

UNDERGRADUATE DEGREE PROGRAMME

B.Sc., Computer Science (Cyber Security) Three Years
/
BSc., (Hons) Computer Science (Cyber Security) 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

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.

MISSION OF THE INSTITUTION	
M1	Effectively imparting knowledge and inculcating innovative thinking.
M2	Facilitating skill enhancement through add on courses and hands on training.
M3	Doing original, socially relevant, high-quality research.
M4	Instilling the spirit of integrity, equity, professional ethics and social harmony.

DEPARTMENT OF ADVANCED COMPUTING AND ANALYTICS
SCHOOL OF COMPUTING SCIENCES

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 technical expertise in identifying, analyzing, and mitigating complex security threats to protect digital assets and infrastructure in diverse organizational environments.
PEO2	Graduates will emerge as leaders or integral team members who can manage cybersecurity projects, communicate risks effectively to stakeholders, and adapt to the evolving landscape of cyber warfare.
PEO3	Graduates will practice cybersecurity with a strong commitment to legal, ethical, and social responsibilities, ensuring compliance with global data privacy laws and industry standards.
PEO4	Graduates will engage in continuous professional development, obtaining advanced certifications or conducting research to address emerging vulnerabilities like AI-driven threats or quantum-resistant cryptography.

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 secure and reliable computing solutions by integrating cybersecurity concepts, modern programming languages, data structures, databases, and networking technologies to mitigate cyber threats and protect organizational information assets.
PSO2	Apply ethical hacking, penetration testing, vulnerability assessment, and digital forensic techniques to detect and respond to cyber incidents based on Cyber laws.

ABBREVIATIONS

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 Report and Dissertation**

VELS INSTITUTE OF SCIENCE, TECHNOLOGY AND ADVANCED STUDIES
CURRICULUM STRUCTURE

B.Sc., Computer Science (Cyber Security) Three Years
/
BSc., (Hons) Computer Science (Cyber Security) Four Years

Total number of Credits: 176

	B.Sc., (Hons) Computer Science (Cyber Security) Minimum Credits to be earned :176 B.Sc., Computer Science Cyber Security) 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		C Programming and Embedded System	4	0	0	4	4	40	60	100
PCC		Cyber Security	3	0	0	3	3	40	60	100
MDC		Mathematics- I	2	1	0	3	3	40	60	100
PEC		Professional Elective Course – I	3	0	0	3	3	40	60	100
PCC (Lab)		Practical I - C Programming and Embedded System Lab	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**	**21**	**-**	**-**	**-**

CIA - Continuous Internal Assessment SEE - Semester End Examination

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

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		Object Oriented Programming Languages	3	0	0	3	3	40	60	100
PCC		Operating Systems with Kali Linux	3	0	0	3	3	40	60	100
MDC		Mathematics – II	2	1	0	3	3	40	60	100
PEC		Professional Elective Course – II	3	0	0	3	3	40	60	100
PCC (Lab)		Practical II - Object Oriented Programming Languages Lab	0	0	2	1	1	40	60	100
PCC (Lab)		Practical III – Operating Systems with Kali Linux Lab	0	0	2	1	1	40	60	100
AEC		Communication Skills	0	0	4	2	2	40	60	100
			17	1	8	22	22	-	-	-

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SEMESTER 3										
			Hours/Week					Maximum Marks		
Category	Code	Course	L	T	P	SL	C	CIA	SEE	Total
PCC		Problem Solving using Python Programming	4	0	0	4	4	40	60	100
PCC		Database Security	3	0	0	3	3	40	60	100
PEC		Professional Elective Course – III	3	0	0	3	3	40	60	100
PCC (Lab)		Practical IV - Problem Solving using Python Programming Lab	0	0	2	1	1	40	60	100
PCC (Lab)		Practical V – Database Security Lab	0	0	2	1	1	40	60	100
VAC		Environmental Studies	3	0	0	3	3	40	60	100
VAC		Indian Knowledge System	2	0	0	0	2	40	60	100
VAC		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	1	-	-	100
			19		6	23	23	-	-	-

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SEMESTER 4										
			Hours/Week					Maximum Marks		
Category	Code	Course	L	T	P	SL	C	CIA	SEE	Total
PCC		Ethical Hacking	4	0	0	4	4	40	60	100
PCC		Data Communication and Networking	3	0	0	3	3	40	60	100
MDC		Statistics	2	1	0	3	3	40	60	100
PEC		Professional Elective Course –IV	4	0	0	4	4	40	60	100
PCC (Lab)		Practical VI - Ethical Hacking Lab	0	0	2	1	1	40	60	100
PCC (Lab)		Practical VII – Network Communication 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	22	-	-	-

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SEMESTER 5										
			Hours/Week					Maximum Marks		
Category	Code	Course	L	T	P	SL	C	CIA	SEE	Total
PCC		Information Security	3	0	0	3	3	40	60	100
PCC		Secure Coding	4	0	0	4	4	40	60	100
PCC		Machine Learning for Cyber Security	3	0	0	3	3	40	60	100
PEC		Professional Elective Course – V	4	0	0	4	4	40	60	100
PCC (Lab)		Practical VIII- AI Enabled Cyber Security Lab	0	0	2	1	1	40	60	100
PCC (Lab)		Practical IX – Secure Coding 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	21	-	-	-

CIA - Continuous Internal Assessment SEE - Semester End Examination

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SEMESTER 6										
			Hours/Week					Maximum Marks		
Category	Code	Course	L	T	P	SL	C	CIA	SEE	Total
PCC		Cyber Crime Investigation and Digital Forensics	3	0	0	3	3	40	60	100
PCC		Quantum Computing & Security	3	1	0	4	4	40	60	100
PCC		Block Chain & Crypto currency	4	0	0	4	4	40	60	100
PCC		Vulnerability Analysis , IDS &Penetration Testing	4	0	0	4	4	40	60	100
PEC		Professional Elective Course – VI	4	0	0	4	4	40	60	100
PCC (Lab)		Practical X - Cyber Crime Investigation and Digital Forensics Lab	0	0	2	1	1	40	60	100
PRD		Mini Project/Industrial Project**	2	0	0	2	2	-	100	100
SEC		On Job Training / Apprenticeship / Startup	0	0	4	1	1	-	100	0
			21	-	6	23	23	-	-	-

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SEMESTER 7										
			Hours/Week					Maximum Marks		
Category	Code	Course	L	T	P	SL	C	CIA	SEE	Total
PCC		DevOps Security	3	0	0	3	3	40	60	100
PCC		Incident Response and Threat Intelligence	4	0	0	4	4	40	60	100
PCC		Intrusion Detection and Prevention System	4	0	0	4	4	40	60	100
PEC		Professional Elective Course – VII	4	0	0	4	4	40	60	100
PCC (Lab)		Practical XI- DevOps Security Lab	0	0	2	1	1	40	60	100
PRD		Research Project I	0	0	12	6	6	40	60	100
			15	-	14	22	22	-	-	-

CIA - Continuous Internal Assessment SEE - Semester End Examination

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

SEMESTER 8										
			Hours/Week					Maximum Marks		
Category	Code	Course	L	T	P	SL	C	CIA	SEE	Total
PCC		Malware Analysis and Reverse Engineering	3	0	0	3	3	40	60	100
PCC		Data Science using R	3	0	0	3	3	40	60	100
PCC		Cyber Laws in India	4	0	0	4	4	40	60	100
PEC		Professional Elective Course -VIII	4	0	0	4	4	40	60	100
PCC (Lab)		Practical XII - Malware Analysis and Reverse Engineering Lab	0	0	2	1	1	40	60	100
PCC (Lab)		Practical XIII - Data Science using R Lab	0	0	2	1	1	40	60	100
PRD		Research Project II	0	0	12	6	6	-	60	100
			14	-	16	22	22	-	-	-

CIA - Continuous Internal Assessment SEE - Semester End Examination

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

PROGRAMME CORE COURSES

Category	Code	Course	L	T	P	SL	C
PCC		C Programming and Embedded System	4	0	0	4	4
PCC		Cyber Security	3	0	0	3	3
PCC (Lab)		C Programming and Embedded System Lab	0	0	2	1	1
PCC		Object Oriented Programming Languages	3	0	0	3	3
PCC		Operating Systems with Kali Linux	3	0	0	3	3
PCC (Lab)		Object Oriented Programming Languages Lab	0	0	2	1	1
PCC (Lab)		Operating Systems with Kali Linux Lab	0	0	2	1	1
PCC		Problem Solving using Python Programming	3	0	0	3	3
PCC		Database Security	3	0	0	3	3
PCC (Lab)		Problem Solving using Python Programming Lab	0	0	2	1	1
PCC (Lab)		Database Security Lab	0	0	2	1	1
PCC		Ethical Hacking	3	0	0	3	3
PCC		Data Communication and Networking	3	0	0	3	3
PCC (Lab)		Ethical Hacking Lab	0	0	2	1	1
PCC (Lab)		Network Communication Lab	0	0	2	1	1
PCC		AI Enabled Cyber Security	3	0	0	3	3
PCC		Secure Coding	4	0	0	4	4
PCC		Machine Learning for Cyber	3	0	0	3	3

		Security					
PCC (Lab)		AI Enabled Cyber Security Lab	0	0	2	1	1
PCC (Lab)		Secure Coding Lab	0	0	2	1	1
PCC		Cyber Crime Investigation and Digital Forensics	3	0	0	3	3
PCC		Physical Security of IT Infrastructure	4	0	0	4	4
PCC		Block Chain & Crypto Currency	4	0	0	4	4
PCC		Criminal Psychology and Behavioral Intelligence	4	0	0	4	4
PCC (Lab)		Cyber Crime Investigation and Digital Forensics Lab	0	0	2	1	1
PCC		DevOps Security	3	0	0	3	3
PCC		Incident Response and Threat Intelligence	4	0	0	4	4
PCC		Intrusion Detection and Prevention System	4	0	0	4	4
PCC (Lab)		DevOps Security Lab	0	0	2	1	1
PCC		Malware Analysis and Reverse Engineering	3	0	0	3	3
PCC		Data Science using R	3	0	0	3	3
PCC		Cyber Laws in India	4	0	0	4	4
PCC (Lab)		Malware Analysis and Reverse Engineering Lab	0	0	2	1	1
PCC (Lab)		Data Science using R Lab	0	0	2	1	1

PROFESSIONAL ELECTIVE COURSES

Category	Code	Course	L	T	P	SL	C
PEC		Fundamentals of Computing	3	0	0	3	3
		Digital Logic Fundamentals					
PEC		Data Structures and Algorithm	4	0	0	4	4
		Introduction to Generative AI					
		Statistics using R and Python **					
PEC		Foundation of Data Science	3	0	0	3	3
		Software Quality Assurance					
		Practical Approach to Cyber Security**					
PEC		Internet of Things	4	0	0	4	4
		Cloud Computing					
		Information Security – Practitioner's Perspective**					
PEC		Robotic Process Automation	4	0	0	4	4
		Social Network Security					
		Advanced Cyber Security- An Application Approach**					
PEC		Augmented Reality	4	0	0	4	4
		Big Data Analytics					
		Cryptography**					
PEC		Multimedia and its Applications	4	0	0	4	4

		Cognitive Computing					
PEC		Green Computing	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	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		Industry Oriented Employability skills	2	0	0	2	2
VAC		Yoga Education / NSS / NCC	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		Professional Development – I	2	0	0	2	2
SEC		Global Certification	-	-	-	1	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		On Job Training / Apprenticeship / Startup	0	0	4	1	1

** Curriculum based on TCS iON

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

RESEARCH PROJECT

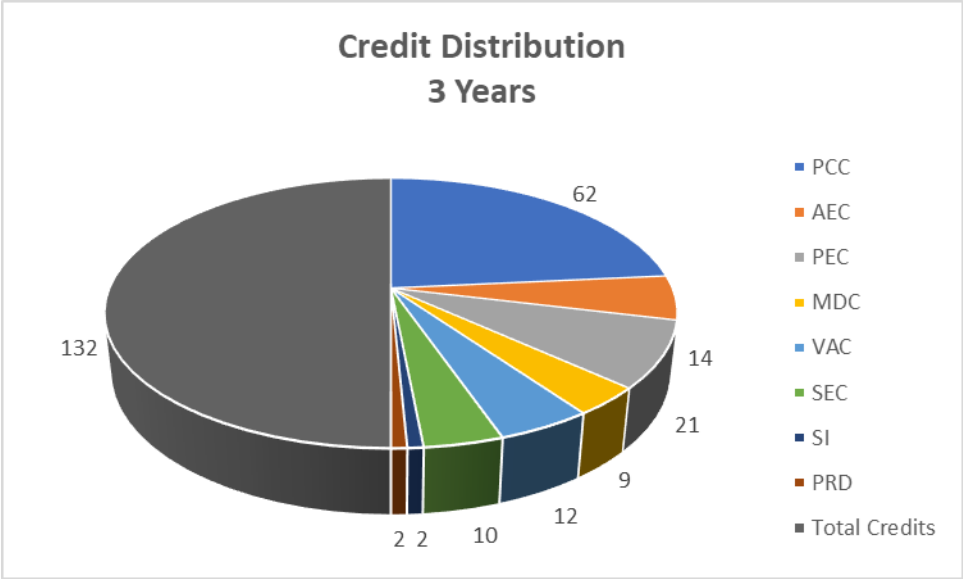
Category	Code	Course	L	T	P	SL	C
PRD		Mini Project / Industry Project	2	0	0	2	2
PRD		Research Project I	0	0	12	6	6
PRD		Research Project II	0	0	12	6	6

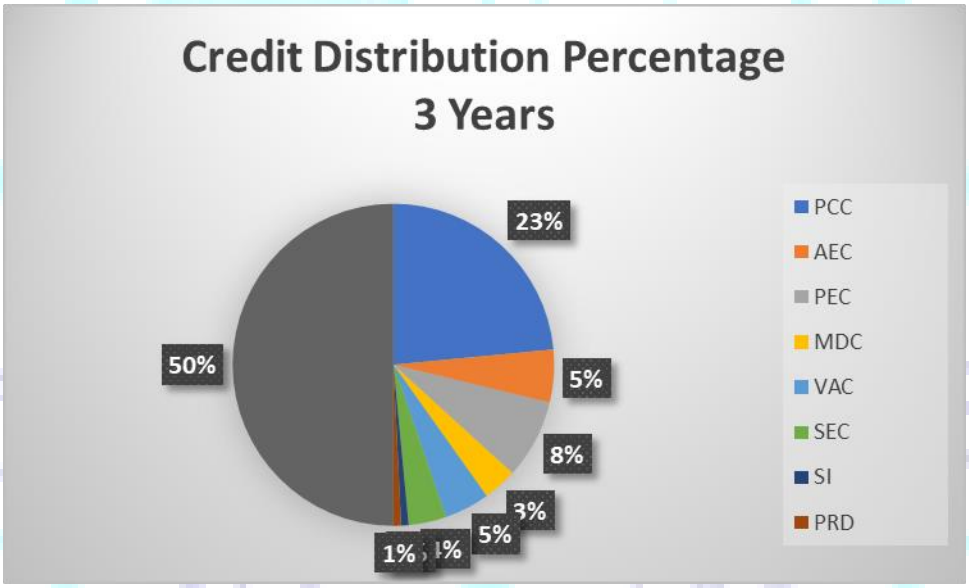
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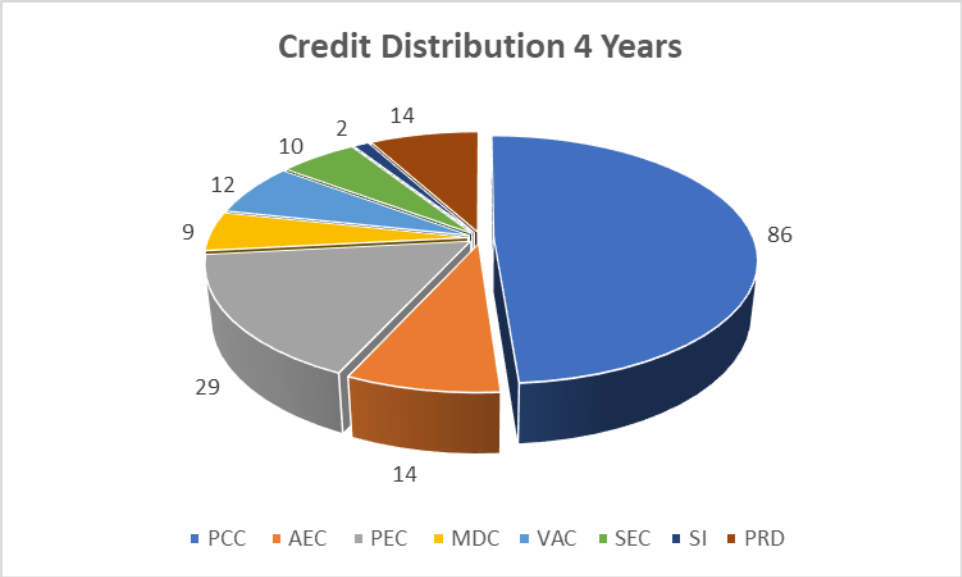
CREDIT DISTRIBUTION

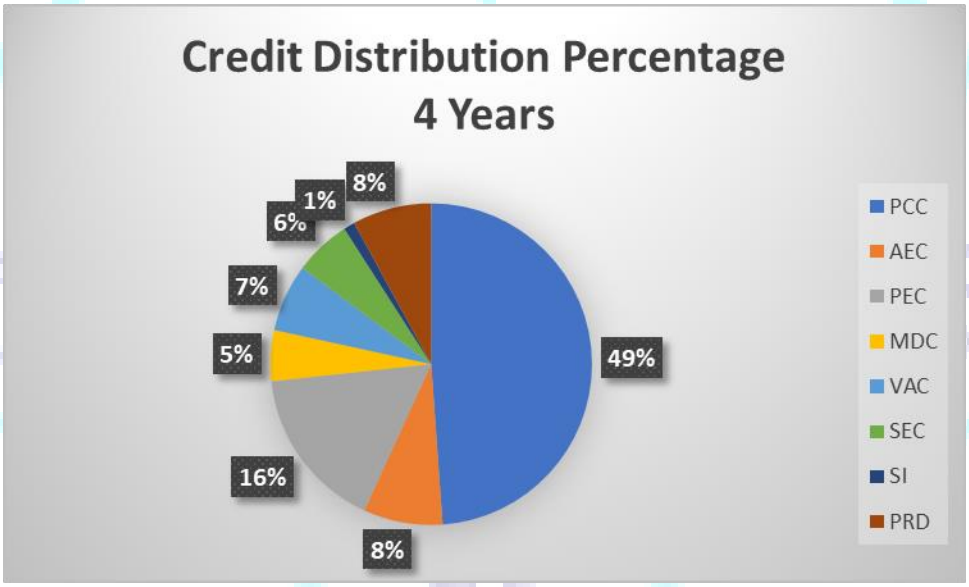
B.Sc., (Hons) Computer Science (Cyber Security)
Minimum credits to be earned: 176
B.Sc., Computer Science (Cyber Security)
Minimum credits to be earned: 132

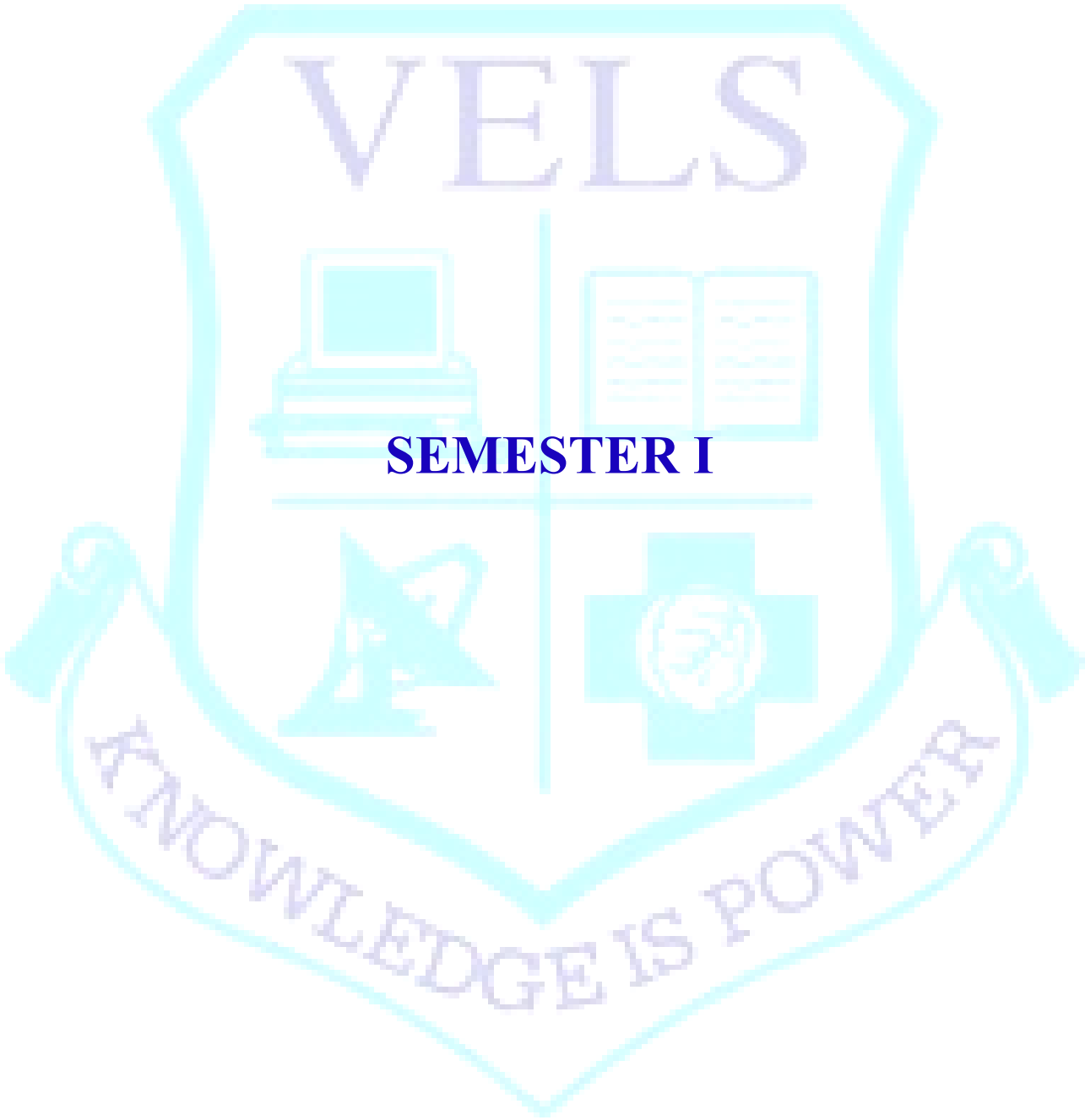
Component	I Sem	II Sem	III Sem	IV Sem	V Sem	VI Sem	3 Yrs. Total Credits	VII Sem	VIII Sem	4 Yrs Total Credits
PCC	8	8	9	9	12	16	62	12	12	86
AEC	6	8	-	-	-	-	14	-	-	14
PEC	3	3	3	4	4	4	21	4	4	29
MDC	3	3	-	3	-	-	9	-	-	9
VAC	1	-	7	2	2	-	12	-	-	12
SEC	-	-	3	4	2	1	10	-	-	10
SI	-	-	1	-	1	-	2	-	-	2
PRD	-	-	-	-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


Credit Distribution Percentage
3 Years
23%
5%
8%
5%
1%
50%
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	-	-

VES
KNOWLEDGE IS POWER

	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 /
2. Saraswati Press / Prabhat Prakashan (various editions available)
3. Vyavaharik Hindi, Publisher: Rajpal & Sons, New Delhi
4. One-Act Play Collection, Lokbharti Prakashan, Prayagraj
5. Prayojanmoolak Hindi, Dr. Naresh Mishra / Dr. Kailash Chandra Bhatia,Rajkamal
6. Prakashan / Vani Prakashan
7. Sharad Joshi Vyangya Rachanavali, Vol. 1, Rajkamal Prakashan
8. Prasad Ki Shreshtha Kahaniyan, Lokbharti Prakashan
9. Vyavaharik Hindi Aur Patra Lekhan, Dr. Hardev Bahri, Kitab Mahal, Allahabad
10. Bharatiya Vigyan Ki Kahani – Gunakar Mule, Rajkamal Prakashan
11. Computer Aur Hindi Bhasha, Dr. Bholanath Tiwari, Vani Prakashan
12. Hindi Sahitya Ka Itihas, Ramchandra Shukla, Nagari Pracharini Sabha, Varanasi
13. 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	-	-

	C PROGRAMMING AND EMBEDDED SYSTEM	L	T	P	SL	C
		4	0	0	4	4

COURSE OBJECTIVES:

To express algorithms and draw flowcharts in a language independent manner. Write, compile and debug programs in C language. Use different data types in a computer program. To describe the techniques for creating program modules in C using functions and recursive functions. To provide an overview of principles of Embedded System. To provide a clear understanding of role of firmware, operating systems in correlation with hardware systems.

UNIT- I	INTRODUCTION TO C PROGRAMMIMG	12 Hours

Introduction- Algorithm, Pseudo code, Flow chart, Identifiers, Data Types, Variables, Constants, Input / Output, Operators, Expressions, Precedence and Associatively, Expression Evaluation, Type conversions, Storage classes-auto, register, static, extern, scope rules,

UNIT-II	CONTROL STRUCTURES AND FUNCTIONS	12 Hours

Statements- Selection Statements– if and switch statements, loops- while, for, do-while, Functions- Introduction to Structured Programming, Functions- basics, user defined functions, call by value, call by reference.

UNIT-III	ARRAYS AND POINTERS	12 Hours

Arrays– Basic concepts, one-dimensional arrays, two – dimensional arrays, multidimensional arrays, arrays to functions, recursive functions, Pointers – pointers to pointers, Pointer Applications, Arrays and Pointers, Pointer Arithmetic, memory allocation functions, array of pointers, command –line arguments, Introduction to structures and unions.

UNIT – IV	INTRODUCTION TO EMBEDDED SYSTEMS	12 Hours

Definition of Embedded System, Embedded Systems vs General Computing Systems, History of Embedded Systems, Classification of Embedded Systems, Major application areas, Purpose of Embedded Systems, Characteristics and Quality attributes of Embedded Systems.

UNIT–V	EMBEDDEDC ROGRAMMING	12 Hours
The Typical Embedded System - Core of the Embedded System, Memory, Sensors and Actuators, Communication Interface, Embedded Firmware, Other System components. Embedded Firmware Design and Development- Embedded Firmware Design, Embedded Firmware Development Languages, Introduction to Softwares, Kiel Compiler, Proteus, Introduction to Embedded C- Difference between C & Embedded C, Advantages of Embedded C, Embedded C Program: Basics, Keywords, Data Types, Structure, Components, Programming style, Applications of the Embedded C Program.		

Total: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 C programming including algorithms, flowcharts, data types, variables, operators and input/output operations.	**K2**
CO2	Develop C programs using decision-making statements, looping constructs, and functions based on structured programming concepts.	**K3**
CO3	Apply arrays, pointers, recursion, dynamic memory allocation, structures, and unions in solving programming problems.	**K3**
CO4	Explain the concepts, characteristics, classifications, architecture, and application areas of embedded systems.	**K2**
CO5	Understand embedded firmware development using tools such as Keil Compiler and Proteus.	**K3**

COURSE ARTICULATION MATRIX

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

TEXT BOOKS:

1. B.A.Forouzan and R.F. Gilberg(2021), Computer Science: A Structured Programming Approach Using C, Third Edition, Cengage Learning.
2. Balaguruswamy (2019),"Programming in ANSI C", 8th Edition, McGraw Hill Education, ISBN: 978-93-5316-513-0.
3. Yashavant P. Kanetkar (2019), "Let Us C", 16th Edition, BPB Publications, ISBN: 978-93- 8728-449-4.

REFERENCE BOOKS:

1. Brian Kernighan and Dennis Ritchie (2015),"The C Programming Language", 2nd edition.
2. Shibu K V (2017), "Introduction to Embedded Systems", Second Edition, Mc Graw Hill.
3. Rajkamal (2003), "Embedded Systems Architecture, Programming and Design", Tata McGraw-Hill.
4. Frank Vahid and Tony Givargis (2002), "Embedded Systems Design" - A Unified Hardware/Software Introduction, John Wiley

WEB RESOURCES:

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

	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	9 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	9 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	9 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	9 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	9 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 fundamentals of cyber security, cyber threats, cyber warfare, and the importance of protecting critical infrastructure.	**K2**
CO2	Identify various types of hackers, cyber crimes, malware, vulnerabilities, and common attack techniques used in cyberspace.	**K2**
CO3	Identify and analyze various threats, attack vectors, and security vulnerabilities affecting information systems and networks using Ethical Hacking techniques.	**K2**
CO4	Analyze cyber forensic investigation processes, evidence collection methods, auditing procedures, and information security management practices.	**K3**
CO5	Interpret cyber laws, IT Act provisions, cyber offences, e-commerce regulations, and intellectual property rights related to cyberspace.	**K3**

COURSE ARTICULATION MATRIX

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

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. Nina Godbole, Sumit Belapure (2011), "Cyber Security", Willey.

REFERENCE BOOKS:

1. Roger Grimes (2017), "Hacking the Hacker", Wiley, Ist Edition.
2. Cyber Law by Bare Act, Govt of India, It Act 2000.

	C PROGRAMMING AND EMBEDDED SYSTEM LAB	L	T	P	SL	C
		0	0	2	1	1

COURSE OBJECTIVES:

This course is emphasizing the nature of C language using many applications and helps to understand the need to choose the language for solving the problem. The students can understand the art of computer programming

LIST OF PROGRAMS:

1. Write a C program to find grade of a list of students given their marks.
2. Write a C program for counting the number of vowels, consonants, words, white spaces in a line of text and array of lines.
3. Write a C program for palindrome.
4. Write a C program for Fibonacci sequence.
5. Write a C program to find GCD of two numbers.
6. Write a program to find NCR and NPR.
7. Write a C program to find grade of a list of students given their marks.

EMBEDDED C

1. Write a simple program to show a delay.
2. Write a loop application to copy values from P1 to P2.
3. Write a C program for counting the no of times that a switch is pressed & released.
4. Write a simple program to create a portable hardware delay.
5. Write a C program to test loop time outs.
6. Develop & implement a program for intruder alarm system

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 the fundamentals of C programming including variables, operators, control statements, loops, arrays, and functions.	**K2**
CO2	Perform string processing operations including counting vowels, consonants, words, and white spaces.	**K3**
CO3	Apply mathematical and logical operations such as Fibonacci series, GCD, palindrome checking.	**K3**
CO4	Understand the basics of Embedded C programming and microcontroller interfacing.	**K2**
CO5	Develop simple Embedded C applications using ports, switches, delays, and loops.	**K3**

COURSE ARTICULATION MATRIX

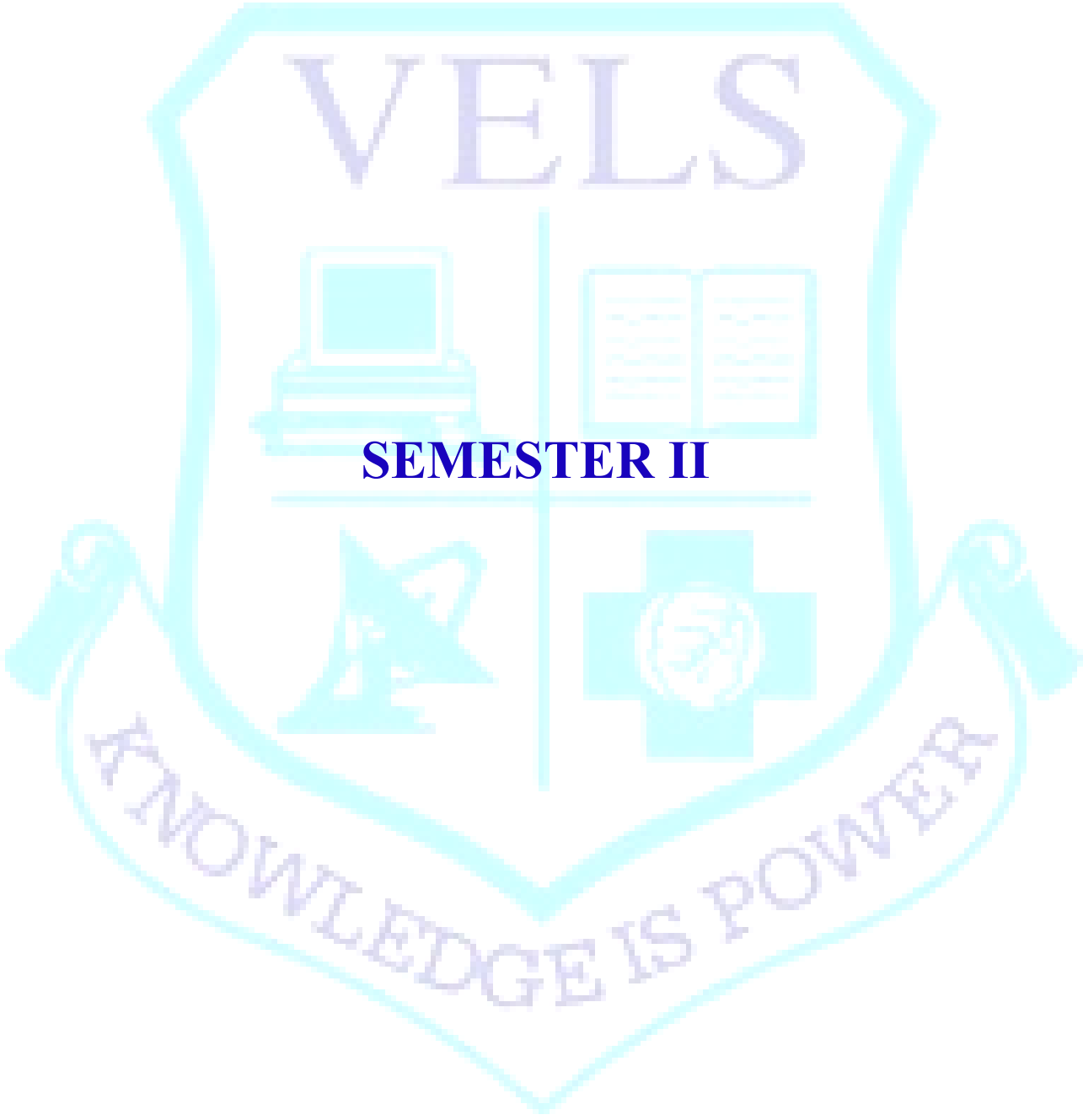
COs \ POs/PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	3	2	2	-	-	-	-	-	2	-
CO2	-	3	3	-	-	-	-	-	2	-
CO3	-	3	3	-	-	-	-	-	2	-
CO4	3	-	-	3	-	-	2	-	-	-
CO5	-	2	2	3	2	-	-	3	-	-
AVG	3	2.5	2.5	3	2	-	2	3	2	-

REFERENCE BOOKS:

1. C Programming for Embedded Systems, Kirk Zurell, Sofie Beerens, CRC Press (March 1, 2000)
2. Embedded C, Mikael J. Pont, Addison-Wesley Professional (May 4, 2002)

WEB RESOURCES:

1. https://www.javatpoint.com/embedded-system-c-programming
2. https://www.electronicshub.org/basics-of-embedded-c-program/



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

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 - வழிவியல் 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 Mஇலக்கியம்	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

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

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

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

1. 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	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),

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	Grammar & Composition	9 hours

- Active & Passive Voice
- Direct & Indirect Speech
- Letter Writing (Formal & Informal)
- Creative Writing – Writing stories
- Hints Developing

UNIT II	Prose	9 hours

- Nadine Gordimer – *Once upon a Time*
- E. V. Lucas – *Bores*

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	Poetry	9 hours

- Robert Frost – *Stopping by Woods on a Snowy Evening*
- Maya Angelou – *Still I Rise*

Listening: Listening and summarizing the poem

Speaking: Explaining poetic lines orally

Reading: Reading and inferring contextual meaning

Writing: Paraphrase of poems

UNIT IV	Short stories	9 hours

• Anton Chekhov – *The Bet* • O. Henry – *After Twenty Years* **Listening:** Story narration and summarizing **Speaking:** Character discussion and debate **Reading**: Contextual vocabulary identification **Writing**: Summary and character sketch		
UNIT V	**One-Act Play**	**9 hours**
• Langston Hughes - *Soul Gone Home* • Lucille Fletcher-*Sorry, Wrong Number* **Listening:** Dramatic reading and dialogue comprehension **Speaking:** Role play and dramatization **Reading:** Character and conflict analysis **Writing:** Character sketch/dialogue writing		

Total: 45 Hours

Self Learning: 45 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. Murphy, Raymond. *English Grammar in Use*. Cambridge University Press, 2019.
2. Wren, P. C., and H. Martin. *High School English Grammar and Composition*. Revised ed., S. Chand & Company, 2009.

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	-	-

	OBJECT ORIENTED PROGRAMMING LANGUAGES	L	T	P	SL	C
		3	0	0	3	3

COURSE OBJECTIVES:

The course provides insight knowledge about object-oriented programming concepts and programming language in C++ and JAVA.

UNIT I	OBJECT ORIENTED PROGRAMMING AND BASICS OF C++	9 Hours

Principles of Object-Oriented Programming – Beginning with C++ - Applications of C++ - Tokens –Keywords- Expressions – Data Types – Storage Classes – Operators –Manipulators- Typecast Operator – Arrays –Strings-Control Structures – Operator Overloading -Functions in C++ - Function Prototyping – Call by REFERENCE BOOKS – Inline Functions –Recursion – Function Overloading – Friend and Virtual Function.

UNIT II	CLASSES AND OBJECTS AND OPERATOR OVERLOADING	9 Hours

Introduction – Classes and Objects – Constructors –Parameterized Constructors – Copy Constructor – Dynamic Constructors – Destructors – Introduction to Operator Overloading – Overloading Unary Operator – Overloading Binary Operator – Type Conversions.

UNIT III	INHERITANCE AND POLYMORPHISM	9 Hours

Introduction- Defining Derived Classes - Inheritance – Types of Inheritance – Abstract Classes - Introduction to Virtual Functions - Pure Virtual Function-Polymorphism – Exception Handling.

UNIT IV	JAVA INTRODUCTION, ARRAYS AND STRINGS	9 Hours

Java Evolution - Overview of Java Language – Constants – Variables – Data Types – Operators and Expressions – Class, Objects and Methods – Arrays, Strings and Vectors.

UNIT V	PACKAGES AND MULTITHREADING	9 Hours

Introduction – Java API Packages – Creating Packages – Accessing a Package – Adding a Class to a package – Multithreading – Creating Threads - Life Cycle of a Thread – Thread Exceptions – Inter-Thread Communication.

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 principles of Object-Oriented Programming and demonstrate the basic concepts of C++ including data types, operators, functions, arrays, strings, and control structures	**K2**
CO2	Develop C++ programs using classes, objects, constructors, destructors, and operator overloading techniques.	**K3**
CO3	Apply inheritance, polymorphism, virtual functions, abstract classes, and exception handling concepts in object-oriented software development.	**K3**
CO4	Explain the fundamentals of Java programming including classes, objects, methods, arrays, strings, vectors, operators, and expressions.	**K2**
CO5	Implement object-oriented applications using C++ and Java programming concepts for solving real-world problems.	**K4**

COURSE ARTICULATION MATRIX

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

TEXT BOOKS:

1. Paul Deitel and Harvey Deitel (2015), "C++ How to Program", Nineth Edition, Prentice Hall.
2. Herbert Schildt (2023), "Java The complete REFERENCE BOOKS", 13th Edition, McGraw Hill Professional.

REFERENCE BOOKS:

1. Balagurusamy E.(2012) "Object oriented programming using C++ and JAVA", First Edition, Tata McGraw–Hill Education.

	OPERATING SYSTEMS WITH KALI LINUX	L	T	P	SL	C
		3	0	0	3	3

COURSE OBJECTIVES:

To provide fundamental knowledge of Operating System concepts and introduce the Linux environment with emphasis on Kali Linux for understanding basic system administration, networking and security tools used in cyber security.

UNIT I	INTRODUCTION TO OPERATING SYSTEMS	9 Hours

Introduction — Definition and Functions of Operating System — Types of Operating Systems — Operating System Structure — System Calls and System Programs — Process Overview — Memory and File Management Overview — Security and Protection Concepts

UNIT II	LINUX OPERATING SYSTEM AND COMMANDS	9 Hours

Introduction to Linux — Features of Linux — Linux File System Structure — Basic Linux Commands — File and Directory Management — File Permissions and Ownership — User and Group Management — Process Management Basics

UNIT III	INTRODUCTION TO KALI LINUX	9 Hours

Introduction — History and Features of Kali Linux — Installation and Booting — Kali Interface — Basic Commands — Directory Structure — User Permissions.

UNIT IV	SYSTEM ADMINISTRATION AND NETWORKING IN KALI LINUX	9 Hours

User and Group Management — Process Management — Disk and Package Management — Networking Basics — Network Configuration — Network Protocols — Introduction to Cyber Security and Ethical Hacking Concepts.

UNIT V	KALI LINUX SECURITY TOOLS AND APPLICATIONS	9 Hours

Information Gathering Tools — Network Scanning Tools — Vulnerability Analysis Tools — Password Cracking Techniques — Wireless Security Testing Tools — Basics of Penetration Testing — Security Reporting and Documentation.

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, functions, structures, and types of operating systems along with process, memory, file management, and security concepts	**K2**
CO2	Demonstrate the use of Linux operating system commands for file management, permissions, user administration, and process management.	**K3**
CO3	Understand the features, installation, directory structure, and command-line operations of Kali Linux.	**K3**
CO4	Apply system administration and networking concepts in Kali Linux including user management, package management, and network configuration.	**K2**
CO5	Utilize Kali Linux security tools for information gathering, vulnerability analysis, network scanning, password testing, and basic penetration testing.	**K3**

COURSE ARTICULATION MATRIX

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

TEXT BOOKS:

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne (2021), *Operating System Concepts*, 10th Edition, Wiley.
2. Richard Fox (2021), *Linux with Operating System Concepts*, 2nd Edition, CRC Press.
3. Glen D. Singh (2024), *The Ultimate Kali Linux Book*, Packt Publishing.

REFERENCE BOOKS:

1. Pranabananda Chakraborty (2024), *Operating Systems: Evolutionary Concepts and Modern Design Principles*, Chapman & Hall / CRC.
2. Vijay Kumar Velu (2023), *Mastering Kali Linux for Advanced Penetration Testing*, Packt Publishing.
3. Glen D. Singh (2022), *The Ultimate Kali Linux Book – Second Edition*, Packt Publishing

	OBJECTORIENTED PROGRAMMING LANGUAGES LAB	L	T	P	SL	C
		0	0	2	1	1

COURSE OBJECTIVES:

The purpose of this course is to introduce to students to the field of programming using C++ and Java. Be able to use the Java SDK environment to create, debug and run simple Java programs.

LIST OF PROGRAMS:

1. Design C++ classes with static members, methods with default arguments.
2. Implement complex number class with necessary operator overloading and type conversions such as integer to complex, double to complex, complex to double etc using C++.
3. Manage bank account using inheritance concept using C++
4. Design stack and queue classes with necessary exception handling using C++.
5. Develop with suitable hierarchy, classes for Point, Shape, Rectangle, Square, Circle, Ellipse, Triangle, Polygon, etc
6. Programs illustrating various data types in java.
7. Programs to implement method overloading in java.
8. Programs illustrating the implementation of various forms of inheritance (single, hierarchical, multilevel).
9. Programs to implement polymorphism and method overriding in java
10. Programs to illustrate interfaces in java.
11. Programs to create package in java

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	Implement C++ classes using static members, constructors, default arguments, and operator overloading techniques.	**K2**
CO2	Develop object-oriented applications using inheritance, polymorphism, exception handling, and class hierarchies in C++.	**K3**
CO3	Demonstrate the use of Java programming concepts including data types, methods, arrays, and object-oriented principles.	**K2**
CO4	Develop Java programs implementing inheritance, polymorphism, method overriding, interfaces, exception handling, and packages..	**K3**
CO5	Construct object-oriented solutions using C++ and Java for solving practical software development problems.	**K3**

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. Herbert Schildt (2023), "Java The complete REFERENCE BOOKS", 13th Edition, McGraw Hill Professional.
2. Bloch, Joshua (2018), "Effective Java: Programming Language Guide" (Third ed.). Addison-Wesley, ISBN 978-0134685991.
3. Pecinovsky, Rudolf (2013). OOP – Learn Object Oriented Thinking & Programming. Bruckner Publishing, ISBN 978-80-904661-8-0.

WEB RESOURCES:

1. https://www.sanfoundry.com/cpp-programs/
2. https://www.javatpoint.com/cpp-programs
3. https://www.programiz.com/cpp-programming/examples

	OPERATING SYSTEMS WITH KALI LINUX LAB	L	T	P	SL	C
		0	0	2	1	1

COURSE OBJECTIVES:

To provide an understanding of the design aspects of operating system concepts and introduce basic Linux commands, system call interface for process management, interprocess communication, and I/O in Linux. It also enables students to gain hands-on experience with virtualization, firewall configuration, and network security using tools such as SNORT for a secure operating system environment

LIST OF PROGRAMS:

1. Basics of Linux commands. Understand and practice Linux permissions, special permissions and authentication (various options of CHMOD, SETUID, SETGID).
2. Write programs using the following system calls of Linux Operating System: FORK, EXEC, GETPID, EXIT, WAIT, CLOSE, STAT, OPENDIR, READDIR.
3. Write programs to implement the various **CPU Scheduling Algorithms**.
4. Implement **Banker's Algorithm** for Deadlock Detection and Avoidance.
5. a)FIFO
   b)LRU
   c) LFU
6. Study the features of firewall in providing network security and configure Firewall Security settings in Microsoft Windows.
7. Install and configure a virtual machine using Oracle VM VirtualBox and set up Kali Linux and Windows operating systems within it.
8. Perform network traffic analysis using Wireshark.
9. Investigate **Buffer Overflow vulnerabilities**.
10. Perform **Password Cracking experiment** in Windows and Linux environment.
11. Investigate **ARP Poisoning attack**.
12. Demonstrate any **Intrusion Detection System Tool** (Snort or any other tool).

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	Understand basic Linux commands, file permissions and authentication mechanisms.	**K2**
CO2	Apply various system calls such as FORK, EXEC, GETPID, etc.	**K3**
CO3	Develop programs to implement CPU Scheduling, Banker's Algorithm and Page Replacement Algorithms.	**K3**
CO4	Apply security tools to perform network traffic analysis and vulnerability assessment.	**K3**
CO5	Demonstrate the use of Intrusion Detection System tools to monitor and analyze network traffic for security threats.	**K3**

COURSE ARTICULATION MATRIX

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

REFERENCE BOOKS:

1. Michael Kerrisk (2010), "The Linux Programming Interface: A Linux and UNIX System Programming".
2. Jason Cannon (2013), "Linux for Beginners: An Introduction to the Linux Operating System and Command Line".

WEB RESOURCES:

1. https://www.tutorialspoint.com/unix/index.htm
2. https://www.javatpoint.com/linux-tutorial

PROFESSIONAL ELECTIVE COURSES

	FUNDAMENTALS OF COMPUTING	L	T	P	SL	C
		3	0	0	3	3

COURSE OBJECTIVES:

To introduce the fundamental concepts of Computers, Hardware, Software and able to interact with documentation, PowerPoint, Spreadsheet and Database.

UNIT I	INTRODUCTION TO COMPUTERS -COMPUTER	9 Hours

Definition, Characteristics of Computers, Basic Applications of Computer, Generations of computers. Components of Computer System: Central Processing Unit (CPU), input/output Devices, computer Memory: primary and secondary memory, magnetic and optical storage devices, Concepts of Hardware and Software. Data processing: concepts of data processing, Definition of Information and data, Basic data types, Storage of data/Information as files, Representation of data/Information.

UNIT II	WORD PROCESSING-MS WORD	9 Hours

Word Processing Basic: An Introduction to Word Processing and MS-Word, working with documents, using tables, pictures, and charts, using mail merge and sending a letter to a group of people, creating form letters and labels, collaborating with workgroups, modifying a report, macros.

UNIT III	ELECTRONICS SPREADSHEET	9 Hours

Elements of Electronics Spread Sheet and Ms-Excel: - Entering, Editing and Formatting Data, Formatting Numbers, Managing Worksheets, Modifying Rows and Columns, Changing Views, AutoFill and Custom Lists, Conditional Formatting, Tables, Data Tools, Functions: Using functions: mathematical, statistical and financial function - Ranges and Dates, Lookups, Conditional Logic, Text Formulas, Introduction to Charts, Formatting Charts, Adding Graphics to Spreadsheets, Outline, Sort, Filter, and Subtotal, PivotTables, Protecting Data.

UNIT IV	PRESENTATION SOFTWARE- MS-POWERPOINT	9 Hours

Creating and enhancing a presentation, creating and publishing a web presentation, modifying a presentation, working with visual elements, delivering a presentation and designing a template.

UNIT V	INTRODUCTION TO DATA BASE:	9 Hours

Working with databases: using the database wizard, working with datasheets, moving between records and files, using goto, updating records, selecting rows and columns,

changing column width, saving and exiting a datasheet. Working with tables: Creating a new database, adding tables to database, adding fields to tables, inserting a field, setting a primary key, adding and sorting records, setting relationships. Creating reports, forms and queries, using wizard and design view.

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, characteristics, generations, and applications of computers along with hardware and software concepts.	**K2**
CO2	Apply word processing techniques using Microsoft Word for creating, editing, formatting, and managing documents.	**K3**
CO3	Perform mathematical, statistical, financial, logical, lookup, text, and date functions to perform data analysis.	**K3**
CO4	Develop effective presentations using Microsoft PowerPoint with multimedia and visual design elements.	**K3**
CO5	Understand database concepts and perform database operations such as creating tables, forms, reports, and queries.	**K2**

COURSE ARTICULATION MATRIX

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

TEXT BOOKS:

1. Goe1, A.,2010 Computer Fundamentals, Pearson Education
2. Joan Lambert & Curtis Frye (2021), Microsoft Excel Step by Step, Microsoft Press.
3. Joan Lambert (2021), Microsoft Word Step by Step, Microsoft Press.
4. Curtis Frye , Joan Lambert (2022), Microsoft Office Step by Step (Office 2021 and Microsoft 365) Paperback – Import.

REFERENCE BOOKS:

1. E. Balagurusamy (2019), Computer Fundamentals & Programming in C, McGraw-Hill.
2. Prof. Satish Jain, M. Geetha, Kratika : Office 2010 Training Guide:
3. P.K. Sinha & Priti Sinha (2010), Computer Fundamentals, BPB Publications.
4. E. Balagurusamy (2019), Computer Fundamentals & Programming in C, McGraw-Hill

	DIGITAL LOGIC FUNDAMENTALS	L	T	P	SL	C
		3	0	0	3	3

COURSE OBJECTIVES:

To understand the concept of digital systems, to operate on various Number systems and simplify Boolean functions and to distinguish logical and combinational circuits.

UNIT I	NUMBER SYSTEM AND CODES	9 *Hours*

Binary-why it is so important in computers? – Conversions: binary to decimal – decimal to binary – octal – Hexa decimal – ASCII code –Excess-3 Code – Gray Code –Gates: OR gates – AND gates – Boolean Algebra – NOR gates – NAND gates.

UNIT II	BOOLEAN ALGEBRA	9 *Hours*

Boolean Law and theorems –sum of product method – K-Map truth tables – Pairs, Quads, Octets – K-Map simplifications – Don't care – product of sum method – product of sum simplifications.

UNIT III	COMBINATIONAL LOGIC CIRCUIT	9 *Hours*

Multiplexers –Demultiplexers – Decoders – Encoders – Code Converters – Parity Generators & Checkers – PAL – PLA.

UNITIV	SEQUENTIAL LOGIC CIRCUITS I	9 Hours

Sequential Logic: RS, JK, D and T Flip-Flops – Edge-Triggered – Master – Slave Flip-Flops. Registers: Shift Registers – Types of Shift Registers.

UNIT V	COUNTERS	9 Hours

Types of ROMs - Types of RAMs -Counters: Asynchronous Counters- Ripple – Synchronous Counters – Shift Counters.

Total: 45 Hours

Self-Learning : 45 Hours

COURSE OUTCOMES:

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

Course Outcome	Description	Bloom's Level
CO1	Explain number systems, binary arithmetic, coding techniques, and basic logic gates used in digital electronics.	**K2**
CO2	Apply Boolean laws, theorems, truth tables, and K-Map techniques for simplification of Boolean expressions.	**K3**
CO3	Design and analyze combinational logic circuits using multiplexers, demultiplexers, encoders, decoders, code converters, and programmable logic devices	**K4**
CO4	Understand the operation of sequential logic circuits including flip-flops and shift registers.	**K2**
CO5	Analyze memory devices, counters, synchronous and asynchronous sequential circuits used in digital systems.	**K4**

COURSE ARTICULATION MATRIX

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

TEXT BOOKS:

1. D.P. Leach & A.P. Malvino (2002), Digital Principles and Application, THM Fifth Edition.
2. Digital Principles and Applications by D.P. Leach & A.P. Malvino (5th Ed, 2002) → Good reference, but edition is older so may not include HDL tools and modern FPGA contexts.
3. Digital Logic and Computer Design by M. Morris Mano (2001) → Classic text, though older. There are later international editions (2016, 2017) noted.

REFERENCE BOOKS:

1. M.M. Mano (2001), Digital Logic and Computer Design, PHI
2. T.C. Bartee (1991), Digital Computer Fundamentals, 6th Edition, Tata McGraw Hill.
3. Donald D.Givone (2004), Digital Principles and Design – Tata McGraw – Hill Publishing Company Limited .
4. Digital Principles and Design by Donald D. Givone (2004) → Still decent, but again older

WEB RESOURCES:

1. www.tutorialspoint.com/computer_logical_organization
2. www.geeksforgeeks.org/digital-electronics-logic-design-tutorials

	DATA STRUCTURES AND ALGORITHMS	L	T	P	SL	C
		4	0	0	4	4

COURSE OBJECTIVES:

To familiarize the students with linear and nonlinear data structures, to understand sorting and searching, to manipulate the complexity of data structures using asymptotic notations and to apply the data structures in solving problems.

UNIT I	INTRODUCTION TO DATA STRUCTURES	12 Hours

Introduction to Data Structures- Why Data Structures – Operations of Data Structures – Data Types – Arrays and Lists – Representation of Arrays – Operations on Arrays - Abstract Data Types (ADTs) – List ADT.

UNIT II	LINEAR DATA STRUCTURES	12 Hours

Stack: Operations of Stack – Representation – Implementation – Infix to Postfix Conversion –Postfix Evaluation–Recursion–Maze Problem–Queue: Operations of Queue– Representation– Implementation– Job Processing using Queue – Circular Queue – Double Ended Queue – Linked List: Representation – Implementation– Polynomial Addition– Doubly Linked List– Circular List– Circular Doubly Linked List.

UNIT III	NON-LINEAR DATA STRUCTURES	12 Hours

Non-Linear Data Structures – Trees: Terminologies in Trees – Representation – Types of Trees – Forest – Transforming Forest into Binary Trees - Traversal Techniques – Applications of Trees – Graphs: Terminologies in Graphs – Representation – Depth First Search – Breadth First Search – Applications of Graphs – Shortest Path- Travelling Salesman Problem – Dijkstra's Algorithm – Types of Graphs.

UNIT IV	SORTING AND SEARCHING	12 Hours

Sorting: Bubble Sort – Selection Sort – Merge Sort – Insertion Sort – Quick Sort – Heap Sort – Searching: Linear Search – Binary Search – Divide and Conquer – Hashing - Hash Table – Direct Address Method – Mapping Function – Handling Collision.

UNIT V	COMPLEXITY AND CASE STUDIES	12 Hours

Asymptotic Notation – Big Oh Notation – Omega Notation – Tita Notation – Complexity: Space Complexity – Time Complexity – Space and Time Complexities of Data Structures – Case Studies: Searching for Patterns- Inventing a new sorting Algorithm - Synthesizing Concurrent Graph Data Structures.

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 concepts of data structures, abstract data types, arrays, and list operations.	**K2**
CO2	Apply linear data structures such as stacks, queues, linked lists, and their operations to solve computational problems.	**K3**
CO3	Analyze graph algorithms such as Depth First Search, Breadth First Search, shortest path, travelling salesman problem, and Dijkstra's algorithm	**K4**
CO4	Apply various sorting and searching techniques including hashing methods for efficient data management.	**K3**
CO5	Evaluate the performance of algorithms and data structures using asymptotic notations and complexity analysis.	**K5**

COURSE ARTICULATION MATRIX

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

TEXT BOOKS:

1. Gav Pai (2017), "Data structures and algorithms, concepts, techniques and Applications", McGraw Hill, ISBN –9780070667266.
2. E.Horowitz and S.Shani (2009) , "Fundamentals of Data Structures in C++", Galgotia Pub.

REFERENCE BOOKS:

1.Horowitz, S.Sahni,and S.Rajasekaran (2012)," Computer Algorithms", Galgotia Pub.Pvt.Ltd.

2.R.Kruse, C.L.Tondoand B.Leung, (1997),"Data Structures and Program designing C", PHI.

WEB RESOURCES:

1. https://www.tutorialspoint.com/data_structures_algorithms
2. https://www.javatpoint.com/data-structure-tutorial
3. https://www.edx.org/learn/data-structures



	INTRODUCTION TO GENERATIVE AI	L	T	P	SL	C
		4	0	0	4	4

COURSE OBJECTIVES:

This course aims to introduce the fundamental concepts of Generative Artificial Intelligence, including deep learning architectures and generative models such as GANs and Large Language Models. It also focuses on applications, challenges, and ethical aspects of Generative AI along with exposure to modern AI tools and techniques.

UNIT I	INTRODUCTION TO GENERATIVE AI	12 Hours

Overview of Artificial Intelligence and Machine Learning – Discriminative vs Generative models – Introduction to Generative AI – History and evolution of generative techniques – Applications in text, image, audio and code generation – Impact of Generative AI in industry – Basic workflow of generative systems.

UNIT II	DEEP LEARNING FOUNDATIONS	12 Hours

Artificial Neural Networks – Activation functions – Loss functions – Gradient descent and backpropagation – Neural network architectures – Convolutional Neural Networks – Recurrent Neural Networks – Representation learning.

UNIT III	GENERATIVE MODELS AND GANS	12 Hours

Probability distributions and likelihood estimation – Latent variable models – Autoencoders – Variational Autoencoders – Generative Adversarial Networks – Generator and Discriminator design – GAN training challenges – Applications of GANs.

UNIT IV	LARGE LANGUAGE MODELS AND APPLICATIONS	12 Hours

Evolution of Natural Language Processing – Transformer architecture overview – Training Large Language Models – Prompt engineering basics – Hallucination in LLMs – Applications in healthcare, education and finance – AI productivity tools.

UNIT V	ETHICS, RISKS AND FUTURE TRENDS	12 Hours

Adversarial attacks – Deepfakes and misinformation – Detection of AI-generated content – Bias and fairness – Privacy and security issues – Responsible AI practices – AI regulations – Future scope of Generative AI.

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 fundamentals, history, workflow, and applications of Generative AI in text, image, audio, and code generation.	**K2**
CO2	Apply deep learning concepts including neural networks, activation functions, loss functions, gradient descent, CNNs, and RNNs in AI systems.	**K3**
CO3	Analyze architectures and training challenges of GANs and Large Language Models.	**K4**
CO4	Evaluate challenges related to hallucination, adversarial attacks, deepfakes, bias, fairness, privacy, and security in Generative AI systems.	**K3**
CO5	Analyze ethical issues, responsible AI practices, regulations, and future trends in Generative AI technologies.	**K4**

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		-	-	-	-	-	-	-
CO4	-	-	3	-	3	-	-	3	-	-
CO5	-	2		-	3	3	2	-	-	-
AVG	2.5	2.3	3	-	3	3	2	3	2	-

TEXT BOOKS:

1. David Foster (2023), *Generative Deep Learning*, 2nd Edition, O'Reilly Media.
2. Sahar Massachi (2024), *Introduction to Generative AI*, Manning Publications.
3. Sebastian Raschka (2024), *Build a Large Language Model (From Scratch)*, Manning Publications.
4. Bernard Marr (2023), *Generative AI in Practice*, Wiley Publications.

REFERENCE BOOKS:

1. Tom Taulli (2023), *Generative AI: How ChatGPT and Other AI Tools Will Revolutionize Business*, Apress.
2. Elvis Saravia (2022), *Prompt Engineering Guide*, DAIR.AI Publications.
3. Andreas Mueller & Sarah Guido (2022), *Introduction to Machine Learning with Python*, O'Reilly Media.
4. Simon Prince (2023), *Understanding Deep Learning*, MIT Press.

	STATISTICS USING R AND PYTHON	L	T	P	SL	C
		4	0	0	4	4

COURSE OBJECTIVES:

This course aims to develop a solid foundation in statistical concepts and to provide an understanding of the fundamentals of R and Python for statistical computing. It focuses on enabling students to utilize these tools effectively for data manipulation and analysis, and to apply statistical techniques to solve real-world problems. The course also seeks to enhance critical thinking and problem-solving skills in the context of statistical reasoning and decision making.

UNIT I	FUNDAMENTALS OF PYTHON AND R ENVIRONMENT	12 Hours

Introduction to Python – Installation and execution – Variables, operators and data types – Decision making – Loops and functions – Reading data from keyboard – Lists and dictionaries – Introduction to R environment – Installation – Variables, operators, data types – Control structures – Functions – Reading and writing CSV and Excel files – Package installation and usage.

UNIT II	DATA MANIPULATION USING PANDAS AND DPLYR	12 Hours

Introduction to Pandas – Series and DataFrame – Reading and writing CSV and Excel files – loc() and iloc() functions – Descriptive statistics – Inserting and deleting columns – Concatenation – Merging and joining DataFrames – Grouping and aggregation – Introduction to DPLYR – arrange(), select(), rename(), filter(), summarize() – Pipe operator – group_by(), across() – Database connectivity using Python and R.

UNIT III	DATA VISUALIZATION AND PROBABILITY DISTRIBUTIONS	12 Hours

Graphical methods – Bar charts – Grouped and stacked bar charts – Histograms – Line charts – Pie charts – Box plots – Scatter plots – Density plots – Strip charts – QQ plots – Implementation using R and Python – Probability distributions – Binomial – Poisson – Normal – Exponential – Chi-square – Student's t – F distribution – Uniform distribution.

UNIT IV	STATISTICAL INFERENCE AND NON-PARAMETRIC TESTS	12 Hours

Hypothesis testing – Population mean with known and unknown variance – Population proportion – Z-test – t-test – F-test – Chi-square goodness of fit test – Implementation using R and Python – Non-parametric tests – One-sample and two-sample tests – Sign test – Wilcoxon signed-rank test – Mann-Whitney test – Kolmogorov-Smirnov test – Kruskal-Wallis test.		
UNIT V	**ANOVA, REGRESSION AND MULTIVARIATE ANALYSIS**	**12. Hours**
Analysis of variance – One-way ANOVA – Two-way ANOVA – Correlation and covariance – Forecasting techniques – Moving average – Weighted moving average – Exponential smoothing – Regression models – Simple linear regression – Multiple regression – Polynomial regression – Logistic regression – Poisson regression – Advanced visualizations – GGPLOT2 graphs – Lattice graphs – Probability graphs – Mosaic graphs – Correlograms – Case studies and discussion		

Total: 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 and apply fundamental statistical concepts using R and Python programming environments.	**K3**
CO2	Perform data manipulation, cleaning and visualization using Pandas and DPLYR libraries.	**K3**
CO3	Create graphical visualizations and implement probability distributions using statistical tools in Python and R.	**K3**
CO4	Apply statistical inference techniques including hypothesis testing, Z-tests, t-tests, F-tests, Chi-square tests, and non-parametric tests using Python and R.	**K4**
CO5	Analyze and interpret ANOVA, regression models, forecasting techniques, and multivariate statistical methods for data-driven decision making.	**K4**

COURSE ARTICULATION MATRIX

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

TEXT BOOKS:

1. Wes McKinney (2022), *Python for Data Analysis*, 3rd Edition, O'Reilly Media.
2. Hadley Wickham & Garrett Grolemund (2023), *R for Data Science*, 2nd Edition, O'Reilly Media.
3. Gareth James, Daniela Witten, Trevor Hastie & Robert Tibshirani (2023), *An Introduction to Statistical Learning*, 2nd Edition, Springer.
4. Peter Bruce, Andrew Bruce & Peter Gedeck (2022), *Practical Statistics for Data Scientists*, O'Reilly Media.

REFERENCE BOOKS:

1. Allen B. Downey (2023), *Think Stats: Exploratory Data Analysis in Python*, O'Reilly Media.
2. Norman Matloff (2022), *The Art of R Programming*, No Starch Press.
3. Jake VanderPlas (2022), *Python Data Science Handbook*, O'Reilly Media.
4. Michael J. Crawley (2022), *Statistics: An Introduction Using R*, Wiley Publications.

	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 completing the course, students 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

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**	**-**	**-**

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

MULTIDISCIPLINARY COURSES

	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: 45 Hours

Self Learning : 45 Hours

COURSE OUTCOMES:

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

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE 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	PO9	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**

TEXTBOOKS

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-orders-lattices/
2. https://www.ipsgwalior.org/download/number%20system.pdf

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

COURSE OBJECTIVES:

- To enable professional undergraduate students to understand the importance of Mathematics
- To provide basic knowledge of Discrete Mathematics and Probability.
- The main aim of this course is to help the students to read, classify and then interpret the data given to them and draw conclusions. Students understand the concepts like Logic, tautology and Probability.
- Students understand the concepts like Logic, tautology and Probability.

UNIT 1:	FUNDAMENTALS OF LOGIC	9 Hours

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

UNIT 2:	LOGIC AND TATUOLOGY	9 Hours

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

UNIT 3:	PERMUTATIONS AND COMBINATIONS	9 Hours

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

UNIT 4:	BASICS OF PROBABILITY	9 Hours

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

UNIT 5	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 Hours: 45 Hours

Self Learning : 45 Hours

COURSE OUTCOMES

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

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE 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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PO9	PSO1	PSO 2	PSO 3
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. S.I.Resnick (1999), A Probability Path, Birhauser, Berlin

WEB LINKS:

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/

VALUE ADDED COURSES

	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:

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

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Identify the basics of value education, skill education, and the concept of happiness and prosperity in life.	K1
CO2	Explain harmony at multiple levels including self, family, society, nature, and co-existence.	K2
CO3	Apply right understanding in ethical human conduct and value-based living in daily life.	K3
CO4	Analyze human relationships, societal harmony, and interconnectedness in nature and existence.	K4
CO5	Evaluate ethical practices, professional values, and strategies for value-based life and profession.	K5

COURSE ARTICULATION MATRIX

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

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.