conflict_resolution

4. https://asana.com/resources/decision-making-process

5. https://www.mayoclinic.org/healthy-lifestyle/adult-health/in-depth/anger-management/art-20045434

Employability

Entrepreneurship

Skill Development

** All the Courses focused on Skill Development