





UNDER GRADUATE DEGREE PROGRAMME

B.Sc., Computer Science (Artificial Intelligence and Machine Learning) Three Years

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B.Sc., (Hons) Computer Science (Artificial Intelligence and Machine Learning) Four Years

CURRICULUM & SYLLABUS

REGULATIONS 2026

Effective from the Academic Year 2026-2027

Department of Advanced Computing and Analytics

School of Computing Sciences

PALLAVARAM

VELS
INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)
(Deemed to be University Estd. u/s 3 of the UGC Act, 1956)
PALLAVARAM, THALAMBUR, PERIYAPALAYAM, THIRUVANMIYUR - CHENNAI

DEPARTMENT OF ADVANCED COMPUTING AND ANALYTICS
SCHOOL OF COMPUTING SCIENCES

VISION OF THE INSTITUTION
To make the Institute an epitome of excellence in higher education by effectively providing high quality education and rigorous training to students in multiple streams of choice with ample scope for all round development to make them excel in their profession for betterment of the society.

VISION OF THE DEPARTMENT
To emerge as a premier Center of Excellence in in Artificial Intelligence and Cyber Security domains by advancing innovation, impactful research, and industry-aligned education, empowering learners to create intelligent, data-driven solutions for global technological and societal challenges.

MISSION OF THE DEPARTMENT	
M1	To impart quality education in Artificial Intelligence, Cyber Security, and Data Science through a contemporary and industry-focused curriculum.
M2	To promote research, innovation, and problem-solving skills for developing intelligent, secure, and scalable technological solutions.
M3	To equip students with technical competence, ethical values, and professional skills to address emerging cyber threats and AI-driven challenges.
M4	To nurture socially responsible professionals and entrepreneurs capable of contributing to secure and sustainable digital transformation.

PROGRAMME EDUCATIONAL OUTCOMES (PEO)	
PEO1	Graduates will demonstrate AI models for applications such as computer vision, natural language processing, speech recognition, and predictive analytics.
PEO2	Graduates will utilize modern machine learning frameworks and tools to build scalable, efficient, and reliable AI solutions while adhering to professional and ethical standards.
PEO3	Graduates will have the technical and analytical skills required to succeed in a wide range of industries, including finance, healthcare, and e-commerce.
PEO4	Graduates will develop and deploy AI and Machine Learning solutions responsibly, considering ethics, privacy, security, and societal impact.

PROGRAMME OUTCOMES (PO)	
PO1	**Computational Knowledge :** Apply knowledge of Computer Science to identify, analyse, and solve problems effectively in the field of computing.
PO2	**Problem Analysis :** Analyze a problem, identify and define the computing requirements appropriate to its solution.
PO3	**Analytical skills:** Ability to design, develop algorithms and provide software solutions to cater the industrial needs.
PO4	**Modern Tool Usage:** Use current techniques, skills, and tools necessary for computing practices.
PO5	**Employability Skills:** Inculcate skills to excel in the fields of Information Technology and its Enabled services, Government and Private sectors, Teaching and Research.
PO6	**Ethics:** Insists ethical responsibilities, human and professional values and make their contribution to the society.
PO7	**Self-Directed and Life-long Learning:** Engaged in lifelong learning to equip them to the changing environment and be prepared to take-up mastering programmes.
PO8	**Communication, Leadership, and Teamwork:** Demonstrate effective communication, leadership, interpersonal, and teamwork skills in multidisciplinary and professional environments.

PROGRAMME SPECIFIC OUTCOMES (PSO)	
PSO1	Develop and deploy autonomous, adaptive, and user-centric intelligent solutions by integrating multi- paradigm programming constructs and transforming data into actionable knowledge to improve organizational outcomes across diverse domains.
PSO2	Analyze large-scale and complex datasets using advanced computational techniques to discover meaningful patterns, generate actionable insights, and support intelligent decision-making.

ABBREVIATION

PCC	**Programme Core Courses**
AEC	**Ability Enhancement Courses**
PEC	**Professional Elective Courses**
MDC	**Multidisciplinary Courses**
VAC	**Value Added Courses**
SEC	**Skill Enhancement Courses**
SI	**Summer Internship**
PRD	**Project Research Dissertation**

CURRICULUM STURUCTURE

B.Sc., Computer Science (Artificial Intelligence and Machine Learning) Three Years / BSc., (Hons) in Computer Science (Artificial Intelligence and Machine Learning) Four Years

Total number of Credits: 176

	B.Sc., Computer Science (Hons) Minimum Credits to be earned :176 B.Sc., Computer Science Minimum Credits to be earned: 132									
	SEMESTER 1									
			Hours/Week					Maximum Marks		
Category	Code	Course	L	T	P	SL	C	CIA	SEE	Total
AEC		Tamil-I / Hindi-I/ French-I	3	0	0	3	3	40	60	100
AEC		English-I	3	0	0	3	3	40	60	100
PCC		Object Oriented Programming using Python	3	0	0	3	3	40	60	100
PCC		Artificial Intelligence	4	0	0	4	4	40	60	100
MDC		Mathematics-I	2	1	0	3	3	40	60	100
PEC		Discipline Specific Elective – I	3	0	0	3	3	40	60	100
PCC (Lab)		Practical I - Python Programming	0	0	2	1	1	40	60	100
VAC		Universal Human Values	1	0	0	1	1	40	60	100
SEC		Orientation programme / Industrial Visit	-	-	-	-	-	-	-	-
			19	**1**	**2**	**-**	**21**	**-**	**-**	**-**

CIA - Continuous Internal Assessment **SEE - Semester End Examination**

***L – Lecture, *T- Tutorial, *P- Practical, * SL – Self – Learning**

SEMESTER 2										
			Hours/Week					Maximum Marks		
Category	Code	Course	L	T	P	SL	C	CIA	SEE	Total
AEC		Tamil-II / Hindi-II / French-II	3	0	0	3	3	40	60	100
AEC		English-II	3	0	0	3	3	40	60	100
PCC		Statistical Structure in Data using R	3	0	0	3	3	40	60	100
PCC		Data Structures using Python	3	0	0	3	3	40	60	100
MDC		Mathematics-II	2	1	0	3	3	40	60	100
PEC		Discipline Specific Elective - II	3	0	0	3	3	40	60	100
PCC (Lab)		Practical II - R Programming	0	0	2	1	1	40	60	100
PCC (Lab)		Practical III- Data Structures using Python	0	0	2	1	1	40	60	100
AEC		Communication Skills	0	0	4	2	2	-	100	100
			17	1	8	-	22	-	-	-

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SEMESTER 3										
			Hours/Week					Maximum Marks		
Category	Code	Course	L	T	P	SL	C	CIA	SEE	Total
VAC		Environmental Studies	3	0	0	3	3	40	60	100
PCC		Programming in Java	4	0	0	4	4	40	60	100
PCC		Advanced Data Base System	3	0	0	3	3	40	60	100
PEC		Discipline Specific Elective-III	3	0	0	3	3	40	60	100
PCC (Lab)		Practical IV - Programming in Java Lab	0	0	2	1	1	40	60	100
PCC (Lab)		Practical V - Advanced Data Base System Lab	0	0	2	1	1	40	60	100
VAC		Indian Knowledge System	2	0	0	2	2	40	60	100
SEC		Industry Oriented Employability skills	2	0	0	2	2	40	60	100
SEC		Professional Development – I	2	0	0	2	2	40	60	100
SI		Internship-I	0	0	2	1	1	-	100	100
SEC		Global Certification	-	-	-	-	1	-	-	100
			19	**-**	**6**	**-**	**23**	**-**	**-**	**-**

CIA -

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SEMESTER 4										
			Hours/Week					Maximum Marks		
Category	**Code**	**Course**	**L**	**T**	**P**	**SL**	**C**	**CIA**	**SEE**	**Total**
PCC		Statistics	2	1	0	3	3	40	60	100
PCC		Machine Learning and its Applications	4	0	0	4	4	40	60	100
MDC		Natural Language Processing	3	0	0	3	3	40	60	100
PEC		Discipline Specific Elective-IV	4	0	0	4	4	40	60	100
PCC (Lab)		Practical VI - Machine Learning using WEKA Lab	0	0	2	1	1	40	60	100
PCC (Lab)		Practical VII – Natural Language Processing Lab	0	0	2	1	1	40	60	100
SEC		Entrepreneurship Development	1	0	2	2	2	40	60	100
SEC		Professional Development – II	2	0	0	2	2	40	60	100
VAC		Yoga Education / National Service Scheme/Disaster Management	0	0	4	2	2	-	100	100
SEC		In-plant Training/ Industrial Tour/ Summer Term	-	-	-	-	-	-	-	-
			16	**1**	**10**	**-**	**22**	**-**	**-**	**-**

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SEMESTER 5										
			Hours/Week					Maximum Marks		
Category	Code	Course	L	T	P	SL	C	CIA	SEE	Total
PCC		Programming in MATLAB	3	0	0	3	3	40	60	100
PCC		Data Visualization	4	0	0	4	4	40	60	100
PCC		Big Data Analytics	3	0	0	3	3	40	60	100
PEC		Discipline Specific Elective-V	4	0	0	4	4	40	60	100
PCC (Lab)		Practical VIII - Programming in MATLAB Lab	0	0	2	1	1	40	60	100
PCC (Lab)		Practical IX - Data Visualization Lab	0	0	2	1	1	40	60	100
SEC		Professional Development – III	1	0	2	2	2	40	60	100
VAC		Value Education	2	0	0	2	2	40	60	100
SI		Internship II	0	0	2	1	1	-	100	100
SEC		Skill Enhancement Training / Student Club Activities/ Institution Innovation Council Activities	-	-	-	-	-	-	-	-
			17	**-**	**8**	**-**	**21**	**-**	**-**	**-**

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SEMESTER 6										
			Hours/Week					Maximum Marks		
Category	Code	Course	L	T	P	SL	C	CIA	SEE	Total
PCC		Data Science using Python	3	0	0	3	3	40	60	100
PCC		Edge AI	4	0	0	4	4	40	60	100
PCC		Cognitive Computing	4	0	0	4	4	40	60	100
PCC		Robotics and its Applications	4	0	0	4	4	40	60	100
PEC		Discipline Specific Elective-VI	4	0	0	4	4	40	60	100
PCC (Lab)		Practical X - Data Science using Python Lab	0	0	2	1	1	40	60	100
PRD		Mini Project	2	0	0	2	2	-	100	100
SEC		On Job Training / Apprenticeship / Startup	0	0	4	1	1	-	100	100
			21	-	**6**	-	**23**	-	-	-

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SEMESTER 7										
			Hours/Week					Maximum Marks		
Category	Code	Course	L	T	P	SL	C	CIA	SEE	Total
PCC		Mobile Application Development for Machine Learning	3	0	0	3	3	40	60	100
PCC		Neural Networks	4	0	0	4	4	40	60	100
PCC		Deep Learning	4	0	0	4	4	40	60	100
PEC		Discipline Specific Elective-VII	4	0	0	4	4	40	60	100
PCC (Lab)		Practical XI - Mobile Application Development for Machine Learning Lab	0	0	2	1	1	40	60	100
PRD		Research Project I	0	0	12	6	6	40	60	100
			15	**-**	**14**	**-**	**22**	**-**	**-**	**-**

CIA - Continuous Internal Assessment SEE - Semester End Examination

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SEMESTER 8										
			Hours/Week					Maximum Marks		
Category	Code	Course	L	T	P	O	C	CIA	SEE	Total
PCC		Introduction to Reinforcement Learning	3	0	0	3	3	40	60	100
PCC		Cloud Computing	3	0	0	3	3	40	60	100
PCC		Pattern Recognition	4	0	0	4	4	40	60	100
PEC		Discipline Specific Elective-VIII	4	0	0	4	4	40	60	100
PCC (Lab)		Practical XII - Introduction to Reinforcement Learning Lab	0	0	2	1	1	40	60	100
PCC (Lab)		Practical XIII - Cloud Computing Lab	0	0	2	2	1	40	60	100
PRD		Research Project II	0	0	12	6	6	-	60	100
			14	**-**	**16**	**-**	**22**	**-**	**-**	**-**

CIA - Continuous Internal Assessment SEE - Semester End Examination

***L – Lecture, *T- Tutorial, *P- Practical, * SL – Self – Learning**

PROGRAMME CORE COURSES

Category	Code	Course	L	T	P	SL	C
PCC		Object Oriented Programming using Python	3	0	0	3	3
PCC		Artificial Intelligence	4	0	0	4	4
PCC (Lab)		Practical I - Python Programming	0	0	2	1	1
PCC		Statistical Structure in Data using R	3	0	0	3	3
PCC		Data Structures using Python	3	0	0	3	3
PCC (Lab)		Practical II - R Programming	0	0	2	1	1
PCC (Lab)		Practical III- Data Structures using Python	0	0	2	1	1
PCC		Programming in Java	4	0	0	4	4
PCC		Advanced Data Base System	3	0	0	3	3
PCC (Lab)		Practical IV - Programming in Java Lab	0	0	2	1	1
PCC (Lab)		Practical V - Advanced Data Base System	0	0	2	1	1
PCC		Machine Learning and its Applications	4	0	0	4	4
PCC		Natural Language Processing	3	0	0	3	3
PCC (Lab)		Practical VI -Machine Learning using WEKA	0	0	2	1	1
PCC (Lab)		Practical VII – Natural Language Processing	0	0	2	1	1
PCC		Programming in MATLAB	3	0	0	3	3
PCC		Data Visualization	4	0	0	4	4

PCC		Big Data Analytics	3	0	0	3	3
PCC		Practical VIII - Programming in MATLAB	0	0	2	1	1
PCC (Lab)		Practical IX - Data Visualization	0	0	2	1	1
PCC (Lab)		Data Science using Python	3	0	0	3	3
PCC		Edge AI	4	0	0	4	4
PCC		Cognitive Computing	4	0	0	4	4
PCC		Robotics and its Applications	4	0	0	4	4
PCC		Data Science using Python	0	0	2	1	1
PCC (Lab)		Mobile Application Development for Machine Learning	3	0	0	3	3
PCC		Neural Networks	4	0	0	4	4
PCC		Deep Learning	4	0	0	4	4
PCC		Mobile Application Development for Machine Learning	0	0	2	1	1
PCC (Lab)		Introduction to Reinforcement Learning	3	0	0	3	3
PCC		Cloud Computing	3	0	0	3	3
PCC		Pattern Recognition	4	0	0	4	4
PCC (Lab)		Introduction to Reinforcement Learning	0	0	2	1	1
PCC (Lab)		Cloud Computing Lab	0	0	2	1	1

PROFESSIONAL ELECTIVE COURSES

Category	Code	Course	L	T	P	SL	C
PEC		Introduction to Cyber Security	3	0	0	3	3
		Information Security					
PEC		Operating Systems	3	0	0	3	3
		Process Management					
PEC		Ethical Hacking	3	0	0	3	3
		Network Security					
PEC		Time Series and Forecasting	4	0	0	4	4
		Marketing Analysis					
PEC		Internet of Things	4	0	0	4	4
		Business Intelligence and Analytics					
PEC		Social Media Analytics	4	0	0	4	4
		Client Relationship Management					
PEC		Games and information	4	0	0	4	4
		Security Issues in Machine Learning					
PEC		Block Chain Technology	4	0	0	4	4
		Design Thinking					

ABILITY ENHANCEMENT COURSES

Category	Code	Course	L	T	P	SL	C
AEC		Tamil I / Hindi I/ French I	3	0	0	3	3
AEC		English I	3	0	0	3	3
AEC		Tamil II / Hindi II / French II	3	0	0	3	3
AEC		English II	3	0	0	3	3
AEC		Communication Skills	0	0	4	2	2

MULTIDISCIPLINARY COURSES

Category	Code	Course	L	T	P	SL	C
MDC		Mathematics- I	2	1	0	3	3
MDC		Mathematics – II	2	1	0	3	3
MDC		Statistics-IV	2	1	0	3	3

VALUE ADDED COURSES

Category	Code	Course	L	T	P	SL	C
VAC		Universal Human Values	1	0	0	1	1
VAC		Environmental Studies	3	0	0	3	3
VAC		Indian Knowledge System	2	0	0	2	2
VAC		Yoga Education / National Service Scheme/Disaster Management	0	0	2	1	1
VAC		Value Education	2	0	0	2	2

SKILL ENHANCEMENT COURSES

Category	Code	Course	L	T	P	SL	C
SEC		Orientation programme / Industrial Visit	-	-	-	-	-
SEC		Industry Oriented Employability skills	2	0	0	2	2
SEC		Professional Development – I	2	0	0	2	2
SEC		Global Certification	-	-	-	-	1
SEC		Entrepreneurial Development	1	0	2	2	2
SEC		Professional Development – II	2	0	0	2	2
SEC		In-plant Training/ Industrial Tour/ Summer Term	-	-	-	-	-
SEC		Professional Development – III	2	0	0	2	2
SEC		Skill Enhancement Training / Student Club Activities/	-	-	-	-	-

		Institution Innovation Council Activities					
SEC		Mini Project	2	0	0	2	2
SEC		On Job Training / Apprenticeship / Startup	0	0	4	1	1

SUMMER INTERNSHIP

Category	Code	Course	L	T	P	SL	C
SI		Internship I	0	0	2	1	1
SI		Internship II	0	0	2	1	1

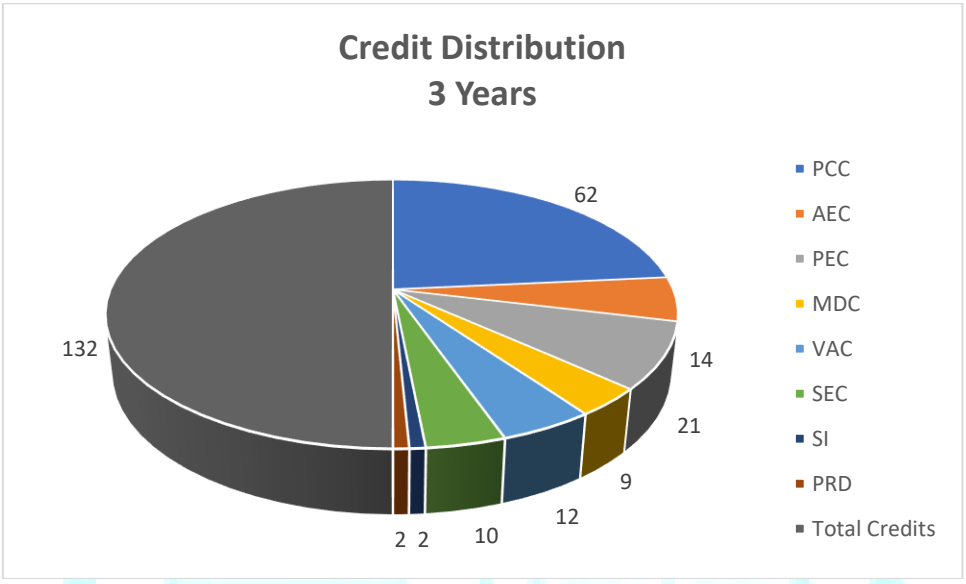
PROJECT RESEARCH DESSERTATION

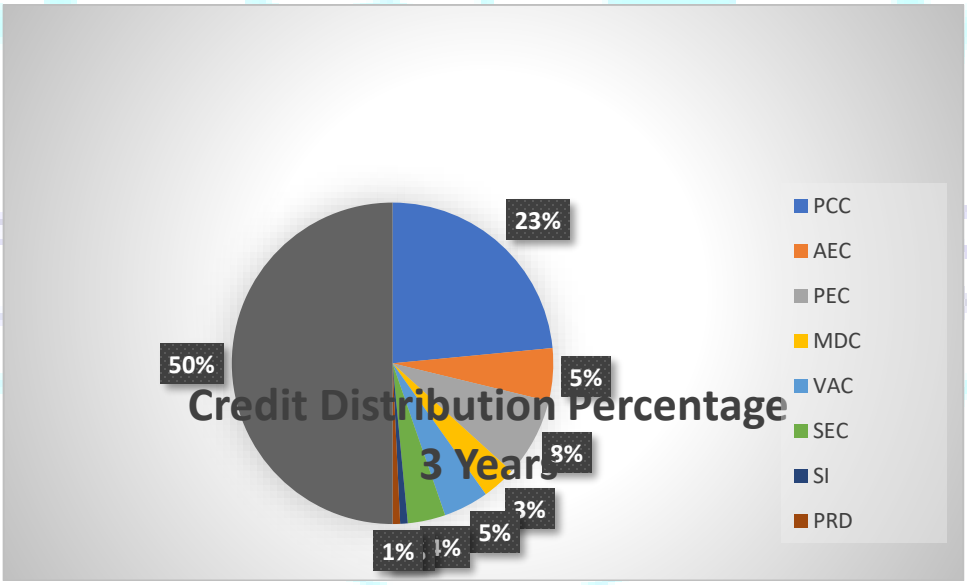
Category	Code	Course	L	T	P	SL	C
PRD		Mini Project	2	0	0	2	2
PRD		Research Project I	0	0	12	6	6
PRD		Research Project II	0	0	12	6	6

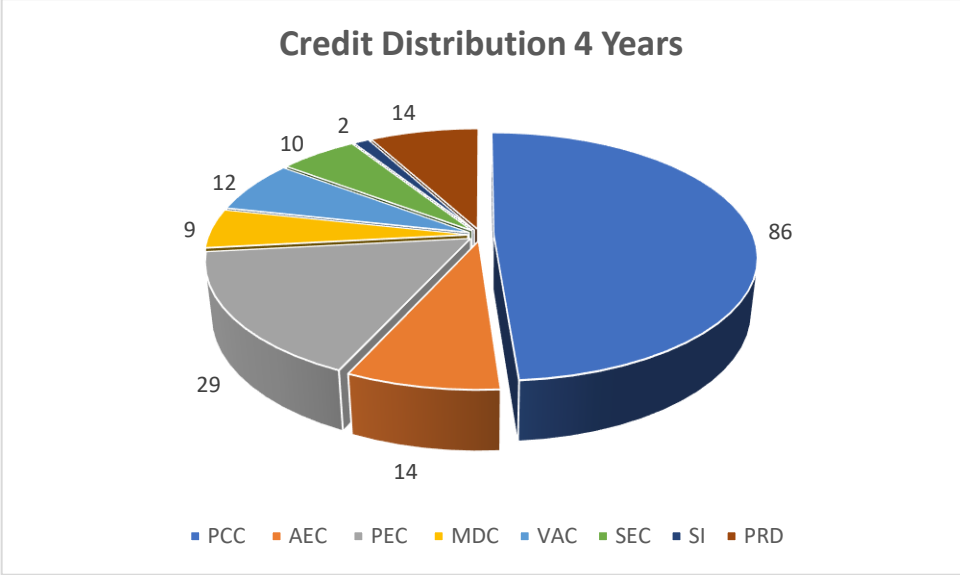
CREDIT DISTRIBUTION

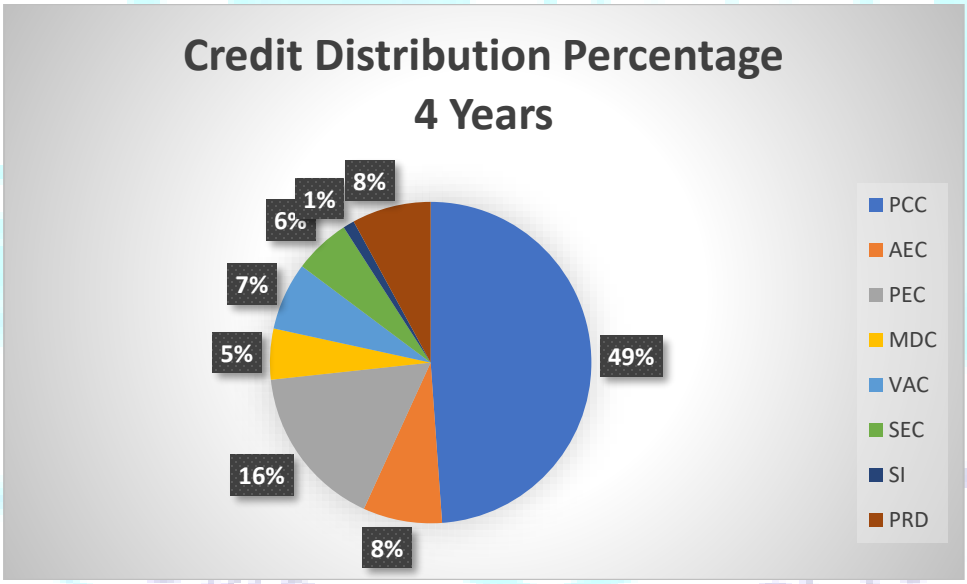
B.Sc., (Hons) in Computer Science (Artificial Intelligence and Machine Learning) Minimum credits to be earned: 176
B.Sc., Computer Science (Artificial Intelligence and Machine Learning) Minimum credits to be earned: 132

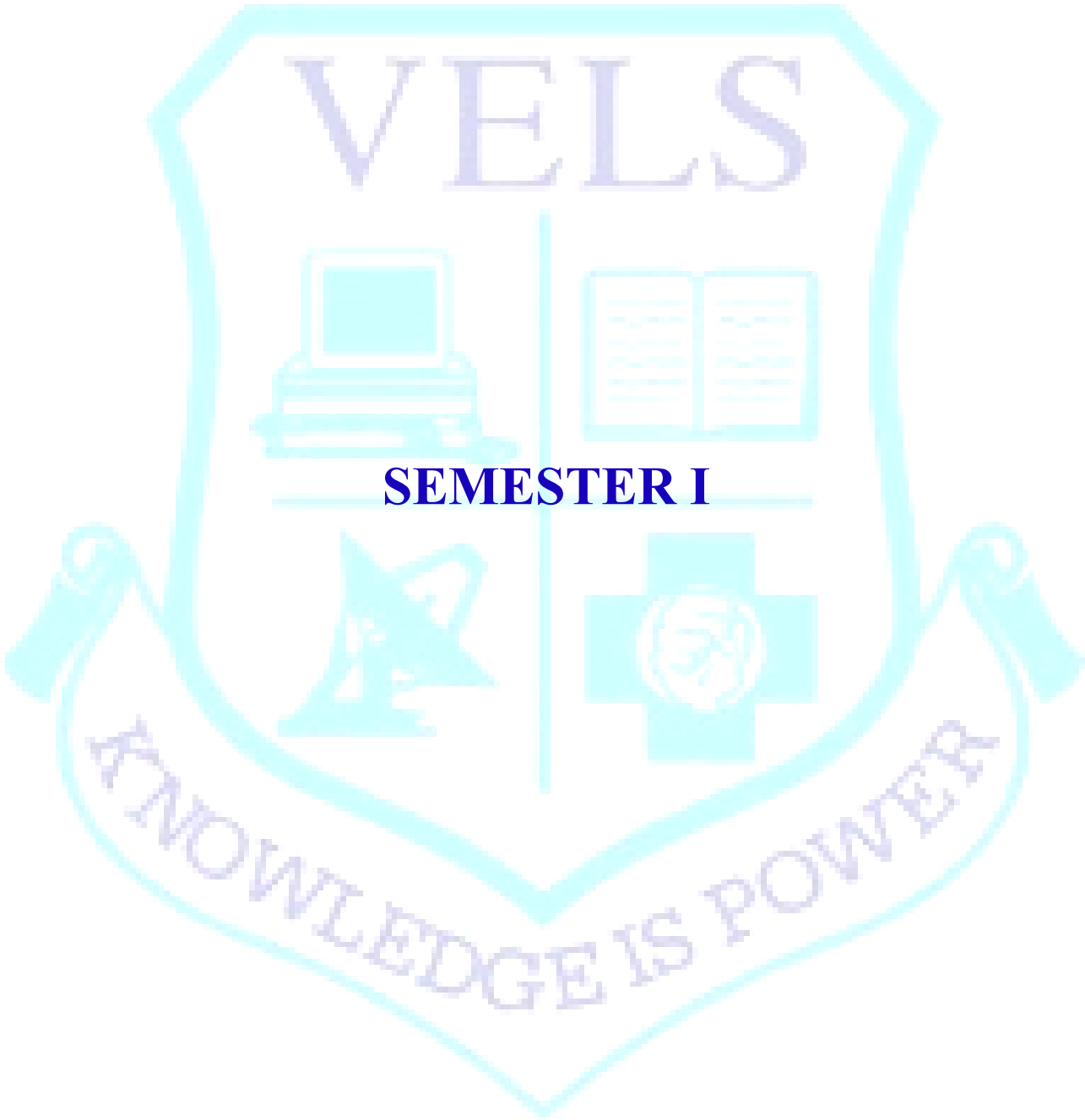
Component	I Sem	II Sem	III Sem	IV Sem	V Sem	VI Sem	3 Yrs. Total Credits	VII Sem	VIII Sem	4 Yrs Total Credits
PCC	8	8	9	9	12	16	62	12	12	86
AEC	6	8	-	-	-	-	14	-	-	14
PEC	3	3	3	4	4	4	21	4	4	29
MDC	3	3	-	3	-	-	9	-	-	9
VAC	1	-	7	2	2	-	12	-	-	12
SEC	-	-	3	4	2	1	10	-	-	10
SI	-	-	1	-	1	-	2	-	-	2
PRD	-	-	-	-	-	2	2	6	6	14
Total Credits	21	22	23	22	21	23	132	22	22	176


Credit Distribution
3 Years
62
14
21
9
12
10
2
2
132
PCC
AEC
PEC
MDC
VAC
SEC
SI
PRD
Total Credits


23%
5%
8%
3%
5%
1%
50%
Credit Distribution Percentage
3 Years
PCC
AEC
PEC
MDC
VAC
SEC
SI
PRD


Credit Distribution 4 Years
14
2
10
12
9
86
29
14
PCC
AEC
PEC
MDC
VAC
SEC
SI
PRD


Credit Distribution Percentage
4 Years
8%
1%
6%
7%
5%
49%
16%
8%
PCC
AEC
PEC
MDC
VAC
SEC
SI
PRD



SEMESTER I

	TAMIL-I	L	T	P	SL	C
		3	0	0	3	3

COURSE OBJECTIVES

மாணவர்களின் தமிழ்மொழித் திறத்தை மேம்படுத்துதல், சங்க இலக்கிய நாட்டத்தை மேம்படுத்துதல், நீதி இலக்கியங்கள் வழி அறக் கருத்துகளை இன்றைய தலைமுறையினர் அறியச் செய்தல், இலக்கிய வடிவங்களான உரைநடை சிறுகதை ஆகியவற்றின் சமூக நிலை குறித்து அறியச் செய்தல், மாணவர்களுக்குத் தமிழைத் தவறின்றி எழுதுவதற்குத் தேவையான பயிற்சி அளித்து அவர்களின் மொழித்திறனை மேம்படுத்துதல், கலைச்சொற்கள் போன்ற தமிழ் மொழியின் வளர் நிலைகளை அறிமுகம் செய்தல் போன்றன இந்தப் பாடத்திட்டத்தின் முக்கிய நோக்கமாகும்.

UNIT I	அலகு- 1: தமிழ் மொழி வரலாறு	10 Hours

அலகு- 1: தமிழ் மொழி வரலாறு

மொழிக்குடும்பம் - இந்திய மொழிக்குடும்பங்கள் - இந்திய ஆட்சி மொழிகள் - திராவிட மொழிக்குடும்பங்கள் - திராவிட மொழிகளின் வகைகள் -திராவிட மொழிகளின் சிறப்புகள் - திராவிட மொழிகளின் வழங்கிடங்கள் - திராவிட மொழிகளுள் தமிழின் இடம் - தமிழ்மொழியின் சிறப்புகள் - தமிழ் பிறமொழித் தொடர்புகள்.

UNIT II	அலகு- 2: சங்க இலக்கியங்கள்	9 Hours

புறநானூறு- பாடல் எண்: 195 (பல்சான்றீரே) 192 (யாதும் ஊரே) 188 (படைப்பு பல) குறுந்தொகை- பாடல் எண்: 03 (நிலத்தினும்) 131 (ஆடமை புரையும்) 57(பூவிடைப்படினும்) 202 (நோம் என் நெஞ்சே) 167 (முளிதயிர்) நெடுநல்வாடை: பாடல் வரிகள் 45 முதல் 72 வரை

UNIT III	அலகு - 3 அற இலக்கியங்கள்	9 Hours

திருக்குறள் அறன் வலியுறுத்தல் (அறம்), நட்பாராய்தல் (பொருள்), குறிப்பறிதல்(இன்பம்),. மூன்று அதிகாரங்கள் முழுமையும் நாலடியார் - பாடல் எண்: 139 (கல்லாரே ஆயினும்) 248 (நண்ணிலைக்கான்) 216 (கடையாயர்) ஔவையார் - மூதுரை- பாடல் எண்- 10 (நெல்லுக்கு இறைத்தநீர்), - பாடல் எண்- 16 (அடக்கமுடையார்)

UNIT IV	அலகு - 4 உரைநடை	9 Hours
சிற்பியே உன்னைச் செதுக்குகிறேன் - வைரமுத்து - லட்சியம்,கல்வி, கலை, உறவு, மொழி,சாதனை ஆகிய தலைப்பிலான கட்டுரைகள் சிறுகதை புதுமைப்பித்தன் - சாபவிமோசனம் ஜெயகாந்தன் - ஒரு பிடி சோறு		
UNIT V	**அலகு 5 மொழித்திறன்**	**8 Hours**
பிழை நீக்கி எழுதுதல் - ஒற்றுப்பிழை நீக்கி எழுதுதல் - தொடர்பிழை நீக்கி எழுதுதல் கலைச்சொல்லாக்கம் - தேவைகள் - கலைச்சொற்களின் பண்புகள் அறிவியல் கலைச்சொற்கள். கடிதம் - வகைகள் - அலுவலகக் கடிதங்கள் - பயிற்சி		

Total: 45 Hours

Self-Learning: 45 Hours

பார்வை நூல்கள்

1. திராவிட மொழிகள் (இரண்டு தொகுதிகள்) டாக்டர் ச.அகத்தியலிங்கம் மணிவாசகர் பதிப்பகம் 2021

2. சங்க இலக்கிய உரை என் சி பி எச் சென்னை 2010

3. திருக்குறள் தெளிவுரை வரதராசன், மு., கழக வெளியீடு, 1994.

4. தவறின்றித் தமிழ் எழுத - மருதூர் அரங்கராசன், ஐந்திணைப் பதிப்பகம், 2003.

5. சிற்பியே உன்னை செதுக்குகிறேன் வைரமுத்து சூர்யா லிட்ரேச்சர் சென்னை 2011

6. **பாடநூல் தேடலுக்கான இணையம் -** https://archive.org/

7. https://tamildigitallibrary.in/Articles/

COURSE OUTCOMES:

After completion of the course, the student will be able to,

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	தமிழ் மொழியின் வரலாறு, மொழிக்குடும்பம், திராவிட மொழிகளின் வகைகள் மற்றும் தமிழ்மொழியின் சிறப்புகளை விளக்க முடியும்	K2
CO2	புறநானூறு, குறுந்தொகை, நெடுநல்வாடை ஆகிய சங்க இலக்கியப் பாடல்களின் கருத்து, பண்பாட்டு மற்றும் சமூக முக்கியத்துவத்தைப் புரிந்து விளக்க முடியும்.	K3
CO3	திருக்குறள், நாலடியார், மூதுரை ஆகிய அற இலக்கியங்களில் காணப்படும் அறநெறி, ஒழுக்கம் மற்றும் வாழ்வியல் கருத்துகளைப் பகுப்பாய்வு செய்ய முடியும்	K4
CO4	வைரமுத்துவின் உரைநடை கட்டுரைகள், புதுமைப்பித்தன் மற்றும் ஜெயகாந்தன் சிறுகதைகளில் காணப்படும் சமூகச் சிந்தனை, மனிதநேயம் மற்றும் இலக்கியப் பண்புகளை மதிப்பீடு செய்ய முடியும்.	K4
CO5	பிழையின்றித் தமிழ் எழுதுதல், கலைச்சொற்கள், அறிவியல் கலைச்சொற்கள் மற்றும் அலுவலகக் கடிதம் எழுதுதல் போன்ற மொழித்திறன்களை நடைமுறையில் பயன்படுத்த முடியும்.	K4

COURSE ARTICULATION MATRIX

COs / POs-PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PSO1	PSO2
CO1	–	–	–	–		3	2	–	–	–
CO2	–	–	–	–	2	3	-	2	–	–
CO3	–	–	–	–	3	-	3	2	-	-
CO4	–	–	–	–	3	2	-	3	-	-
CO5	–	–	–	–	-	3	3	–	-	-
Avg	–	–	–	–	2.6	2.8	2.6	2.3	-	-

	HINDI-I	L	T	P	SL	C
		3	0	0	3	3

COURSE OBJECTIVES:

- To improve students' proficiency in the Hindi language, to increase their interest in prose literature,
- To make the present generation aware of moral values, social limits through various genre of Hindi prose
- To improve students' language proficiency by giving them the necessary training to write error-free correspondence, and to familiarize them with technical terminology and updated language technology.

UNIT I	हिन्दी साहित्य का इतिहास	9 Hours

इकाई/UNIT I : हिन्दी साहित्य का इतिहास - काल विभाजन - गद्य विकास -सामान्य परिचय, कहानी - लॉटेरी (मुंशी प्रेमचंद), भाव एक, भाषा अनेक (देश भक्ति और राष्ट्रीय एकता) - विभिन्न भारतीय संस्कृति एवं प्रदेशों के परिचय History of Hindi Literature – Periodization – Development of Prose – General Introduction, Short Story – "Lottery" (Munshi Premchand), "One Emotion, Many Languages" (Patriotism and National Integration) – Introduction to various Indian cultures and regions.

UNIT II	एकाँकी	9 Hours

इकाई/UNIT II : एकाँकी - अखबारी विज्ञापन (चिरंजीत) - भाषा कौशल विकास -प्रयोजनमूलक हिन्दी - तकनीकी शब्द, पद एवं विभागीय नाम, प्रशासनिक वाक्यांश One-Act Play – "Newspaper Advertisement" (Chiranjit) – Development of Language Skills – Functional Hindi – Technical Terms, Designations and Departmental Names, Administrative Phrases

UNIT III	हास्य व्यंग्य कहानी	9 Hours

इकाई/UNIT III: हास्य व्यंग्य कहानी - तुम कब जाओगे, अतिथि (शरद जोशी) - प्रयोजनमूलक हिन्दी - पत्र लेखन - पत्रों के विभिन्न प्रकार - औपचारिक पत्र Humorous Satirical Story – "Tum Kab Jaoge, Atithi" (Sharad Joshi) – Functional Hindi – Letter Writing – Different Types of Letters – Formal Letters.

UNIT IV	राष्ट्र भक्ति कहानी	9 Hours
इकाई/UNIT IV: राष्ट्र भक्ति कहानी - पुरस्कार (जयशंकर प्रसाद) – प्रयोजनमूलक हिन्दी - पत्र लेखन- पत्रों के विभिन्न प्रकार - अनौपचारिक पत्र Patriotic Story – "Puraskaar" (Jaishankar Prasad) – Functional Hindi – Letter Writing – Different Types of Letters – Informal Letters.		
UNIT V	निबंध	9 Hours
इकाई/UNIT V : निबंध: भारतीय विज्ञान की कहानी (गुणाकार मुले) - विश्व के लिए भारत की देन, प्रयोजनमूलक हिन्दी - भाषा प्रौद्योगिकी – युनिकोड हिन्दी फ़ॉन्ट्स,इनस्क्रिप्ट कीबोर्ड - ई-पुस्तकालय – ई-शब्दकोश – ई-अध्ययन – व्यावहारिक उपयोग हेतु कृत्रिम बुद्धिमत्ता Essay: "The Story of Indian Science" (Gunakar Mule) – India's Contribution to the World – Functional Hindi – Language Technology – Unicode Hindi Fonts, Inscript Keyboard – e-Library – e-Dictionary – e-Learning – Artificial Intelligence for Practical Use		

Total: 45 Hours

Self-Learning: 45 Hours

संदर्भ ग्रन्थ/ Reference Books

1. Munshi Premchand: Mansarovar (Short Story Collection), Vol. 8 Hans Prakashan /
1. Saraswati Press / Prabhat Prakashan (various editions available)
2. Vyavaharik Hindi, Publisher: Rajpal & Sons, New Delhi
3. One-Act Play Collection, Lokbharti Prakashan, Prayagraj
4. Prayojanmoolak Hindi, Dr. Naresh Mishra / Dr. Kailash Chandra Bhatia,Rajkamal
5. Prakashan / Vani Prakashan
6. Sharad Joshi Vyangya Rachanavali, Vol. 1, Rajkamal Prakashan
7. Prasad Ki Shreshtha Kahaniyan, Lokbharti Prakashan
8. Vyavaharik Hindi Aur Patra Lekhan, Dr. Hardev Bahri, Kitab Mahal, Allahabad
9. Bharatiya Vigyan Ki Kahani – Gunakar Mule, Rajkamal Prakashan
10. Computer Aur Hindi Bhasha, Dr. Bholanath Tiwari, Vani Prakashan
11. Hindi Sahitya Ka Itihas, Ramchandra Shukla, Nagari Pracharini Sabha, Varanasi
12. Kendriya Hindi Sansthan, Banking Hindi Patyakram, 2012.

वेब लिंक्स/ Web Sources:

1. https://www.prabhatbooks.com
2. jhttps://vaniprakashan.com
3. https://www.rajkamalprakashan.com
4. https://home.unicode.org
5. https://home.unicode.org

COURSE OUTCOMES

After completion of the course, the student will be able to,

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Develop interest in Hindi language & literature , various culture of India	K2
CO2	Learn moral values in a lighter way & proficient in functional hindi	K3
CO3	Know the awareness about the social limitations	K2
CO4	Identify the importance of patriotism	K1
CO5	Analyze and produce structured functional Hindi content using modern technology tools.	K4

COURSE ARTICULATION MATRIX

COs / POs-PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PSO1	PSO2
CO1	–	–	–	–	-	3	-	–	–	–
CO2	–	–	–	–	3	-	-	2	–	–
CO3	–	–	–	–	3	-	2	2	-	-
CO4	–	–	–	–	2	3	3	-	-	-
CO5	–	–	–	–	-	2	3	3	-	-
Avg	–	–	–	–	2.6	2.6	2.6	2.3	-	-

	FRENCH–I	L	T	P	SL	C
		3	0	0	3	3

COURSE OBJECTIVES

- To greet, to express excuse and to introduce oneself
- To introduce another person
- To express his/her ideas, opinions and weekend projects
- To request someone to do something, polite manners
- To accept, refuse, enquire and indicate the time and date
- To express himself / herself in positive and negative manner

UNIT I	**Salut**	**6 Hours**
les nombres, Les jours de la semaine et du mois, La nationalité		
UNIT II	**Enchanté**	**8 Hours**
Les verbes Etre, Avoir, Aller, Regular ER verbes, Present tense.		
UNIT III	**J'Adore**	**8 Hours**
La negation, l'adjectif possessif, le futur proche		
UNIT IV	**Tu veux bien**	**10 Hours**
Les articles de finis/indéfinis, Les pronoms après une préposition (avec lui, chez moi), Le passé composé		
UNIT V	**On se voit quand**	**6 Hours**
Les pronoms compléments directs me, te, nous, vous, L'interrogation avec est-ce que, L'heure et la date.		
UNIT VI	**Bonne idée**	**7 Hours**
Les articles partitifs, Le masculin et le féminin des adjectifs, Les pronoms compléments directs le, la, les, La négation : ne… pas de.		

Total: 45 Hours

Self-Learning: 45 Hours

Text Books :

1. LATITUDES 1 (A1/A2) MÉTHODE DE FRANÇAIS - Régine Mérieux and Yves Loiseau

Reference Books:

1. SAISON A1 - MÉTHODE DE FRANÇAIS - Marie-Noëlle Cocton, Élodie Heu, Catherine Houssa, Émilie Kasazian

COURSE OUTCOMES:

After completion of the course, the student will be able to,

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Greet, excuse and introduce oneself in simple communication situations.	K2
CO2	Recall basic expressions used for introducing someone.	K1
CO3	Analyze and express ideas, opinions, and weekend activities in different contexts.	K4
CO4	Ask someone to do tasks in a polite and appropriate manner.	K3
CO5	Accept, refuse, enquire, and indicate time and date in everyday communication.	K3

COURSE ARTICULATION MATRIX

COs / POs-PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PSO1	PSO2
CO1	–	–	–	–	2	3	2	–	–	–
CO2	–	–	–	–	2	3	-	2	–	–
CO3	–	–	–	–	2	3	2	2	-	-
CO4	–	–	–	–	2	2	2	-	-	-
CO5	–	–	–	–	3	2	2	3	-	-
Avg	–	–	–	–	2.6	2.8	2.0	2.3	-	-

	ENGLISH–I	L	T	P	SL	C
		3	0	0	3	3

COURSE OBJECTIVES

- To develop an understanding of prose, poetry, and short stories.
- To enhance reading comprehension and critical thinking skills.
- To improve accuracy and clarity in language use.
- To build a rich and adequate vocabulary.
- To promote the use of digital tools for communication and presentation skills.

UNIT I	Grammar & Vocabulary	9 Hours

- Parts of Speech
- Subject – Verb Agreement
- Tenses
- Prefix and Suffix
- Spot the errors

UNIT II	Prose	9 Hours

- A.G. Gardiner – *On the Rule of the Road*
- Helen Keller – Excerpt from *The Story of My Life – Chapter IV*

Listening: Audio summary comprehension

Speaking: Discussion on freedom & learning

Reading: Passage comprehension

Writing: Reflective paragraph writing

UNIT III	Poetry	9 Hours

- William Wordsworth – *The Solitary Reaper*
- Rabindranath Tagore – *Where the Mind is Without Fear*

Listening: Infer the central idea of the poem.

Speaking: Sharing personal interpretation of the poem

Reading: Read aloud exercise

Writing: Critical Appreciation

UNIT IV	Short stories	9 Hours

- O. Henry – *The Gift of the Magi*
- R.K. Narayan – *An Astrologer's Day*

Listening: Story narration

Speaking: Retell the story

Reading: Silent reading and reflective reading

Writing: Summary & Character analysis

UNIT V	One-Act Play	9 Hours

- Douglas Turner Ward-*The Shirt*
- J. M. Synge-*Riders to the Sea*

Listening: Listening to dialogue delivery

Speaking: Role play and enactment

Reading: Character mapping and identification of key ideas

Writing: Dialogue writing & Short critical commentary

Total: 45 Hours

Self-Learning: 45 Hours

Text Books:

1. Naik, M. K., ed *Indian Prose in English: An Anthology*. Oxford University Press, 2001.
2. Greenblatt, Stephen, ed. *The Norton Anthology of English Literature*. 9th ed., W. W. Norton & Company, 2012.
3. Henry, O. *Selected Short Stories of O. Henry*. Penguin Classics, 2001.
4. Narayan, R. K. *Malgudi Days*. Indian Thought Publications, 1982.
5. Wren, P. C., and H. Martin. *High School English Grammar and Composition.* Revised ed., S. Chand & Company, 2009.
6. McCarthy, Michael, and Felicity O'Dell. *English Vocabulary in Use*. 4th ed., Cambridge University Press, 2017.

References:

1. Murphy, Raymond. *English Grammar in Use*. Cambridge University Press, 2019.
2. Strunk Jr., William, and E. B. White. *The Elements of Style*. 4th ed., Longman, 2000.
3. Quirk, Randolph, et al. *A Comprehensive Grammar of the English Language*. Longman, 1985.
4. Hacker, Diana, and Nancy Sommers. *The Bedford Handbook*. 11th ed., Bedford/St. Martin's, 2020.

Websites:

1. British Council. *LearnEnglish*. British Council, https://learnenglish.britishcouncil.org.
2. Duolingo. *Duolingo*. Duolingo Inc., https://www.duolingo.com.
3. BBC. *BBC Learning English*. BBC, https://www.bbc.co.uk/learningenglish.

COURSE OUTCOMES

After completion of the course, the student will be able to,

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Demonstrate understanding of prose, poetry, and short stories.	K2
CO2	Analyze reading comprehension texts and develop critical thinking skills.	K4
CO3	Apply language skills to improve accuracy and clarity in communication.	K3
CO4	Recall and use appropriate vocabulary in different contexts.	K1
CO5	Evaluate digital tools for effective communication and presentation skills.	K5

COURSE ARTICULATION MATRIX

COs / POs-PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PSO1	PSO2
CO1	–	–	–	–	-	-	2	2	–	–
CO2	–	–	–	–	2	3	3	-	–	–
CO3	–	–	–	–	3	2	3	3	-	-
CO4	–	–	–	–	-	-	-	3	-	-
CO5	–	–	–	3	3	3	3	3	-	-
Avg	–	–	–	3.0	2.6	2.6	2.8	2.8	-	-

	OBJECT ORIENTED PROGRAMMING USING PYTHON	L	T	P	SL	C
		3	0	0	3	3

COURSE OBJECTIVES:

Describe the Discipline Specific Course syntax and semantics of Python programming language, Discover the need for working with the strings and functions and to Infer the Object-oriented Programming concepts in Python.

UNIT- I	PARTS OF PYTHON PROGRAMMING LANGUAGE	9 Hours

Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, The type() function and Is Operator, Dynamic and Strongly Typed Language, Control Flow Statements, The if Decision Control Flow Statement, The if…else Decision Control Flow Statement, The if…elif…else Decision Control Statement, Nested if Statement, The while Loop, The for Loop, The continue and break Statements, Catching Exceptions Using try and except Statement, Functions, Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, The return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and kwargs, Command Line Arguments.

UNIT-II	STRINGS & DICTIONARIES	9 Hours

Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings, Lists, Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, The del Statement. Dictionaries: Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, The del Statement,Tuples and Sets, Creating Tuples, Basic Tuple Operations, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Tuple Methods, Using zip() Function, Sets, Set Methods, Traversing of Sets, Frozen set.

UNIT-III	FILES	9 Hours
Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, The Pickle Module, Reading and Writing CSV Files, Pythons 10 and OS. path Modules, Regular Expression Operations, Using Special Characters, Regular Expression Methods, Named Groups in Python Regular Expressions, Regular Expression with glob Module.		
UNIT – IV	OBJECT-ORIENTED PROGRAMMING, CLASSES AND OBJECTS	9 Hours
Creating Classes in Python, Creating Objects in Python, The Constructor Method, Classes with Multiple Objects, Class Attributes versus Data Attributes, Encapsulation, Inheritance, The Polymorphism.		
UNIT–V	CASE STUDY	9 Hours
Working with the sample Python programs – Using Functions, Strings, Dictionaries, Files and OOP Concepts.		

Total Hours: 45

Self Learning:45

COURSE OUTCOMES:

At the end of this course, students will be able to,

Course Outcome	Description	Bloom's Level
CO1	Explain the fundamental concepts, syntax, semantics, and control flow statements of Python programming language.	**K2**
CO2	Apply Python data structures such as strings, lists, tuples, dictionaries, and sets for solving computational problems	**K3**
CO3	Demonstrate file handling operations, regular expressions, and exception handling techniques in Python programs.	**K2**
CO4	Illustrate object-oriented programming concepts including classes, objects, inheritance, encapsulation, and polymorphism using Python.	**K2**
CO5	Develop Python applications using functions, files, data structures, and object-oriented programming concepts for real-world case studies	**K3**

COURSE ARTICULATION MATRIX

COs/POs/PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	2	-
CO2	-	3	2	-	-	-	-	2	2	-
CO3	3	2		-	3	-	-	-	-	-
CO4	-	-	3	2	-	-	2	-	2	
CO5	-	3	3	3	2	-	3	-	-	3
AVG	3	2.6	2.5	2.5	2.5	-	2.5	2	2	3

TEXT BOOKS:

1. Venkatesh, Nagaraju Y, Introduction to Python Programming, Khanna Publishing House, 2021.
2. Jeeva Jose, Introduction to Computing & Problem Solving With PYTHON, Khanna Publishing House, 2023.
3. Gowrishankar S, Veena A,(2018) "Introduction to Python Programming",1st Edition, CRC Press/Taylor &Francis, 2018. ISBN-13: 978-0815394372

REFERENCE BOOKS:

1. Jake VanderPlas, "Python Data Science Handbook: Essential Tools for Working with Data", 1st Edition, O'Reilly Media, 2016. ISBN-13:978-1491912058
2. Aurelien Geron, Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, O'Reilly Media, 2017. ISBN – 13: 978-1491962299.
3. Wesley J Chun, "Discipline Specific Course Python Applications Programming", 3rd Edition, Pearson Education India, 2015. ISBN-13: 978-9332655365
4. MiguelGrinberg, "Flask Web Development: Developing Web Applications with Python", 2nd Edition, O'Reilly Media, 2018. ISBN-13: 978-1491991732.

WEB RESOURCES:

1. https://www.electronicshub.org/basics-of-embedded-c-program/
2. https://www.mygreatlearning.com/blog/embedded-c/

	ARTIFICIAL INTELLIGENCE	L	T	P	SL	C
		4	0	0	4	4

COURSE OBJECTIVES:

To introduce the basic principles, techniques, and applications of Artificial Intelligence. Emphasis will be placed on the teaching of these fundamentals, not on providing a mastery of specific software tools or programming environments. Assigned projects promote a 'hands-on'approach for understanding, as well as a challenging avenue for exploration and creativity.

UNIT I	PROBLEM, PROBLEM SPACES AND SEARCH	12 Hours

What is AI? – AI Problems – What is an AI technique – Defining the problem as a state space search – Production system - Production system – Characteristics – Problem Characteristics?

UNIT II	HEURISTIC SEARCH TECHNIQUES	12 Hours

Generate and test – Hill Climbing – Best first Search – Problem Reduction – Constraints Satisfaction – Means end analysis.

UNIT III	KNOWLEDGE REPRESENTATION	12 Hours

Representations and Mappings – Approaches to Knowledge Representation. Using predicate Logic: Representing simple facts in logic – Computable functions and prediction – Resolution – The basic of resolution – Resolution in Propositional Logic – The Unification algorithm – Resolution in Predicate Logic.

UNIT IV	REPRESENTING KNOWLEDGE USING RULES	12 Hours

Procedural versus – Declarative Knowledge – logic Programming – Forward versus Backward Reasoning – Matching.

UNIT V	GAME PLAYING	12 Hours

The Minimax search procedure – Adding Alpha Beta cut offs – Addition Refinements – Waiting for Quiescence – Secondary Searches – Using Book moves.

COURSE OUTCOMES:

At the end of this course, students will be able to,

Course Outcome	Description	Bloom's Level
CO1	Explain the fundamental concepts of Artificial Intelligence, problem solving techniques, production systems, and state space search methods	**K2**
CO2	Apply heuristic search techniques such as hill climbing, best first search, problem reduction, and constraint satisfaction for solving AI problems.	**K3**
CO3	Illustrate various knowledge representation techniques using logic, predicate calculus, and resolution methods in Artificial Intelligence.	**K2**
CO4	Analyze reasoning mechanisms including logic programming, forward and backward reasoning, and rule-based knowledge representation systems.	**K4**
CO5	Demonstrate game playing strategies using minimax algorithm, alpha-beta pruning, and other search refinements in AI applications.	**K3**

COURSE ARTICULATION MATRIX

COs \ POs/PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO 2
CO1	3	2	-	-	-	-	-	-	-	2
CO2	2	3	2	-	2	-	-	-	2	-
CO3	-	2	-	-	-	-	-	2	-	3
CO4	2	-	3	2	-	-	2	-	2	-
CO5	-	3	3	3	3	-	3	-	-	3
AVG	2.3	2.5	2.6	2.5	2.5	-	2.5	2	2	2.6

TEXT BOOKS:

1. M.C. Trivedi, Introduction to AI and Machine Learning, Khanna Book Publishing Company, 2024.
2. Russell, S. and Norvig, P., "Artificial Intelligence - A Modern Approach", 3rd edition, Prentice Hall
3. Elain Rich Kevin knight "Artificial Intelligence" - Tata McGraw Hill.
4. Artificial Intelligence and Intelligent Systems – N.P.PADHY.

REFERENCE BOOKS:

1. Introduction to Artificial Intelligence Rajenda Akeskar PHI.
2. Artificial Intelligence by PH, Winston – Addison Wesley.
3. Introduction to Artificial Intelligence and Expert System by Patter

	MATHEMATICS-I	L	T	P	SL	C
		2	1	0	3	3

COURSE OBJECTIVES:

To learn various concept in matrix. To apply the concept of Sets to promote critical thinking, problem-solving technique and interdisciplinary connections. To analyse the relationships, decisions making and modeling complex systems using Partial Order Relations.

UNIT I	MATRICES & DETERMINANTS	9 Hours

Matrices: Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices, Adjoint, Inverse, Cramer's Rule, Rank of Matrix Dependence of Vectors. Determinants: Definition, Minors, Cofactors, Properties of Determinants.

UNIT II	SETS	9 Hours

Sets: Sets, Subsets, Equal Sets Universal Sets, Finite and Infinite Sets, Operation on Sets, Union, Intersection and Complements of Sets, Cartesian Product, Cardinality of Set, Simple Applications.

UNIT III	RELATIONS & FUNCTIONS	9 Hours

Relations: Properties of Relations, Equivalence Relation. Functions: Partial Order Relation Function: Domain and Range, Onto, Into and One to One Functions, Composite and Inverse Functions.

UNIT IV	PARTIAL ORDER RELATIONS	9 Hours

Partial Order Sets, Representation of POSETS using Hasse diagram, Chains, Maximal and Minimal Point, GLB, LUB.

UNIT V	NUMBER SYSTEM AND CONVERSIONS	9 Hours

Number Systems: Binary Numbers, Octal Numbers, Decimal numbers, Hexa Decimal numbers. Number base conversions: Octal and Hexa Decimal Numbers - Complements - Signed Binary Numbers - Binary Arithmetic - Binary Codes - Decimal Code

Total Hours: 45

Self Learning: 45

COURSE OUTCOMES:

At the end of this course, students will be able to,

Course Outcome	Description	Bloom's Level
CO1	Understand matrices and determinants including operations, inverse, rank, and properties.	**K1**
CO2	Explain sets and set operations such as union, intersection, complement, and Cartesian product.	**K2**
CO3	Apply relations and functions including equivalence relations, domain, range, and composition.	**K3**
CO4	Analyze partial order relations, Hasse diagrams, chains, GLB and LUB concepts.	**K4**
CO5	Evaluate number systems, conversions, binary arithmetic, and coding systems.	**K5**

COURSE ARTICULATION MATRIX

COs/POs/PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PSO1	PSO2	PSO3
CO1	3	2	2	–	2	3	2	–	–	–	3	2
CO2	3	2	2	–	2	3	2	–	–	–	3	2
CO3	3	3	3	–	2	3	2	2	–	–	3	2
CO4	3	3	3	–	2	2	2	2	–	–	2	2
CO5	3	3	3	–	2	3	2	2	–	–	3	2
AVG	**3.0**	**2.6**	**2.6**	–	**2.0**	**2.8**	**2.0**	**0.8**	–	–	**2.8**	**2.0**

Textbook

1. Kolman, Busby, Ross and Rehman (2003), Discrete Mathematical Structures for Computer Science, Pearson Education, 5th Edition

Reference Books

1. D.S. Malik and M.K. Sen(2004), Discrete Mathematical Structures: Theory and Applications, Thomson.
2. Goodaire & Parmenter (2000), Discrete Mathematics & Graph Theory, Pearson Education.
3. Kenneth H. Rosen, (2004), Discrete Mathematics and its Applications, Tata McGraw Hill, 5th Ed.
4. C.L. Liu (1986), Elements of Discrete Mathematics, 2nd Edition, McGraw Hill.

Web Links:

1. https://www.geeksforgeeks.org/mathematics-partial-oPPRDers-lattices/
2. https://www.ipsgwalior.org/download/number%20system.pdf

	PYTHON PROGRAMMING LAB	L	T	P	SL	C
		0	0	2	1	1

COURSE OBJECTIVES:

To implement Python programs with conditionals and loops. Also represent compound data using Python lists, tuples, dictionaries and Read and write data from/to files in Python.

LIST OF PROGRAMS:

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton's method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. First n prime numbers
8. Multiply matrices
9. Programs that take command line arguments (word count)
10. Find the most frequent words in a text read from a file
11. Simulate elliptical orbits in Pygame
12. Simulate bouncing ball using Pygame

Total: 15 Hours

Self Learning : 15 Hours

COURSE OUTCOMES:

At the end of this course, the student will be able to,

Course Outcome	Description	Bloom's Level
CO1	Understand and explain basic Python programming constructs and mathematical problem-solving techniques.	K2
CO2	Implement Python programs with conditionals and loops. Represent compound data using Python lists, tuples, dictionaries, turtles, files and modules	K3
CO3	Implement searching, sorting, file handling, and command-line operations using Python.	K3
CO4	Develop problem-solving skills using simulation and visualization tools like Pygame.	K4
C05	Develop integrated Python programs for real-world computational problems	K4

COURSE ARTICULATION MATRIX

COs/POs/PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	3	-	-	-	-	-	2	-	2	-
CO2	2	3	3	2		-	-	-	-	3
CO3	-	3	3		2	-	-	3	2	-
CO4	-	-	3	3	-	-	-	-		3
CO5	-	-	2	3	3	-	2	-	-	3
AVG	2.5	3	2.75	2.6	2.5		2	3	2	3

WEB RESOURCES:

http://interactivepython.org/courselib/static/pythonds

http://www.ibiblio.org/g2swap/byteofpython/read/

http://www.diveintopython3.net/

http://greenteapress.com/wp/think-python-2e/

	UNIVERSAL HUMAN VALUES	L	T	P	SL	C
		1	0	0	1	1

COURSE OBJECTIVES:

The candidates will be able to appreciate the complementarity between the values and skills for sustained happiness and prosperity. To influence the students to approach the life and profession with a holistic perspective towards a value-based living in a natural way. To highlight plausible implications of holistic understanding of ethical human conduct.

UNIT I	INTRODUCTION TO VALUE EDUCATION	5 Hours

Living a fulfilling life. Value education. Skill education. Complementarity of Values and Skills. Development of a holistic perspective. Right understanding, relationship and physical facility. Understanding the happiness and prosperity.

UNIT II	HARMONY AT MULTIPLE LEVELS	5 Hours

Human being as co-existence of the self and the human body. Understanding harmony in the self. Harmony in the family and understanding values in human-human relationships. Harmony in the society and understanding universal human order. Harmony in nature and understanding the interconnectedness, self-regulation and mutual fulfillment. Harmony in existencedot and understanding co-existence at various levels.

UNIT III	IMPLICATIONS OF THE RIGHT UNDERSTANDING	5 Hours

Ethical human conduct. Implications of value-based living. Right understanding of professional ethics. Humanistic education. Holistic technologies, production systems and management models. Strategies for transition towards value-based life and profession.

Total: 15 Hours
Self Learning : 15 Hours

COURSE OUTCOMES:

At the end of this course, the student will be able to,

Course Outcome	Description	Bloom's Level
CO1	Develop qualities like responsibility and the ability to handle problems with sustainable solutions.	K3
CO2	Appraise human values and the harmony at various levels	K4
CO3	Perceive a better critical ability.	K4
CO4	Develop qualities pertaining to value-based living	K3
C05	Apply what they have learnt to their own self in real life settings.	K3

COURSE ARTICULATION MATRIX

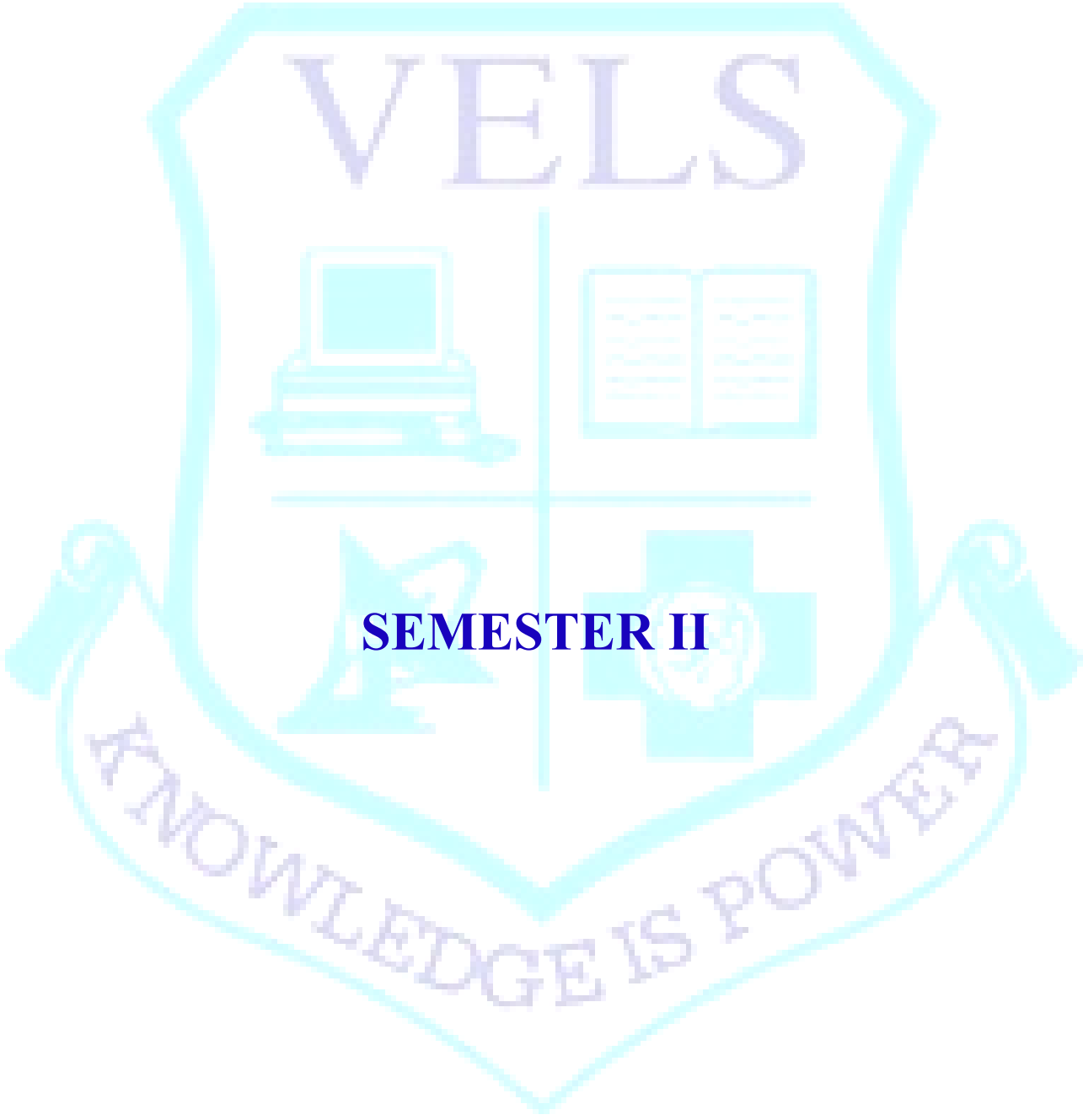
COs/POs/PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	2	-	-	-	-	3	3	-	2	-
CO2	3	2	-	2	-	3	-	3	-	2
CO3	2	3	3	3	-	-	-	2	2	-
CO4	-	2	2	-	-	3	-	3		2
CO5	-	-	2	-	3	-	2	-	3	3
AVG	2.33	2.33	2.33	2.5	3.0	3.0	2.5	2.67	2.33	2.33

Text Books:

1. R.R. Gaur, R. Asthana, G.P. Bagaria. (2023). A Foundation Course in Human Values and Professional Ethics. 3rd Revised Edition. Excel Books, New Delhi.

Reference Books:

1. Nagaraj, Jeevan Vidya Prakashan, Amar Kantak. Jeevan Vidya (1999), Ek Parichaya
2. Rakesh Gupta. Jeevan Vidya (2008), An Introduction (Introductory Book to Madhyasth Darshan-Coexistentialism). English Version.
3. . N. Tripathi (2004), Human Values. First Edition. New Age International Publishers, New Delhi



SEMESTER II

	TAMIL–II	L	T	P	SL	C
		3	0	0	3	3

பாடத்திட்ட நோக்கம்:

மாணவர்களிடம் தமிழரின் நாகரிகம் மற்றும் பண்பாட்டு மரபினை அறிமுகம் செய்தல் தமிழ் இலக்கிய காப்பியச் செழுமையையும் பக்தி இலக்கிய மாண்பையும் உணர்த்துதல், தமிழ்க் கவிதை வளத்தையும் அதன் பொருண்மைகளையும் எடுத்துரைத்தல், ஊடகம்- கணினி- செயற்கை நுண்ணறிவு போன்ற நவீன அறிவுசார் வளர்ச்சி நிலைகளைப் பயன்பாட்டு நோக்கில் பயிற்சியளித்தல், இதன் வாயிலாக மாணவர்களின் ஆளுமைத் திறனை மேம்படுத்தி அவர்களை போட்டித் தேர்வுகளுக்கு தயார் செய்வதும் வேலைவாய்ப்பிற்கான பயிற்சி அளிப்பதும் இந்தப்

அலகு 1	தமிழர் வாழ்வும் பண்பாடும்	9 மணி நேரம்

பண்பாடு - வாழ்வியல் முறை - அகம், புறம் - உணவு முறை - விருந்தோம்பல் - நம்பிக்கைகள் - விழாவும் வழிபாடும் - கலைகள் - கட்டடம் - சிற்பம் - ஓவியம் - இசை - கூத்து - தொழிலும் வணிகமும் - அறிவியல் நோக்கு.

அலகு 2	காப்பியங்கள்	9 மணி நேரம்

1. சிலப்பதிகாரம் - ஆய்ச்சியர் குரவை
2. மணிமேகலை- காதை 19 - உலக அறவி புக்க காதை
3. கம்பராமாயணம் - மந்தரை சூழ்ச்சிப் படலம் (பாடல் எண் தேர்ந்தெடுக்கப்பட்ட 9 பாடல்கள்)

அலகு 3	பக்தி இலக்கியம்	9 மணி நேரம்

திருமூலர் - திருமந்திரம் - மூன்று பாடல்கள்

- ✓ உடம்பார் அழியின் உயிரார் அழிவர் (திருமந்திரம்: 724)
- ✓ மனையுள் இருந்தவர் மாதவர் ஒப்பர் (திருமந்திரம்:47)
- ✓ மரத்தை மறைத்தது மாமத யானை (திருமந்திரம்: 2290)

தேம்பாவணி - காட்சிப் படலம் முதல் 5 பாடல்கள்

சீறாப்புராணம் - மானுக்கு பிணை நின்ற படலம்

அலகு 4	கவிதை இலக்கியம்	9 மணி நேரம்

- பாரதியார் - செந்தமிழ் நாடு- செந்தமிழ் நாடெனும் போதினிலே எனும் கவிதை (பாடல் எண்1.6, 7, 8, 9, 10)
- பாரதிதாசன் - இசையமுது- "தூய்மை சேரடா தம்பி" என்று தொடங்கும் பாடல்
- கவிக்கோ அப்துல்ரகுமான் - ஆலாபனை- போட்டி எனும் தலைப்பில் அமைந்த கவிதை
- நா.முத்துக்குமார் - பட்டாம்பூச்சி விற்பவன்- தூர் எனும் தலைப்பில் அமைந்த கவிதை
- இளம்பிறை - நீ எழுத மறுக்கும் எனதழகு - அம்மா எனும் தலைப்பில் அமைந்த கவிதை

அலகு 5	ஊடகத் தமிழ் – கணினித் தமிழ் அறிமுகம்	9 மணி நேரம்

ஊடகத் தமிழ்: இதழியல் - ஊடக வகைகள் - அச்சு ஊடகங்கள் - மின்னணு ஊடகம் - ஊடகங்களில் தமிழ், ஊடகங்களின் மொழி நடை - வானொலி- தொலைக்காட்சி- திரைப்படம்.

கணினித் தமிழ்: கணினியும் தமிழும், தமிழ் மென்பொருள்கள் (Tamil software) - எழுத்துருக்கள் (Fonts) - இணையமும் தமிழ்ப் பயன்பாடும் - மின்னூலகம் (Online e-Library), மின்னகராதி (e-Dictionary), - மின்வழிக் கற்றல்

மொத்தம்; 45 மணிநேரம்
சுய கற்றல்: 45 மணிநேரம்

பார்வை நூல்கள்

1. தமிழர் நாகரிகமும் பண்பாடும், டாக்டர் அ. தட்சிணாமூர்த்தி, ஐந்திணைப் பதிப்பகம், 2001.
2. இதழியல் கலை, டாக்டர் மா. பா. குருசாமி, குரு - தேமொழி பதிப்பகம், திண்டுக்கல், 1998.
3. கணிப்பொறியில் தமிழ், த.பிரகாஷ், பெரிகாம், 2011.
4. .தமிழ்க் கணினி இணையப் பயன்பாடுகள், முனைவர் துரை. மணிகண்டன், மணிவானதி பதிப்பகம், 2013.
5. அச்சுக் கலை வழிகாட்டி, பாலசுப்பிரமணியன், ஆ. சென்னை: தனசு பதிப்பகம், 1966

.பாடநூல் தேடலுக்கான இணையம்
http://www.tamilvu.org/courses/nielit/Chapters/Chapter1/11.pdf

COURSE OUTCOMES:

After completion of the course, the student will be able to:

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	தமிழரின் வாழ்வியல், பண்பாடு, உணவு முறை, விருந்தோம்பல், நம்பிக்கைகள், கலைகள், தொழில், வணிகம் மற்றும் அறிவியல் நோக்கு ஆகியவற்றை விளக்க முடியும்.	K2
CO2	சிலப்பதிகாரம்மணிமேகலை, கம்பராமாயணம் போன்ற தமிழ் காப்பியங்களின் இலக்கியச் சிறப்புகளையும் கருத்துகளையும் புரிந்து விளக்க முடியும்.	K2
CO3	சிலப்பதிகாரம், மணிமேகலை, கம்பராமாயணம் போன்ற தமிழ் காப்பியங்களின் இலக்கியச் சிறப்புகளையும் கருத்துகளையும் புரிந்து விளக்க முடியும்.	K4
CO4	பாரதியார், பாரதிதாசன், அப்துல் ரகுமான், நா. முத்துக்குமார், இளம்பிறை ஆகியோரின் கவிதைகளில் உள்ள சமூகச் சிந்தனை, மொழிநயம் மற்றும் கருத்துப் பொருளை மதிப்பீடு செய்ய முடியும்.	K5
CO5	ஊடகத் தமிழ், கணினித் தமிழ், தமிழ் மென்பொருள்கள், இணையத் தமிழ் பயன்பாடு, மின்னூலகம், மின்னகராதி, மின்வழிக் கற்றல் மற்றும் செயற்கை நுண்ணறிவு பயன்பாடுகளை நடைமுறையில் பயன்படுத்த முடியும்.	K3

COURSE ARTICULATION MATRIX

COs / POs-PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PSO1	PSO2
CO1	–	–	–	–		3	2	–	–	–
CO2	–	–	–	–	2	3	-	2	–	–
CO3	–	–	–	–	3	-	3	2	-	-
CO4	–	–	–	-	3	2	-	3	-	-
CO5	–	–	–	–	-	3	3	–	-	-
Avg	–	–	–	-	2.6	2.8	2.6	2.3	-	-

	HINDI–II	L	T	P	SL	C
		3	0	0	3	3

COURSE OBJECTIVES:

- To introduce students to Hindi and Indian civilization and cultural heritage
- To make them understand the richness of Hindi and Indian epics and the greatness of devotional literature
- To provide practical training in modern intellectual developments such as translation, advertisement and to develop students' skills, for competitive examinations, and provide employment-oriented training are the major objectives of this syllabus.

UNIT I	हिन्दी साहित्य का इतिहास	9 hours

हिन्दी साहित्य का इतिहास - आदि काल, मध्यकाल, आधुनिक युग -सामान्य परिचय, प्राचीन युग - नैतिक साहित्य - तिरुक्कुरल - 5 दोहे (तिरुवल्लुवर),भक्ति काल - नैतिक साहित्य - वेमना (वेमना) के पद - History of Hindi Literature – Ancient, medieval, modern era – General Introduction, Ethical Literature - Thirukkural - 5 couplets (Thiruvalluvar), Bhakti Kal - Ethical Literature - Vemana Pad - 3 (Vemana)

UNIT II	भक्ति काल	9 hours

भक्ति काल - नैतिक साहित्य - कबीर के दोहे- 5 (कबीरदास), -भ्रमरगीत के पद-1 (सूरदास), कौशल विकास - प्रश्न निर्माण - अभ्यास

Bhakti Kal - Ethical Literature - Kabir ke Dohe - 5 (Kabirdas), Bhramargeet ke Pad -1 (Surdas), Skill Development - Question framing – Exercise

UNIT III	भक्ति काल	9 hours

भक्ति काल - विनय के पद- 1 (तुलसीदास), कम्ब रामायण के पद - 2 (कम्बर)

Bhakti Kal - Vinay ke Pad - 1(Tulsidas), Kambaramayan ke Pad - 2 (Kambar)

UNIT IV	आधुनिक युग	9 hours

आधुनिक युग - पुष्प की अभिलाषा (माखनलल चतुर्वेदी), कौशल विकास - अनुवाद : अर्थ, परिभाषा, प्रकार एवं अभ्यास Modern Era - Pushpa ki Abhilasha (Makhanlal Chaturvedi), Skill Development - Translation: Meaning, Definition & Exercise

UNIT V	आधुनिक युग	9 hours
आधुनिक युग - बीज व्यथा (ज्ञानेंद्रपति), कौशल विकास - 'विज्ञापन लेखन : अर्थ, परिभाषा, प्रकार एवं अभ्यास Modern Era - Beej Vyatha (Gyanendrapathi), Skill Development – Advertisement : Meaning, Definition & Exercise		

Total: 45 Hours

Self Learning: 45 Hours

संदर्भ ग्रन्थ/ Reference Books:

1. Hindi Sahitya Ka Itihas, Ramchandra Shukla, Nagari Pracharini Sabha, Varanasi
2. Thirukkural, Hindi Translator: M. Govindarajan, Central Institute of Classical Tamil,Chennai
3. Vemana ki vaani,Hindi Translator: Dr. Suryanarayan Bhanu, Potti Sriramulu Telugu University
4. Kabir Granthavali Kabir, Rajkamal Prakashan
5. Sursagar, Surdas, Lokbharti Prakashan
6. Vinay Patrika, Tulsidas, Gita Press, Gorakhpur
7. Kambaramayan, Bhuvan Vani Trust, Lucknow
8. Him Tarangini, Makhanlal Chaturvedi, Bharati Bhandar
9. Anuvaad Vigyan, Dr. Bholanath Tiwari, Kitab Mahal
10. Gyanendra Pati Ki Kavitaayein,Gyanendra Pati, Rajkamal Prakashan
11. Prayojanmoolak Hindi, Dr. Kailash Chandra Bhatia, Vani Prakashan
12. Vyavaharik Hindi – Dr. Hardev Bahri – Rajpal & Sons

वेब लिंक्स/ Web Links:

1. https://www.cict.in
2. https://vaniprakashan.com
3. https://www.rajkamalprakashan.com
4. https://www.gitapress.org
5. https://www.tamiluniversity.ac.in

COURSE OUTCOMES:

After completion of the course, the student will be able to,

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Know various types of poetry in Indian languages, culture, moral values, along with the history of Hindi literature.	K1
CO2	Know the richness of ethical and Bhakti literature in Hindi language with cultural and moral values.	K2
CO3	Know the importance of Bhakti literature.	K2
CO4	Apply the value of patriotism and proficiency in Hindi translation.	K4
CO5	Know about modern poetry and develop skills for competitive examinations.	K5

COURSE ARTICULATION MATRIX

COs / POs-PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PSO1	PSO2
CO1	–	–	–	–	-	3	-	–	–	–
CO2	–	–	–	–	3	-	-	2	–	–
CO3	–	–	–	–	3	-	2	2	-	-
CO4	–	–	–	-	2	3	3	-	-	-
CO5	–	–	–	–	-	2	3	3	-	-
Avg	–	–	–	-	2.6	2.6	2.6	2.3	-	-

	FRENCH-II	L	T	P	SL	C
		3	0	0	3	3

COURSE OBJECTIVES:

The lessons are being chosen:

1) To express his / her where abouts and to ask seek direction
2) To express obligation and restriction
3) To describe a place
4) To narrate and to question
5) To describe someone
6) To express his desire and to speak about the future

UNIT I	**C'est où**	**10 hours**
L'impératif, Les articles contractés au, à la…, Le passé composé et l'accord du participle passé avec être.		
UNIT II	**N'oubliez pas**	**6 hours**
Le pronom relatif Qui, que, où, Les pronoms compléments indirects (me, te, lui, leur…) Skill Development - Question framing – Exercise		
UNIT III	**Belle vue sur la mer**	**6 hours**
Les adjectifs démonstratifs, Y- pronom complément.		
UNIT IV	**Quel beau voyage!**	**8 hours**
Les verbes pronominaux, En- pronom complément.		
UNIT V	**Oh ! joli**	**10 hours**
L'imparfait, L'imparfait ou le passé composé.		
UNIT VI	**Et après ?**	**5 hours**
Le futur simple, Le subjonctif présent.		

Total: 45 Hours

Self Learning: 45 Hours

Text Book:

1. LATITUDES 1 (A1/A2) MÉTHODE DE FRANÇAIS - Régine Mérieux and Yves Loiseau

Reference book:

1. SAISON A1 - MÉTHODE DE FRANÇAIS - Marie-Noëlle Cocton, Élodie Heu, Catherine Houssa, Émilie Kasazian

COURSE OUTCOMES:

After completion of the course, the student will be able to,

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Recall and express one's whereabouts and ask for directions.	K1
CO2	Understand and express obligation and restrictions in daily communication.	K2
CO3	Apply language skills to describe a place using appropriate vocabulary.	K3
CO4	Analyze and narrate events and frame questions effectively.	K4
CO5	Apply language structures to describe a person.	K3

COURSE ARTICULATION MATRIX

COs / POs-PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PSO1	PSO2
CO1	–	–	–	–	-	3	-	–	–	–
CO2	–	–	–	–	3	-	-	2	–	–
CO3	–	–	–	–	3	-	2	2	-	-
CO4	–	–	–	-	2	3	3	-	-	-
CO5	–	–	–	–	-	2	3	3	-	-
Avg	–	–	–	-	2.6	2.6	2.6	2.3	-	-

	ENGLISH-II	L	T	P	SL	C
		3	0	0	3	3

Course Objectives:

- To appreciate prose, poetry, drama, and short fiction.
- To enhance reading and interpretative skills.
- To express ideas clearly in speech and writing.
- To use appropriate language structures in communication.
- To develop effective writing skills across formats

UNIT I	**PROSE**	**6 hours**

- If you are wrong, admit it- Dale Garnegie
- Words of Wisdom- Chetan Bhaghat

UNIT II	**POETRY**	**6 hours**

- La Belle Dame Sans Merci - John Keats
- Ozymandias- P.B.Shelley

UNIT III	**FICTION**	**6 hours**

- The School for Empathy - E.V. Lucas
- The Lamb to the Slaughter-Roald Dahl

UNIT IV	**GRAMMAR**	**6 hours**

- Types of sentences, Concord

UNIT V	**GRAMMAR**	**6 hours**

- Tenses, Voices

Total: 30 Hours

Self Learning: 30 Hours

Text Books:

1. Gordimer, Nadine. “Once upon a Time.” *Jump and Other Stories*. Penguin Books, 1991.
2. Lucas, E. V. “Bores.” *The Best Loved Essays of E. V. Lucas*. Methuen & Co., 1923.
3. Frost, Robert. “Stopping by Woods on a Snowy Evening.” *New Hampshire*. Henry Holt and

Company, 1923.

4. Angelou, Maya. “Still I Rise.” *And Still I Rise*. Random House, 1978.
5. Hughes, Langston. *Soul Gone Home*. In *Five Plays by Langston Hughes*. Indiana University Press, 1963.

References:

1. June., Dr. M. Narayana Rao and Dr. B. G. Barki (2012), Anu’s Current English for Communication (AnuChitra).
2. General English for competitive examinations by V.Rajagopalan (2010), Mcgraw Hill Education.

Websites

1. *British Council LearnEnglish*. British Council, https://learnenglish.britishcouncil.org/.
2. *Poetry Foundation*. Poetry Foundation, https://www.poetryfoundation.org/.

COURSE OUTCOMES:

After completion of the course, the student will be able to,

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Understand grammar concepts including voice, speech, sentence structure, and composition skills.	K1
CO2	Apply reading and writing skills through prose comprehension and reflective writing tasks.	K2
CO3	Analyze poetry to interpret themes, emotions, and contextual meanings.	K4
CO4	Evaluate short stories by examining characters, themes, and narrative techniques.	K5
CO5	Apply communication and literary skills through one-act plays including dialogue, role play, and interpretation.	K3

COURSE ARTICULATION MATRIX

COs / POs-PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PSO1	PSO2
CO1	–	–	–	2	-	-	3	3	–	–
CO2	–	–	–	–	2	3	2	-	–	–
CO3	–	–	–	–	3	2	-	-	-	-
CO4	–	–	–	–	-	-	-	3	-	-
CO5	–	–	–	3	3	3	3	3	-	-
Avg	–	–	–	2.5	2.6	2.6	2.6	3.0	-	-

	STATISTICAL STRUCTURE IN DATA USING R	L	T	P	SL	C
		3	0	0	3	3

COURSE OBJECTIVES:

To use R for statistical programming, computation, graphics, and modeling, write functions and use in an efficient way and be able to develop programs and use for their research.

UNIT I	INTRODUCTION	9 Hours

Introduction, How to run R, R Sessions, and Functions, Basic Math, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes.

UNIT II	R PROGRAMMING STRUCTURES	9 Hours

Control Statements, Loops, – Looping Over Non vector Sets,- If-Else, Arithmetic, and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objective, No Pointers in R, Recursion, A Quicksort Implementation-Extended Extended Example: A Binary Search Tree.

UNIT III	MATH AND SIMULATION IN R	9 Hours

Math Function, Extended Example Calculating Probability- Cumulative Sums and Products- Minima and Maxima- Calculus, Functions Fir Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices, Extended Example: Vector cross Product-Extended Example: Finding Stationary Distribution of Markov Chains, Set Operation, Input /out put, Accessing the Keyboard and Monitor, Reading and writer Files.

UNIT IV	GRAPHICS AND PROBABILITY DISTRIBUTIONS	9 Hours

Creating Graphs, The Workhorse of R Base Graphics, the plot() Function – Customizing Graphs, Saving Graphs to Files. Normal Distribution - Binomial Distribution – Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests,-ANOVA.

UNIT V	LINEAR MODELS AND CASE STUDY	9 Hours

Simple Linear Regression, -Multiple Regression Generalized Linear Models, Logistic Regression, – Poisson Regression- other Generalized Linear Models-Survival Analysis, Nonlinear Models, Splines- Decision- Random Forests – Case study on simple R programs.

Total: 45 Hours

Self Learning : 45 Hours

COURSE OUTCOMES:

At the end of this course, students will be able to,

Course Outcome	Description	Bloom's Level
CO1	Explain the fundamentals of R programming, data types, vectors, functions, and advanced data structures such as data frames, lists, matrices, arrays, and classes.	K2
CO2	Apply control structures, loops, functions, recursion, and user-defined programming constructs to develop solutions for computational problems in R.	K3
CO3	Analyze mathematical and statistical computations using R, including probability calculations, matrix operations, Markov chains, set operations, and file handling techniques.	K4
CO4	Interpret graphical representations, probability distributions, statistical measures, hypothesis testing, correlation analysis, and ANOVA results using R.	K2
CO5	Develop predictive and analytical models using regression techniques, generalized linear models, decision trees, random forests, and case studies in R for data-driven decision making.	K4

COURSE ARTICULATION MATRIX

COs/POs/PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	3	-		-	-	-	-	2	-	2
CO2	-	2	2	-	-	-	-	-	3	-
CO3	2	3		-	2	-	-	2	-	3
CO4	-	-	3	2	-	-	2	-	2	3
CO5	-	3	2	3	3	-	3	-	-	-
AVG	2.5	2.6	2.3	2.5	2.5		2.5	2	2.5	2.5

TEXT BOOKS:

1. "Beginner's Guide for Data Analysis using R Programming" by Jeeva Jose, Khanna Publishing House, 2024.
2. Cornillon Pierre Andre Et AI(2015),"R for statistics",TandF India, ISBN 9781439881453.
3. Venables, W. N., and Ripley, B. D.(2012) "Modern Applied Statistics with S" , 4th ed.,Springer- Verlag, New York.

	DATA STRUCTURES USING PYTHON	L	T	P	SL	C
		3	0	0	3	3

COURSE OBJECTIVES:

To introduce the fundamentals of Python programming and develop the ability to write Python scripts. The course aims to help students understand Object-Oriented Programming concepts, work with lists, dictionaries, and regular expressions, learn searching and sorting techniques, and gain knowledge of linear and non-linear data structures.

UNIT I	OOPS CONCEPTS	9 Hours

Oops Concepts- class, object, constructors, types of variables, types of methods. Inheritance: single, multiple, multi-level, hierarchical, hybrid, Polymorphism: with functions and objects, with class methods, with inheritance, Abstraction: abstract classes

UNIT II	DATA STRUCTURES	9 Hours

Data Structures – Definition, Linear Data Structures, Non-Linear Data Structures Python Specific Data Structures: List, Tuples, Set, Dictionaries, Comprehensions and its Types, Strings, slicing.

UNIT III	ARRAYS AND SEARCH	9 Hours

Arrays - Overview, Types of Arrays, Operations on Arrays, Arrays vs List. Searching -Linear Search and Binary Search. Sorting - Bubble Sort, Selection Sort, Insertion Sort, Merge Sort, Quick Sort.

UNIT IV	LINKED LIST AND STACKS	9 Hours

Linked Lists – Implementation of Singly Linked Lists, Doubly Linked Lists, Circular Linked Lists.Stacks - Overview of Stack, Implementation of Stack (List & Linked list), Applications of StackQueues:Overview of Queue, Implementation of Queue(List & Linked list), Applications of Queues, Priority Queues.

UNIT V	GRAPHS AND BINARY TREE	9 Hours

Graphs -Introduction, Directed vs Undirected Graphs, Weighted vs Unweighted Graphs, Representations, Breadth First Search, Depth First Search. Trees - Overview of Trees, Tree Terminology, Binary Trees: Introduction, Implementation, Applications. Tree Traversals, Binary Search Trees: Introduction, Implementation, AVL Trees: Introduction, Rotations, Implementation.

Total: 45 Hours

Self Learning : 45 Hours

COURSE OUTCOMES:

At the end of this course, students will be able to,

Course Outcome	Description	Bloom's Level
CO1	Explain the fundamental concepts of Object-Oriented Programming in Python, including classes, objects, inheritance, polymorphism, and abstraction.	K2
CO2	Apply Python-specific data structures such as lists, tuples, sets, dictionaries, strings, and comprehensions to solve computational problems.	K3
CO3	Analyze the performance and implementation of arrays, searching algorithms, and sorting techniques for efficient data organization and retrieval.	K4
CO4	Design linked lists, stacks, queues, and priority queues for solving real-world applications.	K3
CO5	Illustrate graph and tree-based solutions using traversal algorithms, binary search trees, and AVL trees to model and solve complex problems.	K4

COURSE ARTICULATION MATRIX

COs \ POs/PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	2
CO2	3	-	2	-	-	-	-	2	2	-
CO3	2	2	-	3	3	-	2	-	-	2
CO4	-	3	3	2	-	-	-	2	2	-
CO5	-	3	3	-	2	-	3	-	-	3
AVG	2.6	2.5	2.6	2.5	2.5		2.5	2	2	2.3

TEXT BOOKS:

1. Venkatesh, Nagaraju Y, Introduction to Python Programming, Khanna Publishing House, 2021.

2. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser(2013)-Data Structures and Algorithms in Python-Wiley.

3. Narasimha Karumanchi(2016)-Data Structure and Algorithmic Thinking with Python Data Structure and Algorithmic Puzzles-Careermonk Publications.

REFERENCE BOOKS:

1. Hands-On Data Structures and Algorithms with Python: Write complex and powerful code using the latestfeatures of Python 3.7, 2nd Edition by Dr. Basant Agarwal, Benjamin Baka.

2. Data Structures and Algorithms with Python by Kent D. Lee and Steve Hubbard.

3. Problem Solving with Algorithms and Data Structures Using Python by Bradley N Miller and David L.Ranum.

4. Discipline Specific Course Python Programming -Second Edition,R. Nageswara Rao, Dreamtech Press

	MATHEMATICS-II	L	T	P	SL	C
		2	1	0	3	3

COURSE OBJECTIVES:

To provide students with a basic understanding of Mathematics, Discrete Mathematics, and Probability. The course aims to develop logical thinking and analytical skills, enabling students to read, classify, and interpret data effectively, draw meaningful conclusions, and understand fundamental concepts such as logic, tautology, and probability.

UNIT I	FUNDAMENTALS OF LOGIC	9 Hours

Fundamentals of logic: Introduction to logic, propositional logic, logical connectives and truth table, negation conjunction, disjunction.

UNIT II	LOGIC AND TATUOLOGY	9 Hours

Conditional, bi-conditional or double implication, converse, inverse and contra positive, tautology and contradiction.

UNIT III	PERMUTATIONS AND COMBINATIONS	9 Hours

Introduction -Fundamental Principle of Counting-Permutations: Problems on permutations – Combinations - Problems on combinations, Difference between permutations and combinations.

UNIT IV	BASICS OF PROBABILITY	9 Hours

Basics of probability: Basic Probability- Axioms of Probability- Addition and Multiplication theorem without proof-Conditional Probability-simple problems

UNIT V	RANDOM VARIABLES	9 Hours

Random variable - Discrete random variables- Mean- Expectations- Variance- Independent random variables- simple problems, Continuous random variables- Mean- Expectations- Variance-simple problems.

Total: 45 Hours

Self Learning : 45 Hours

COURSE OUTCOMES:

At the end of this course, students will be able to,

Course Outcome	Description	Bloom's Level
CO1	Understand the fundamentals of logic including propositions, logical connectives, and truth tables.	K1
CO2	Explain conditional statements, biconditional logic, tautology, and contradiction in logical reasoning.	K2
CO3	Apply principles of permutations and combinations to solve counting problems.	K3
CO4	Analyze basic probability concepts including axioms, conditional probability, and probability theorems.	K4
CO5	Evaluate random variables including mean, expectation, variance, and their applications in problems.	K5

COURSE ARTICULATION MATRIX

COs \ POs/PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PSO1	PSO2	PS03
CO1	3	2	2	–	2	3	2	–	–	–	3	2
CO2	3	2	2	–	2	3	2	–	–	–	3	2
CO3	3	3	3	–	2	3	2	2	–	–	3	2
CO4	3	3	3	–	2	2	2	2	–	–	2	2
CO5	3	3	3	–	2	3	2	2	–	–	3	2
AVG	3.0	2.6	2.6	–	2.0	2.8	2.0	0.8	–	–	2.8	2.0

TEXT BOOKS:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, McGraw Hill.
2. R A Johnson And C.B.Gupta., Probability and statistics for engineers (Erwin Miller and John E.Freund), 7th edition, Pearson Education / PHI.

REFERENCE BOOKS:

1. R. P. Grimaldi, (2007)"Discrete and Combinatorial Mathematics", Pearson Education, Fifth Edition.
2. Thomas Koshy, (2005) "Discrete Mathematics with Applications", Academic Press.
3. Birhauser, Berlin,(1999),S.I.Resnick, A Probability Path.

WEB RESOURCES:

1. https://courses.umass.edu/phil110-gmh/text/c01.pdf
2. https://www.cuemath.com/data/permutations-and-combinations/
3. https://www.toppr.com/guides/maths/probability/introduction-to-probability/

	R PROGRAMMING LAB	L	T	P	SL	C
		0	0	2	1	1

COURSE OBJECTIVES:

To provide basic knowledge of R Programming and its applications. The course enables students to write simple R programs and perform data analysis effectively. It also helps students develop problem-solving skills using statistical computing techniques.

LIST OF PROGRAMS:

1. Write a R Program to Make a Simple Calculator.
2. Write a program to find Sum of Natural Numbers Using Recursion.
3. Write a program to find Fibonacci Sequence Using Recursion in R
4. Write a program to implement R Program for the Factors of a Number.
5. Write a program to to Find the Sum of Natural Numbers.
6. Write a program to Check if a Number is Positive, Negative or Zero.
7. Write a program to Find the “Hello World” Program.
8. Write a program to Program to Add Two Vectors
9. Write a function to Find Minimum and Maximum.
10. Write a program to Sort a Vector
11. Write a R Program to Check for Leap Year
12. Write a program to multiply two Matrices.

Total Hours: 45 Hours

Self Learning : 45 Hours

COURSE OUTCOMES:

At the end of this course, students will be able to,

Course Outcome	Description	Bloom's Level
CO1	Demonstrate the use of basic R programming constructs, variables, operators, input/output statements, and functions through simple programming exercises.	K2
CO2	Apply conditional statements, loops, and recursive functions to solve computational problems such as Fibonacci series, sum of natural numbers, and factorization.	K3
CO3	Analyze data using vectors, vector operations, sorting techniques, and user-defined functions in R.	K4
CO4	Implement problem-solving approaches involving numerical computations, leap year verification, and minimum–maximum value determination.	K3
CO5	Develop R programs for matrix operations and other real-world computational applications using appropriate programming techniques and data structures.	K4

COURSE ARTICULATION MATRIX

COs \ POs/PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	2	-
CO2	3	3	3	2		-	-	-	-	-
CO3	-	3	3	3		-	2	-	2	-
CO4	-	-	3	3	2	-	-	3	2	-
CO5	-	-	2	3	2	-	-	-	-	-
AVG	3	3	2.75	2.75	2	-	2	3	2	-

REFERENCE BOOKS:

1. "Beginner's Guide for Data Analysis using R Programming" by Jeeva Jose, Khanna Publishing House, 2024.
2. JaredP.Lander, R for Everyone: Advanced Analytics and Graphics, 2nd Edition,PearsonEducation,2018.
3. S.R.ManiSekhar and T.V.SureshKumar, Programming with R, 1st Edition,,CENGAGE,2017.

WEB RESOURCES:

1. https://www.r-project.org/
2. https://www.tutorialspoint.com/r/index.htm

	DATA STRUCTURES USING PYTHON	L	T	P	SL	C
		0	0	2	1	1

COURSE OBJECTIVES:

This course covers techniques for the data structures and algorithms analysis. The course aims to enable the student to understand in-depth data structures and to know how to apply them to resolve practical issues. Topics include: Stack, Queue, Link List, Searching, Sorting, Recursion and Trees.

LIST OF PROGRAMS:

1. Write a Python program for class, Flower, that has three instance variables of type str, int, and float that respectively represent the name of the flower, its number of petals, and its price. Your class must include a constructor method that initializes each variable to an appropriate value, and your class should include methods for setting the value of each type, and retrieving the value of each type.
2. Develop an inheritance hierarchy based upon a Polygon class that has abstract methods area( ) and perimeter( ). Implement classes Triangle, Quadrilateral, Pentagon, that extend this base class, with the obvious meanings for the area( ) and perimeter( ) methods. Write a simple program that allows users to create polygons of the various types and input their geometric dimensions, and the program then outputs their area and perimeter.
3. Write a python program to implement Method Overloading and Method Overriding.
4. Write a Python program to illustrate the following comprehensions:
   a) List Comprehensions b) Dictionary Comprehensions
   c) Set Comprehensions d) Generator Comprehensions
5. Write a Python program to generate the combinations of n distinct objects taken from the elements of a given list. Example: Original list: [1, 2, 3, 4, 5, 6, 7, 8, 9] Combinations of 2 distinct objects: [1, 2] [1, 3] [1, 4] [1, 5] [7, 8] [7, 9] [8, 9].
6. Write a program for Linear Search and Binary search.
7. Write a program to implement Bubble Sort and Selection Sort.
8. Write a program to implement Merge sort and Quick sort.
9. Write a program to implement Stacks and Queues.
10. Write a program to implement Singly Linked List.
11. Write a program to implement Doubly Linked list.
12. Write a program to implement Binary Search Tree.

Total: 15 Hours

Self Learning : 15 Hours

COURSE OUTCOMES:

At the end of this course, students will be able to,

Course Outcome	Description	Bloom's Level
CO1	Demonstrate Object-Oriented Programming concepts in Python by designing classes, objects, inheritance hierarchies, polymorphism, abstraction, and comprehensions.	K2
CO2	Apply Python programming techniques to solve computational problems involving combinations, searching algorithms, and data manipulation.	K3
CO3	Analyze the efficiency and behavior of searching and sorting algorithms such as Linear Search, Binary Search, Bubble Sort, Selection Sort, Merge Sort, and Quick Sort.	K3
CO4	Implement the applications of linear data structures including stacks, queues, singly linked lists, and doubly linked lists.	K3
CO5	Classify non-linear data structures such as Binary Search Trees and apply appropriate data structures to solve real-world problems.	K4

COURSE ARTICULATION MATRIX

COs \ POs/PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	3	-	-	-	-	-	2	-	2	-
CO2	2	2	3	2		-	-	-	-	3
CO3	-	3	3		2	-	-	3	2	-
CO4	-	2	-	3	-	-	-	-		3
CO5	2	-	2	3	3	-	2	-	-	2
AVG	2.3	2.3	2.6	2.6	2.5		2	3	2	2.6

TEXT BOOKS:

1. Data Structures and Algorithms Using Python, Rance D. Necaise, JOHN WILEY & SONS, INC.
2. ReemaThareja, Python Programming using Problem Solving Approach, First Edition,Oxford Higher Eduction.

26PSSK12	COMMUNICATION SKILLS	L	T	P	SL	C
		0	0	4	2	2

Course Objectives:

- To improve speaking and presentation skills.
- To build reading and writing skills for academic and professional use.
- To prepare students for job communication (resume, GD, interview)

UNIT I	Fundamentals of Communication & Basic LSRW Skills	6 hours

- **Listening:** Listening for specific information (MCQs)
- **Speaking:** Self-introduction; talking about likes and dislikes; greetings
- **Reading:** Skimming, scanning, and detailed comprehension
- **Writing:** Formal letters (job application), resume basics, problem–solution writing

Language Lab / Practical:

- Digital literacy: E- resources
- Practice: Self-introduction, JAM (Just a Minute)

UNIT II	Listening & Speaking Strategies in Context	6 hours

- **Listening:** Conversations, advertisements, small talks, TED talks, summarizing,
- **Speaking:** Impromptu talks, speech writing, mini-presentations, AI-based speaking and Pronunciation tools
- **Reading:** Identifying arguments and main ideas in texts
- **Writing:** Writing Instruction, Checklist Preparation, Paragraph writing,

Language Lab / Practical:

- Blog creation, online quizzes, and Kahoot activities
- Practice: Conversation Drills, Prompting Conversation

Listening: Note-taking from audio/text recitation

Speaking: Discussion on fear, society, and behaviour

Reading: Skimming, scanning, and interpretation of textual features

Writing: Reflective paragraph writing

UNIT III	Reading, Technical Writing & Analytical Skills	6 hours

- **Listening:** Listening to debates/Academic discussions and extracting key points
- **Speaking:** Participating in group discussions, AI for Presentation using prompts
- **Reading:** Extracting specific information; note-making
- **Writing:** Framing open-ended /closed ended questions, sequencing sentences, Report writing, and précis writing

Language Lab / Practical:

- PowerPoint presentations, Slide Share tools
- Practice: Reading comprehension, report writing, statement of purpose

UNIT IV	Critical Thinking & Presentation	6 hours

- **Listening:** Understanding instructions, interpretations & recommendations
- **Speaking:** Formal presentations, public speaking
- **Reading:** Classification and interpretation of information
- **Writing:** Instructions, recommendations, user manuals

Language Lab / Practical:

- Online discussion forums and collaborative tools
- Practice: Book/film review, presentation delivery.

UNIT V	Professional & Workplace Communication	6 hours

- **Listening:** Workplace communication.
- **Speaking:** Group discussions, interviews, persuasive communication, negotiation
- **Reading:** Professional documents and job-related texts
- **Writing:** Cover letters, resumes, formal emails, Process Descriptions

Language Lab / Practical:

- Digital tools for communication and presentations
- Practice: Mock interviews, GDs

Total: 30 Hours

Self Learning: 30 Hours

COURSE OUTCOMES

After completion of the course, the student will be able to:

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Understand basic communication skills including listening, speaking, reading, and writing fundamentals.	K1
CO2	Apply listening and speaking strategies in real-life and academic communication contexts.	K2
CO3	Analyze reading and writing skills for technical communication, reports, and academic tasks.	K4
CO4	Evaluate critical thinking and presentation skills for effective communication and interpretation.	K5
CO5	Apply professional communication skills including interviews, group discussions, and workplace writing.	K3

COURSE ARTICULATION MATRIX :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO1	-	2	-	2	-	3	2	2	-	2	-	-
CO2	-	2	-	2	-	3	2	3	-	2	-	-
CO3	-	3	-	3	-	3	2	3	-	2	-	-
CO4	-	3	-	3	-	3	2	3	-	2	-	-
CO5	-	3	-	3	-	3	2	3	-	3	-	-
Avg	-	2.6	-	2.6	-	3.0	2.0	2.8	-	2.2	-	

Text Books

1. Kumar, Sanjay, and Pushp Lata. *Communication Skills*. Pearson Education, 2018.
2. Bovée, Courtland L., and John V. Thill. *Business Communication Today*. 14th ed., Pearson, 2020.
3. Raman, Meenakshi, and Sangeeta Sharma. *Technical Communication: Principles and Practice*. 3rd ed., Oxford University Press, 2015.
4. Kumar, Kulbhushan. *Effective Communication Skills*. Khanna Publishing House, 2018.
5. Mohan, Krishna, and Meera Banerji. *Developing Communication Skills*. 2nd ed., Macmillan Education, 2018.

References

1. Sharma, R. C., and Krishna Mohan. *Business Correspondence and Report Writing: A Practical Approach to Business and Technical Communication*. 5th ed., McGraw-Hill Education, 2017.
2. Mitra, Barun K. *Personality Development and Soft Skills*. 2nd ed., Oxford University Press, 2016.
3. Sasikumar, V., P. Kiranmai Dutt, and Geetha Rajeevan. *A Course in Listening and Speaking I*. Cambridge University Press, 2005.
4. Murphy, Raymond. *English Grammar in Use*. 5th ed., Cambridge University Press, 2019.
5. Lewis, Norman. *Word Power Made Easy*. Revised ed., Goyal Publishers & Distributors, 2014.

Websites

1. Purd Online Writing Lab. "OWL." *Purdue University*, https://owl.puPPRDue.edu/.
2. TED. "TED Talks." *TED Conferences*, https://www.ted.com/talks.
3. British Council. *Learn English*. British Council ,https://learnenglish.britishcouncil.org/

PROFESSIONAL ELECTIVE COURSES

	INTRODUCTION TO CYBER SECURITY	L	T	P	SL	C
		3	0	0	3	3

COURSE OBJECTIVES:

This course provides the foundation for understanding the key issues associated with protecting information assets. The purpose of the course is to provide the student with an overview of the field of information security and assurance.

UNIT I	INTRODUCTION	12 Hours

Introduction to Cyber Security - Importance and challenges in Cyber Security - Cyberspace - Cyber threats - Cyber warfare - CIA Triad - Cyber Terrorism - Cyber Security of Critical Infrastructure - Cyber security - Organizational Implications.

UNIT II	HACKERS AND CYBER CRIMES	12 Hours

Types of Hackers - Hackers and Crackers - Cyber-Attacks and Vulnerabilities - Malware threats - Sniffing - Gaining Access - Escalating Privileges - Executing Applications - Hiding Files - Covering Tracks - Worms - Trojans - Viruses - Backdoors.

UNIT III	ETHICAL HACKING AND SOCIAL ENGINEERING	12 Hours

Ethical Hacking Concepts and Scopes - Threats and Attack Vectors - Information Assurance - Threat Modeling - Enterprise Information Security Architecture - Vulnerability Assessment and Penetration Testing - Types of Social Engineering - Insider Attack - Preventing Insider Threats - Social Engineering Targets and Defense Strategies

UNIT IV	CYBER FORENSICS AND AUDITING	12 Hours

Introduction to Cyber Forensics - Computer Equipment and associated storage media - Role of forensics Investigator - Forensics Investigation Process - Collecting Network based Evidence - Writing Computer Forensics Reports - Auditing - Plan an audit against a set of audit criteria - Information Security Management System Management. Introduction to ISO 27001:2013

UNIT V	CYBER ETHICS AND LAWS	12 Hours

Introduction to Cyber Laws - E-Commerce and E-Governance - Certifying Authority and Controller - Offences under IT Act- Computer Offences and its penalty under IT Act 2000 - Intellectual Property Rights in Cyberspace

Total: 45 Hours

Self Learning : 45 Hours

COURSE OUTCOMES:

At the end of this course, students will be able to,

Course Outcome	Description	Bloom's Level
CO1	Explain the fundamental concepts of cyber security, cyberspace, cyber threats, cyber warfare, CIA triad, and the significance of protecting critical infrastructure.	**K2**
CO2	Apply knowledge of cyber-attacks, vulnerabilities, malware, hacking techniques, and security mechanisms to identify potential security risks.	**K3**
CO3	Analyze ethical hacking methodologies, threat models, vulnerability assessment techniques, penetration testing processes, and social engineering attacks.	**K4**
CO4	Investigate cyber forensic procedures, auditing practices, evidence collection techniques, and information security management systems based on established standards.	**K4**
CO5	Apply concepts of cyber laws, IT Act provisions, cyber ethics, e-governance principles, and intellectual property rights to develop basic solutions for cyber security governance.	**K3**

COURSE ARTICULATION MATRIX

COs \ POs/PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	2	2		-	-	-	-	-	2	-
CO2	-	-	2	2	-	-	2	2	-	2
CO3	2	2		3	2	-	-	-	-	-
CO4	-	3	3	-	3	3	-	-	-	-
CO5	-	3	3	-	-	3	3	-	-	-
AVG	2	2.5	2.6	2.5	2.5	3	2.5	2	2	2

TEXT BOOKS:

1. Donaldson, S., Siegel, S., Williams, C.K., Aslam, A (2015), "Enterprise Cyber security -How to Build a Successful Cyber defense Program against Advanced Threats", Apress, 1st Edition.
2. Dr. Gerald Auger, Jaclyn "Jax" Scott, Jonathan Helmus, Kim Nguyen, "Cybersecurity Career Master Plan" (2026)

REFERENCE BOOKS:

1. The Cybersecurity Playbook: How Every Leader and Employee Can Contribute to a Culture of Security" (2022) – J. B. Wood, Brian O'Neill.

Web links

https://www.javatpoint.com/what-is-cyber-security

	INFORMATION SECURITY	L	T	P	SL	C
		3	0	0	3	3

COURSE OBJECTIVES:

This course provides the foundation for understanding the key issues associated with protecting information assets. The purpose of the course is to provide the student with an overview of the field of information security and assurance.

UNIT I	INTRODUCTION TO INFORMATION SECURITY	12 *Hours*

Introduction to Information Security: Attacks, Vulnerability, Security Goals, Security Services and mechanisms - Conventional Cryptographic Techniques : Conventional substitution and transposition ciphers, One-time Pad

UNIT II	BLOCK CIPHER AND STREAM CIPHER	12 *Hours*

Block cipher and Stream Cipher, Steganography - Symmetric and Asymmetric Cryptographic Techniques: DES, AES, RSA algorithms Authentication and Digital Signatures: Use of Cryptography for authentication.

UNIT III	SECURE HASH FUNCTION	12 *Hours*

Secure Hash function, Key management – Kerberos - Program Security: No malicious Program errors – Buffer overflow, Incomplete mediation, Time-of-check to Time-of- use Errors, Viruses, Trapdoors

UNITIV	SALAMI ATTACK	12 Hours

Salami attack, Man-in-the- middle attacks, Covert channels - Security in Networks : Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong.

UNIT V	AUTHENTICATION	12 Hours

Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security, Firewalls – Design and Types of Firewalls, Personal Firewalls, IDS, Email Security – PGP,S/MIME

Total: 60 Hours

Self-Learning : 60 Hours

COURSE OUTCOMES:

At the end of this course, the student will be able to,

Course Outcome	Description	Bloom's Level
CO1	Explain the fundamental concepts of information security, security goals, vulnerabilities, attacks, security services, and conventional cryptographic techniques.	**K2**
CO2	Apply symmetric and asymmetric cryptographic algorithms, steganography, authentication mechanisms, and digital signatures to secure information systems.	**K3**
CO3	Execute key management techniques, secure hash functions, Kerberos authentication, and common program security vulnerabilities and malicious software threats.	**K3**
CO4	Categorize various security attacks, network threats, covert channels, and network security controls to determine appropriate protection mechanisms.	**K4**
CO5	Design secure network environments using firewalls, intrusion detection systems, wireless security mechanisms, email security protocols, and access control techniques.	**K4**

COURSE ARTICULATION MATRIX

COs \ POs/PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	2	2	-	-	-	-	-	-	-	-
CO2	-	-	2	-	-	-	-	2	2	-
CO3	2	-	2	-	-	-	-	-	2	-
CO4	-	-	3	-	3	-	2	-	-	-
CO5	-	3	3	2	2	2	-	-	-	-
AVG	2	2.5	2.5	2	2.5	2	2	2	2	-

TEXT BOOKS:

1. Information Systems Today, Managing in the Digital World", Third Edition by Leonard
2. M. Jessup; Joseph S. Valacich, Publisher: Prentice Hall
3. "Introduction to Information Technology", V. Rajaraman, PHI

REFERENCE BOOKS:

1. Information Systems Management in Practice" Barbara C. McNurlin, Ralph H. Sprague, and Publisher: Pearson Education.
2. Security in Computing, Fourth Edition, by Charles P. Pfleeger, Pearson Education
3. Cryptography And Network Security Principles And Practice, Fourth or Fifth Edition, William Stallings, Pearson
4. Modern Cryptography: Theory and Practice, by Wenbo Mao, Prentice Hall.
5. Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall

	OPERATING SYSTEMS	L	T	P	SL	C
		3	0	0	3	3

COURSE OBJECTIVES:

Student will understand Modern Operating System and their principles. The course will cover theory as well as practice aspects of a subject through scheduled lectures and labs, course will cover details of processes, CPU scheduling, memory management, file system, storage subsystem, input/output management and security protection.

UNIT I	OPERATING SYSTEMS OVERVIEW	12 Hours

Operating Systems Overview- Overview and Functions of Operating Systems - History and Generation of Operating System - Protection and Security - Distributed Systems - Operating Systems Structures - Services-System Calls.

UNIT II	PROCESS MANAGEMENT	12 Hours

Processes-Process Concept - Process Scheduling - Operations on Processes - Interprocess Communication; Threads – Overview - Multicore Programming - Multithreading Models; Windows 7 – Thread and SMP Management. Process Synchronization – Critical Section Problem - Mutex Locks – Semaphores – Monitors- CPU Scheduling and Deadlocks

UNIT III	MEMORY MANAGEMENT	12 Hours

Memory: Swapping, contiguous memory allocation, paging, page table, segmentation, virtual memory, demand paging, page- replacement, Allocation of frames. Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault, Working Set, Dirty page/Dirty bit – Demand paging (Concepts only) – Page Replacement policies : Least Recently used (LRU) Optimal (OPT), Second Chance (SC), First in First Out (FIFO), Not recently used (NRU).

UNIT IV	FILE SYSTEM INTERFACE AND MASS STORAGE STRUCTURE	12 Hours

File system Interface - Concept of a File – File Access – File Directories - File System Implementation-Mass-Storage Structure: RAID Structure - Disk Structure, Disk Attachment - Disk Scheduling - Swap-Space- Management - Stable-Storage Implementation - Overview of Mass-Storage Structure - Tertiary Storage Structure.

UNIT V	I/O SYSTEMS AND SECURITY PROTECTION	12 Hours

I/O systems - Hardware - Application I/O Interface - Kernel I/O Subsystem - Transforming I/O Requests to Hardware Operations – STREAMS - Protection & Security Protection –

Protection -Goals of Protection - Principles of Protection - Domain of Protection Access Matrix- Implementation of Access Matrix - Access control - Security – Problems - Program Threats – Intruders – Accidental Data Loss- User Authentication - Implementing Security Defenses- Firewalls – Antivirus and Antivirus Techniques.

Total Hours: 60 Hours

Self Learning : 60 Hours

COURSE OUTCOMES:

At the end of this course, students will be able to,

Course Outcome	Description	Bloom's Level
CO1	Explain the fundamental concepts, functions, structures, services, protection mechanisms, and evolution of operating systems.	**K2**
CO2	Apply process management concepts, including process scheduling, inter-process communication, multithreading, synchronization techniques, CPU scheduling, and deadlock handling.	**K3**
CO3	Analyze memory management techniques such as paging, segmentation, virtual memory, demand paging, and page replacement algorithms for efficient resource utilization.	**K4**
CO4	Understand file system structures, file access methods, storage management techniques, RAID architectures, and disk scheduling algorithms for system performance optimization.	**K2**
CO5	Implement solutions for operating system resource management by integrating process, memory, file, and storage management concepts to improve system efficiency and reliability.	**K3**

COURSE ARTICULATION MATRIX

COs \ POs/PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	2	-
CO2	-	2	3	-	-	-	-	-	-	-
CO3	2	3	-	-	-	-	3	-	-	-
CO4	-	-	3	-	3	-	-	2	2	-
CO5	-	2	2	-	3	-	2	-	-	-
AVG	2.5	2.3	2.6	-	3	-	2.5	2	2	-

TEXT BOOKS:

1. Ekta Walia, Operating Systems Concepts, Khanna Publishing House, 2022
2. Abraham Silberchatz, Peter B. Galvin, Greg Gagne (2015), "Operating System Concepts" 8th edition

REFERENCE BOOKS:

1. Stallings (2009) "Operating Systems - Internals and Design Principles", Pearson Education, 6th Edition.
2. Andrew S. Tanenbaum, Herbert Bos (2014) "Modern Operating Systems", Pearson Education, 4th Edition.
3. B.L.Stuart (2012)"Principles of Operating Systems" Cengage learning, India Edition,
4. A.S. Godboie (2009) "Operating Systems" 2nd Edition, TMH.

	PROCESS MANAGEMENT	L	T	P	SL	C
		3	0	0	3	3

COURSE OBJECTIVES:

To provide theoretical and practical practise in software development and process models. To understand Agile development and testing in Scrum. To acquire knowledge about Devops principles. To learn and use Lean UX, Sprint and to understand Design Thinking principles.

UNIT I	SOFTWARE AND SOFTWARE ENGINEERING	12 Hours

Software And Software Engineering - The Nature of Software –The Unique Nature of WebApps-Software Engineering- Software Process- Software Engineering Practice-Software Myths. Software Process Model: A Generic Process Model- Process Assessment and Improvement –Perspective Process Models-Specialized Process Model-The Unified Process.

UNIT II	STACKS	12 Hours

Stacks- Operations on Stacks, Application of Stack-Infix to Postfix Conversion, Recursion, Maze Problems-Queues-Operations on Queues, Queue Application, Circular Queue

UNIT III	DEVOPS	12 Hours

Devops - Introduction to Devops-Principles-Automation-Performance Measurement through KPIS and Metrics-Agile and Devops-Agile Infrastructure-Velocity-Lean Startup UPS.

UNIT IV	LEAN UX AND AGILE ANTI-PATTERNS SPRINT	12 Hours

Lean Ux and Agile Anti-Patterns Sprint -Staggered sprints -Sprint zero and design sprints-Dual-track Agile-Listening to Scrum’s rhythms- Listening to Scrum’s rhythms-Participation- Design is a team sport-Coordinating multiple Lean UX teams- Managing up and out – Agile anti-patterns.

UNIT V	DESIGN THINKING	12 Hours
Design Thinking Introduction to Design Thinking – Lean thinking - Actionable Strategy- The Problem with Complexity - Vision and Strategy - Defining Actionable Strategy Act to Learn - Leading Teams to Win.		

Total Hours: 60 Hours

Self Learning : 60 Hours

COURSE OUTCOMES

At the end of this course, students will be able to,

Course Outcome	Description	Bloom's Level
CO1	Understand the fundamentals of software engineering, software processes, software process models, and software development practices used in modern software projects.	**K2**
CO2	Apply stack and queue data structures, including their operations and applications, to solve computational problems such as expression conversion, recursion, and queue management.	**K3**
CO3	Analyze DevOps principles, automation strategies, Agile practices, infrastructure management, performance metrics, and Lean Startup concepts in software development environments.	**K4**
CO4	Explain UX practices, Scrum methodologies, sprint planning techniques, team collaboration models, and Agile anti-patterns for effective project execution.	**K2**
CO5	Design actionable strategies using design thinking, lean thinking, and agile methodologies to solve complex software and business problems.	**K4**

COURSE ARTICULATION MATRIX

COs \ POs/PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-
CO2	2	-	2	-	-	-	-	2	-	-
CO3	-	2	-	-	3	-	2	-	3	-
CO4	-	3	3	3	3	-	-	2	2	2
CO5	-	3	3	-	-	-	3	-	-	-
AVG	2.5	2.5	2.6	3	3	-	2.5	2	2.5	2

TEXT BOOKS:

1. Software Engineering, N.S. Gill, Khanna Publishing House, 2023
2. Software Engineering, Ian Somerville, 9th edition, Pearson education.
3. Software Engineering A practitioner's Approach, 8th edition, Roger S Pressman, Bruce
4. R. Maxim. McGraw Hill Education, 2015.
5. KalloriVikraman,(2016) "Introduction to Devops", 1st Edition.
6. Stephen Haunts, (2012)"Essential of Scrum" Addison-Wesley Professional; 1st Edition.
7. Jeff Gothelf, Josh Seiden, (2016) "Lean UX", 2nd Edition.
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