KG COLLEGE OF ARTS AND SCIENCE
Autonomous Institution | Affiliated to Bharathiar University
Accredited with A++ Grade by NAAC
ISO 9001:2015 Certified Institution
KGiSL Campus, Saravanampatti, Coimbatore – 641 035

Regulations 2025 -26 for Undergraduate Programme

Learning Outcomes Based Curriculum Framework- (LOCF)
model with Choice Based Credit System (CBCS)

Programme: B.Sc. Computer Science with Cyber Security
Programme Code: BCY

(Applicable for the Students Admitted During the Academic Year 2025 - 26 onwards)

Eligibility

The Student should have passed Higher Secondary Examination and wherever the students have not studied mathematics knowledge be imparted through Residential/Bridge Course. (As per the eligibility condition given Ref. BU/R/B3-B4/Eligibility Condition/2025/7960 dated 08/05/2025).

Program Learning Outcomes (PLOs)

The successful completion of B.Sc. CS With Cyber Security Programme shall enable the students to:

PLO1	Design, implement, and evaluate a computer network and information security needs of an organization
PLO2	Analyze and evaluate the cyber security needs of an organization and society and apply the knowledge for sustainable solutions
PLO3	Explore Current and emerging techniques and technologies to formulate solutions for systems and organizations.
PLO4	Develop ethical solutions by applying of Artificial Intelligence, Machine learning, Cloud Computing, Big Data and Cyber Security.
PLO5	Demonstrate comprehensive knowledge in IT solution development to achieve professional excellence and support higher education and research.

B.Sc. Computer Science with Cyber Security
Distribution of Credits and Hours for all the Semesters

Part	Courses	No. of Courses	Hours		Credits	Total		Semester
I	Language – I	4	4 X 4	16	3	12	12	1-4
II	Language - II	4	4 X 4	16	3	12	12	1-4
III	Core Theory **(6 hrs. /week)**	4	4 X 6	24	4	16	100	3,6
	Core Theory **(5 hrs./week)**	9	9 X 5	45	4	36		1,2,4,5
	Core Lab **(4 hrs. / week)**	4	4 X 4	16	2	8		1-4
	Core Lab **(5 hrs./week)**	3	3 X 5	15	3	9		5,6
	Allied	4	4 X 4	16	3	12		1-4
	Electives	2	2 X 5	10	3	6		5,6
	Project	1	1 X 6	6	5	5		6
	SEC : Internship	1	-	-	2	2		5
	Skill Enhancement (SEC)	3	3 X 2	6	2	6		3,4,6
IV	Foundation Course(FC)	2	2 X 2	4	2	4	14	1,2
	Foundation Course(FC) - Self-study	1	-	-	2	2		3
	Ability Enhancement Compulsory Course(AECC)	3	3 X 2	6	2	6		1,2,4
	Ability Enhancement Compulsory Course(AECC) - MOOC	1	-	-	2	2		3
V	Extension Activity-Liberal Arts Extracurricular and co-curricular activities	-	-	-	2	2	2	4
	Total	**46**		**180**		**140**	**140**	

Consolidated Semester wise and Component wise
Hours and Credits Distribution

Semester	Part I		Part II		Part III		Part IV		Part V		Total	
	Hrs.	Credits	Hrs.	Credits	Hrs.	Credits	Hrs.	Credits	Hrs.	Credits	**Hrs.**	**Credits**
I	4	3	4	3	18	13	4	4	-	-	**30**	**23**
II	4	3	4	3	18	13	4	4	-	-	**30**	**23**
III	4	3	4	3	22	15	-	4	-	-	**30**	**25**
IV	4	3	4	3	20	15	2	2	-	2	**30**	**25**
V	-	-	-	-	30	23	-	-	-	-	**30**	**23**
VI	-	-	-	-	30	21	-	-	-	-	**30**	**21**
Total	**16**	**12**	**16**	**12**	**138**	**100**	**10**	**14**	**-**	**2**	**180**	**140**

Curriculum

B.Sc. Computer Science with Cyber Security

Semester – 1									
Course Code	**Part**	**Course Category**	**Course Name**	**Hours / Week**	**Examination**				**Credits**
					Duration in Hours	**Max Marks**			
						CIA	**ESE**	**Total**	
25TAM11L	I	Language-I	Tamil-I	4	3	25	75	100	3
25HIN11L	I		Hindi-I						
25MAL11L	I		Malayalam-I						
25FRE11L	I		French-I						
25ENG12L	II	Language-II	English-I	4	3	25	75	100	3
25BCY13C	III	Core – I	Python Programming	5	3	25	75	100	4
25BCY14P	III	Core Lab – I	Python Programming Lab	4	3	40	60	100	2
25BCY15C	III	Core – II	Foundations of Networking and Cybersecurity	5	3	25	75	100	4
25BCY16A	III	Allied – I	Linear Algebra and Discrete Mathematics	4	3	25	75	100	3
25ENV1FC	IV	FC – I	Environmental Studies	2	2	50	-	50	2
25SOF1AE	IV	AECC – I	Soft Skills	2	2	-	50	50	2
			Total	**30**				**700**	**23**

Semester – 2									
Course Code	**Part**	**Course Category**	**Course Name**	**Hours/ Week**	**Examination**				**Credits**
					Duration in Hours	**Max Marks**			
						CIA	**ESE**	**Total**	
25TAM21L	I	Language - II	Tamil – II	4	3	25	75	100	3
25HIN21L	I		Hindi – II						
25MAL21L	I		Malayalam – II						
25FRE21L	I		French – II						
25ENG22L	II	English – II	English – II	4	3	25	75	100	3
25BCY23C	III	Core – III	Java Programming	5	3	25	75	100	4
25BCY24P	III	Core Lab - II	Java Programming Lab	4	3	40	60	100	2
25BCY25C	III	Core – IV	Security Fundamentals with Linux Operating System	5	3	25	75	100	4
25BCY26A	III	Allied – II	Optimization Techniques	4	3	25	75	100	3
25HUM2FC/	IV	FC – II	Human Rights/	2	2	50	-	50	2
25DIM2FC			Disaster Management						
25IDT2AE	IV	AECC – II	Innovation & Design Thinking	2	2	-	50	50	2
25IPR2AE			Intellectual Property Rights						
25END2AE			Entrepreneurship Development						
			Total	**30**				**700**	**23**

Semester – 3									
Course Code	**Part**	**Course Category**	**Course Name**	**Hours / Week**	**Examination**				**Credits**
					Duration in Hours	**Max Marks**			
						CIA	**ESE**	**Total**	
25TAM31L	I	Language – I	Tamil – III	4	3	25	75	100	3
25HIN31L	I		Hindi – III						
25MAL31L	I		Malayalam – III						
25FRE31L	I		French – III						
25ENG32L	II	Language – II	English – III	4	3	25	75	100	3
25BCY33C	III	Core – V	Data Structures	6	3	25	75	100	4
25BCY34P	III	Core Lab – III	Data Structures Lab	4	3	40	60	100	2
25BCY35C	III	Core – VI	Cyber Law	6	3	25	75	100	4
25BCY36A	III	Allied – III	Number Theory	4	3	25	75	100	3
25BCY37P	III	SEC – I	Ethical Hacking Lab	2	3	40	60	100	2
25BAT3FC/	IV	FC – III	Basic Tamil /	-	2	50	-	50	2
25ADT3FC/			Advanced Tamil/						
25IKS3FC			Indian Knowledge Systems (IKS)*						
25MOO3AE	IV	AECC – III	Online Course - MOOC	-	-	50	-	50	2
			Total	**30**				**800**	**25**

Semester – 4									
Course Code	**Part**	**Course Category**	**Course Name**	**Hours/ Week**	**Examination**				**Credits**
					Duration in Hours	**Max Marks**			
						CIA	**ESE**	**Total**	
25TAM41L	I	Language - I	Tamil – IV	4	3	25	75	100	3
25HIN41L	I		Hindi – IV						
25MAL41L	I		Malayalam – IV						
25FRE41L	I		French – IV						
25ENG42L	II	Language - II	English – IV	4	3	25	75	100	3
25BCY43C	III	Core – VII	RDBMS Programming	5	3	25	75	100	4
25BCY44P	III	Core Lab – IV	RDBMS Programming Lab	4	3	40	60	100	2
25BCY45C	III	Core – VIII	Blockchain Technology	5	3	25	75	100	4
25BCY46A	III	Allied – IV	Security in IoT	4	3	25	75	100	3
25BCY47P	III	SEC Lab – II	Security Analysis Lab	2	3	40	60	100	2
25QUA4AE	IV	AECC – IV	Quantitative Aptitude	2	2	-	50	50	2
25EXC4LA	V	Extra-Curricular & Co-Curricular Activities	Liberal Arts	-	-	50	-	50	2
			Total	**30**				**800**	**25**

Semester – 5									
Course Code	**Part**	**Course Category**	**Course Name**	**Hours / Week**	**Examination**				**Credits**
					Duration in Hours	**Maximum Marks**			
						CIA	**ESE**	**Total**	
	III	Core – IX	Cyber Crime Investigation and Digital Forensics	5	3	25	75	100	4
	III	Core Lab – V	Cyber Crime Investigation and Digital Forensics lab	5	3	40	60	100	3
	III	Core – X	Relational Database Management System	5	3	25	75	100	4
	III	Core Lab – VI	RDBMS lab	5	3	40	60	100	3
	III	Core – XI	Data Analytics for Fraud Detection	5	3	25	75	100	4
	III	Elective – I	Ethical Hacking	5	3	25	75	100	3
			Data Communication and Networking						
			Biometric Security						
	III	SEC-III	Internship	-	-	50	-	50	2
Total				**30**				**650**	**23**

Semester – 6									
Course Code	**Part**	**Course Category**	**Course Name**	**Hours / Week**	**Examination**				**Credits**
					Duration in Hours	**Max. Marks**			
						CIA	**ESE**	**Total**	
	III	Core – XII	Cyber Security	6	3	25	75	100	4
	III	Core Lab –VII	Cyber Security Lab	5	3	40	60	100	3
	III	Core – XIII	Artificial Intelligence & Machine Learning	6	3	25	75	100	4
	III	Elective – II	Internet of Things	5	3	25	75	100	3
			Intrusion Detection and Prevention System						
			Network Security & Cryptography						
	III	SEC – IV	Network Management Systems and Operations Lab	2	3	40	60	100	2
	III	Core	Project Work	6	3	40	60	100	5
			Total	**30**				**700**	**21**
			Grand Total	**180**				**4250**	**140**

Semester 1

Semester – 1									
Course Code	**Part**	**Course Category**	**Course Name**	**Hours / Week**	**Examination**				**Credits**
					Duration in Hours	**Max Marks**			
						CIA	**ESE**	**Total**	
25TAM11L	I	Language-I	Tamil-I	4	3	25	75	100	3
25HIN11L	I		Hindi-I						
25MAL11L	I		Malayalam-I						
25FRE11L	I		French-I						
25ENG12L	II	Language-II	English-I	4	3	25	75	100	3
25BCY13C	III	Core – I	Python Programming	5	3	25	75	100	4
25BCY14P	III	Core Lab – I	Python Programming Lab	4	3	40	60	100	2
25BCY15C	III	Core – II	Foundations of Networking and Cybersecurity	5	3	25	75	100	4
25BCY16A	III	Allied – I	Linear Algebra and Discrete Mathematics	4	3	25	75	100	3
25ENV1FC	IV	FC – I	Environmental Studies	2	2	50	-	50	2
25SOF1AE	IV	AECC – I	Soft Skills	2	2	-	50	50	2
			Total	**30**				**700**	**23**

Part – I: Language-I - Tamil – I

(All the Undergraduate Programmes)

Course Code	Course Name	Category	Hours / Week	Credits
25TAM11L	Tamil – I	Language – I	4	3

Course Objectives

- இலக்கிய வளர்ச்சியை அறிந்து கொள்ளுதல்
- இலக்கியம் படைக்கும் திறன்
- இலக்கிய இலக்கண உரைசெய்தல்
- திறனாய்வு முறையினைக் கற்றுத்தேர்தல்

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	புதுக்கவிதையின் மூலம் வாழ்வியல் விழுமியங்களை உணர்ந்து கொள்ளுதல்.	K1, K2
CLO2	சிறந்த மற்றும் வாழும் கவிஞர்களை அறிந்து கொள்ளுதல்.	K2, K3
CLO3	சிறந்த படைப்பாளர்களின் சிறுகதையில் வெளிப்படும் சமூகச் சிந்தனைகளை அறிந்து விழிப்புணர்வைப் பெறுதல்.	K3
CLO4	தற்கால இலக்கியங்களான புதுக்கவிதை, சிறுகதை தோன்றி வளர்ந்த பின்புலத்தை அறிதல்.	K1, K3
CLO5	மொழியைப் பிழையின்றி பேச எழுத கற்கத் தேவையான தமிழ் இலக்கணத்தின் இன்றியமையாமையை உணர்தல். நடைமுறை வாழ்வியலுக்குத் தேவைப்படும் ஆங்கிலக் கடிதத்தைத் தமிழாக்கம் செய்தலுக்கான பயிற்சி அடைதல்.	K2, K3
K1 - Remember; **K2** - Understand; **K3** – Apply.		

Part – I: Language –I - Tamil – I

Unit	Content	No. of Hours
I	**நாட்டுப்பற்று** 1. உலகத்தை நோக்கி வினவுதல் - பாரதியார் 2. பாரதிதாசன் கவிதைகள் - பாரதிதாசன் • தமிழ்ப்பேறு 3. ஒற்றுமையே உயிர்நிலை -நாமக்கல் கவிஞர் 4. தேவதேவன் கவிதைகள் - தேவதேவன் • சாலையும் மரங்களும் செருப்பும் • புதிய வீடு 5. ஆலாபனை - கவிக்கோ அப்துல் ரகுமான் • போட்டி • பாதை 6. புத்தகச் சந்தை - கவிஞர் வாலி	14
II	**சமூகம்** 1. எட்டாவது சீர்..... - ஈரோடு தமிழன்பன் 2. தொலைந்து போனேன் - கவிஞர் தாமரை 3. திருநங்கைகள் காகிதப் பூக்கள் - நா. காமராசன் 4. மரங்களைப் பாடுவேன் - வைரமுத்து 5. புள்ளிப் பூக்கள் (ஹைக்கூ) - அமுத பாரதி 6. நாட்டுப்புறப் பாடல்கள் (தாலாட்டுப் பாடல் , தெம்மாங்குப் பாடல் , உழவுத்தொழில்)	14
III	**சிறுகதை** 1. காஞ்சனை - புதுமைப்பித்தன் 2. சுமைதாங்கி - ஜெயகாந்தன் 3. சோற்றுக் கணக்கு - ஜெயமோகன் 4. ஆறு யானைகள் - எஸ்.ராமகிருஷ்ணன் 5. மரத்தைக் கர்ப்பம் சுமந்தவள் - ஆண்டாள் பிரியதர்சினி	12

Unit	Content	No. of Hours
IV	**இலக்கிய வரலாறு** 1. மரபுக்கவிதையின் தோற்றமும் வளர்ச்சியும் 2. புதுக்கவிதையின் தோற்றமும் வளர்ச்சியும் 3. ஹைக்கூ கவிதையின் தோற்றமும் வளர்ச்சியும் 4. சிறுகதையின் தோற்றமும் வளர்ச்சியும்	10
V	**இலக்கணம்** 1. எழுத்துகள் (முதல் எழுத்துகள், சார்பெழுத்துகள்) 2. எழுத்துக்களின் பிறப்பு 3. மாத்திரைகள் 4. பயிற்சிக்குரியன - மொழிபெயர்ப்பு (ஆங்கிலத்திலிருந்து தமிழுக்கு மொழிபெயர்த்தல்)	10
	Total Hours	**60**

Reference Books

1.	பேரா. குருசாமி, ம.ரா.போ. (2014), பாரதி பாடல்கள், ஆய்வுப் பாதிப்பு, தமிழ்ப் பல்கலைக் கழகம், தஞ்சாவூர்.
2.	அப்துல் ரகுமான்,(2000), ஆலாபனை, கவிக்கோ பதிப்பகம்
3.	தாமரை கவிதைகள், (2012), நியூ செஞ்சுரி புக் ஹவுஸ்
4.	வரதராசனார் மு, (2021), தமிழ் இலக்கிய வரலாறு, சாகித்ய அகாடமி பதிப்பு.
5.	முனைவர் பஞ்சாங்கம் கா, (2017), தமிழ் இலக்கிய வரலாறு, காவ்யா பதிப்பகம்.
6.	முனைவர் வேங்கடராமன் கா. கோ (2008), தமிழ் இலக்கிய வரலாறு, கலையக வெளியீடு.
7.	பரந்தாமனார் அ.கி. (2002), நல்ல தமிழ் எழுத வேண்டுமா?, அல்லி நிலையம்.
8.	ராமகிருஷ்ணன் எஸ் (2006), 100 சிறந்த சிறுகதைகள் (தொகுதி 1 & 2) பதிப்பகம்: தேசாந்திரி பதிப்பகம்
9.	குமரன் கோ (2010), தமிழ் இலக்கணம் எளிய அறிமுகம் , சந்தியா பதிப்பகம்
10	சக்திவேல் சு,(2012), நாட்டுப்புறவியல், மணிவாசகர் பதிப்பகம்

Question Pattern

காலம் : 3 மணி நேரம் மொத்த மதிப்பெண்கள் : 75

பிரிவு – அ **10x1=10**

- சரியான விடையைத் தேர்ந்தெடுத்து எழுதுக.

பிரிவு – ஆ **5x5=25**

- செய்யுள் - 1 வினா
- செய்யுள் - 1 வினா
- சிறுகதை - 1 வினா
- இலக்கிய வரலாறு - 1 வினா
- இலக்கணம் - 1 வினா

பிரிவு – இ **5x8=40**

- செய்யுள் - 1 வினா
- செய்யுள் - 1 வினா
- சிறுகதை - 1 வினா
- இலக்கிய வரலாறு - 1 வினா
- மொழிபெயர்ப்பு - 1 வினா

Course Code	Course Name	Category	Hours / Week	Credits
25HIN11L	Hindi - I	Language – I	4	3

Course Objectives

The course intends to

- Improve grammatical knowledge.
- Read and learn about articles and think about them.
- Read and understand short stories , thoughts and life of the people of this state.
- Have translation knowledge and the ability to read and analyze a message

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Understand the text styles and grammatical elements	K1, K2
CLO2	Discuss the content of a reading passage	K2, K3
CLO3	Develop an interest in the appreciation of short stories	K3
CLO4	Comprehend the grammatical structures and sentence making	K1, K3
CLO5	Understand the language and developing English to Hindi translation skill	K2, K3
K1 - Remember; **K2** - Understand; **K3** – Apply		

Part – I: Hindi – I

Unit	Content	Hours
I	**Prose : Nuthan Gadya Sangrah** Lesson 1 – Bharathiya Sanskurthi - Dr.Rajendra Prasad Lesson 3 – Razia - Ramaviksha Benipuri Lesson 4 – Makreal - Yespal Lesson 5 – Bahtha Pani Nirmala -'Ageya' Lesson 6 – Rashtrapitha Mahathma Gandhi - Mukthibodh Lesson 9 – Ninda Ras - Harishankar Parsayi.	14
II	**Non Detailed Text Short Stories: Kahani Kunj** Pareksha - Premchand Mamtha - Jayashankar Prasad Apna paraya - Jaynendrakumar Admi ka bachcha - Yespal Bolaram ka jeev - Harishankar Parsayi Vapasi - Mannu Bhandari	14
III	**Grammar: Shabdha Vichar Only** (Noun, Pronoun, Adjective, Verb, Tense, Case, Endings) Theoretical & Applied.	12
IV	**Translation: English – Hindi Only.** Anuvadh Abhyas – III (1-15 Lessons Only)	10
V	**Comprehension**: 1 Passage From Anuvadh Abhyas–III (16-30)	10
	Total Hours	**60**

Text Books

1	Jayaprakash, (2009), Nuthan Gadya Sangrah, Publisher: Sumitra Prakashan Sumitravas, 16/4, Hastings Road, Allahabad – 211001.
2	Amithab. V.P. (2011), Kahani Kunj, Publisher : Govind Prakashan Sadhar Bagaar, Mathura, Uttar Pradesh,–281 001

Course Code	Course Name	Category	Hours / Week	Credits
25MAL11L	Malayalam - I	Language – I	4	3

Course Objectives

The course intends to

- Improve grammatical knowledge.
- Read and learn about articles and think about them.
- Read and understand short stories and thoughts and life of the people of this state.
- Have translation knowledge and the ability to read and analyze a message

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Understand the text styles and grammatical elements	K1
CLO2	Discuss the content of a reading passage	K1
CLO3	Develop an interest in the appreciation of short stories	K2
CLO4	Comprehend the grammatical structures and sentence making	K3
CLO5	Understand the language and developing English to Malayalam translation skill	K4
K1 - Remember; **K2** - Understand**; K3** – Apply**; K4**-Analyse.		

Part – I: Malayalam – I

Unit	Content	No. of Hours
I	Novel – Pathummayude Aadu - Vaikam Muhammed Basheer	14
II	Novel- - Pathummayude Aadu - Vaikam Muhammed Basheer	14
III	Short Story - Ente Priyappeta Kadhakal – (Akbar Kakkattil)	12
IV	Short Story - Ente Priyappeta Kadhakal – (Akbar Kakkattil)	10
V	Composition &Translation(English to Malayalam)	10
	Total Hours	**60**

Text Books	
1	Vaikam Muhammed Basheer, (2012), Novel- PathummayudeAadu, D.C.Books, Kottayam, Kerala
2	Akbar Kakkattil, (2009), Short Story - Ente Priyappeta Kadhakal
Reference Books	
1	Tharakan K.M, (2016), Malayala Novel SahithyaCharitram, N.B.S.Kottayam.
2	Achuyuthan M, (2014), Cherukatha Innale Innu-M.Achuyuthan D.C Books, Kottayam.
3	Dr George K.M,(2011) Sahithya CharitramPrasthanangalilude, D.C.Books Kottayam.
4	Sukumar Azheekode, (2015), Malayala Sahithyavimarsam, D.C.Books

Course Code	Course Name	Category	Hours / Week	Credits
25FRE11L	French - I	Language – I	4	3

Course Objective

The course intends

To understand, speak, read and write simple, standard speech which is very slow and is carefully articulated and can recognize familiar words and very basic phrases concerning themselves, their family and immediate concrete surroundings when people speak slowly and clearly.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	Course Outcome	Knowledge Level
CLO1	Comprehend basic vocabulary	K1
CLO2	Understand basic syntax and grammar patterns	K2
CLO3	Converse slowly in known situations	K2
CLO4	Translate small basic sentences	K3
K1 - Remember; **K2** - Understand; **K3** - Apply		

Part – I: French – I

Unit	Content	Hours
I	Etape 0	14
	Etape1- (Lecons 1 - 3)	
II	Etape2- (Lecons 1 - 3)	14
III	Etape 3 – (Leçons 1 – 2)	12
IV	Etape 3 – (Leçon 3)	10
	Etape 4 – (Leçon 1)	
V	Etape 4 – (Leçons 2 – 3)	10
	Total Hours	**60**
Text Book		
1	Céline Himber, Corina Brillant, Sophie Erlich, (2008), Adomania 1 – Methode de francais, Publisher - Hachette Fle.	
Reference Book		
1	Yves Loiseau, Régine, (2014), Latitudes 1, Merieux Publisher: French and European Publications Inc.	

Course Code	Course Name	Category	Hours / Week	Credits
25ENG12L	English - I	Language II	4	3

Course Objectives

The course intends to cover

- Various genres of literature.
- Active and passive vocabulary.
- Usage of Grammar and Communication.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Identify aesthetic sense and appreciate poetry, enhancing creativity and understanding relevant to professional environments.	K1
CLO2	Understand diverse styles of prose, facilitating versatility in writing and inculcating interpersonal skills.	K2
CLO3	Apply the characters and the narrative techniques in creative writing and content creation ethically.	K3
CLO4	Employ vocabulary and grammatical proficiency in communication to enhance clarity in workplace interactions.	K3
CLO5	Enhance overall communication competence. Practicing these skills in combination reinforces learning and provides students with opportunities to use the language in authentic contexts.	K3
K1 - Remember; **K2** - Understand; **K3** - Apply		

Part - II: English – I

Unit	Content	No. of Hours
I	**Poetry** : Nature 1. I Wandered Lonely as a Cloud - William Wordsworth 2. The Sparrow - Paul Laurence Dunbar 3. Stopping by woods on a snowy Evening – Robert Frost	12
II	**Prose** : Friendship 1. The Man in Black - Oliver Goldsmith 2. Of Friendship - Francis Bacon 3. The Blessing of Friends - Sir John Lubbock	12
III	**Short Stories:** Morality 1. The Necklace – Guy de Maupassant 2. The Lottery - Shirley Jackson 3. The Monkey's Paw - W. W. Jacobs	12
IV	**Language Competency** 1. Vocabulary : Synonyms, Antonyms, Word Formation 2. Parts of Speech 3. Error correction	12
V	**English for Communication** 1. Listening for General and Specific Information. 2. Self - Introduction, Introducing others, Greetings. 3. Reading a prose passage, Reading a poem and Reading a short story 4. Descriptive writing – Writing a short descriptive essay of two to three paragraphs.	12
	Total Hours	**60**

Text Books	
1.	Zama, M. (2004). Poetry Down the Ages. Orient Blackswan.
2.	Goldsmith, O. (1869). The Works of Oliver Goldsmith. J. Dicks
3.	Bacon, F., & Montagu, B. (1857). The Works of Francis Bacon (Vol. 1). Parry & McMillan.
Reference Books	
1.	Kumar,V. T. Bhavani, Durga.K. Srinivas.YL. (2018). English in use - A textbook for College Students. (English, Paperback).
2.	Swan, M. (2005). Practical english usage (Vol. 7). Oxford: Oxford university press.
Web Resources (Swayam / NPTEL)	
1.	https://nptel.ac.in/courses/109105205

Course Code	Course Name	Category	Hours / Week	Credits
25BCY13C	Python Programming	Core - I	5	4

Course Objectives

The course intends to cover

- Core syntax and semantics of Python programming language.
- Process of structuring the data using lists, dictionaries, tuples and sets.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Remember the fundamentals of solving problems with computers and execute simple Python programs.	K1
CLO2	Learn the Basic Programming constructs in Python.	K2
CLO3	Understand the basic functions in Python Programming.	K2
CLO4	Apply Software Objects and databases in Python.	K3
CLO5	Apply OOPs concepts in Python programs.	K3
K1 - Remember; **K2** - Understand; **K3** - Apply;		

CLO – PLO Mapping

CLOs/PLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	3	3	1	1	1
CLO2	3	3	2	1	1
CLO3	3	2	2	2	1
CLO4	3	2	2	2	1
CLO5	3	2	2	2	1
3 - Substantial (high)		**2** - Moderate (medium)		**1** - Slight (low)	

Core - I: Python Programming

Unit	Content	No. of Hours
I	**Introduction:** The essence of computational problem solving – Limits of computational problem solving - Computer Algorithms - Computer Hardware - Computer Software - process of computational problem solving - Python programming language - Literals - Variables and Identifiers - Operators - Expressions and Data types, Input / Output.	15
II	**Control Structures:** Boolean Expressions - Selection Control - If Statement Indentation in Python - Multi-Way Selection - Iterative Control - While Statement- Infinite loops - Definite vs. Indefinite Loops - Boolean Flag. String, List, Tuple, Manipulations, Decorators. Building blocks of Python programs, Understanding and using range-Slicing	15
III	**Functions:** Program Routines- Defining Functions- More on Functions : Calling Value - Returning Functions - Calling Non-Value – Returning Functions- Parameter Passing - Keyword Arguments in Python – Default Arguments in Python-Variable Scope. **Recursion:** Recursive Functions. **Modular Design** : Modules - Top-Down Design - Python Modules**.**	15
IV	**Objects and their use**: Software Objects - Turtle Graphics – Turtle Attributes. **Text Files:** Opening, reading and writing text files. **Database Programming:** Connecting to a database, **C**reating Tables, **R**ead, **U**pdate, **D**elete (CRUD) and Insert operations, Transaction Control, Disconnecting from a database, String Processing – Exception Handling.	15
V	**Dictionaries and Sets**: Dictionary type in Python - Set Data type. **Object Oriented Programming using Python**: Encapsulation - Inheritance – Polymorphism. **Python packages:** Simple programs using the built-in functions of packages matplotlib, numpy, pandas etc..	15
	Total Hours	**75**

Text Books

1. Charles Dierbach (2022), Introduction to Computer Science using Python - A Computational Problem solving Focus, Wiley India Edition. (Unit – I, II, III, IV)
2. Wesley J. Chun (2016), Core Python Applications Programming, 3rd Edition, Pearson Education. (Unit – V)

Reference Books

1. Mark Lutz (2018), Learning Python Powerful Object Oriented Programming, O"Reilly Media, 5th Edition.
2. Timothy A. Budd (2011), Exploring Python, Tata MCGraw Hill Education Private Limited, 1st Edition.
3. John Zelle (2016), Python Programming: An Introduction to Computer Science, 3rd Edition, Course Technology Cengage Learning Publications, ISBN 978- 1590282410.

Web Resources(Swayam / NPTEL)

1. https://onlinecourses.nptel.ac.in/noc20_cs07/preview

Course Code	Course Name	Category	Hours/Week	Credits
25BCY14P	Python Programming Lab	Core Lab – I	4	2

S.No	Programs
1	Sample Programs using Lists, Tuples , Dictionaries and Decorators.
	Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.
2	Program to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from the user.
3	Write a Python script that prints prime numbers less than 20.
4	Program to find factorial of the given number using recursive function.
5	Write a Python program to count the number of even and odd numbers from array of N numbers.
6	Write a Python class to reverse a string word by word.
7	Given a tuple and a list as input, write a program to count the occurrences of all items of the list in the tuple. (Input : tuple = ('a', 'a', 'c', 'b', 'd'), list = ['a', 'b'], Output : 3)
8	Create a Savings Account class that behaves just like a BankAccount, but also has an interest rate and a method that increases the balance by the appropriate amount of interest (Hint: use Inheritance).
9	Write a Python program to construct the following pattern, using a nested loop * ** *** **** ***** **** *** ** *
10	Read a file content and copy only the contents at odd lines into a new file.

S.No.	Programs
11	Create a Turtle graphics window with a specific size.
12	Write a Python program for Towers of Hanoi using recursion
13	Create a menu driven Python program with a dictionary for words and their meanings.
14	Devise a Python program to implement the Hangman Game.
15	Program to create a student database and calculate total marks, percentage and grade of a student. Marks obtained in each of the five subjects are to be input by user. Assign grades according to the following criteria: Grade A: Percentage >=80 Grade B: Percentage >=70 and 80 Grade C: Percentage >=60 and <70 Grade D: Percentage >=40 and <60 Grade E: Percentage < 40
16	Capstone Project : "Weather Data Analysis and Visualization" (Using Python libraries like matplotlib, numpy, and pandas to process and visualize weather data)
	Total Hours **60**

Text Books	
1	Charles Dierbach (2015), Introduction to Computer Science using Python - A computational Problem-solving Focus, Wiley India Edition.
2	Wesley J. Chun (2016), Core Python Applications Programming, Pearson Education, 3rd Edition.
Reference Books	
1	Mark Lutz (2018), Learning Python Powerful Object Oriented Programming, O'reilly Media,5th Edition.
2	John Zelle (2013), Python Programming: An Introduction to Computer Science, Course Technology Cengage Learning Publications, 2nd Edition, ISBN 978- 1590282410
3	Timothy A. Budd (2011), Exploring Python, Tata McGraw Hill Education Private Limited,5th Edition.
Web Resources (Swayam/ NPTEL Courses)	
1	https://onlinecourses.swayam2.ac.in/cec22_cs20/preview
2	https://onlinecourses.nptel.ac.in/noc21_cs32/preview

Course Code	Course Name	Category	Hours / Week	Credits
25BCY15C	Foundations of Networking and Cybersecurity	Core - II	5	4

Course Objectives

The course intends to

- Understand the basics of networking, OSI model and key protocols like TCP and UDP
- Identify and understand networking devices.
- Use tools to simulate network scenario.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Understand basic networking concepts and protocols.	K1
CLO2	Understand network device functions and recognize common security threats.	K2
CLO3	Understand and detect the cyberattacks like spoofing and tunneling.	K2, K3
CLO4	Analyze and implement static and dynamic routing, WAN technologies.	K3
CLO5	Analyze and configure Access Control Lists.	K3
K1 - Remember; **K2** - Understand; **K3** - Apply		

CLO – PLO Mapping

CLOs/PLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	3	1	3	2	2
CLO2	1	3	3	2	2
CLO3	2	2	3	3	3
CLO4	1	1	3	2	2
CLO5	1	2	3	2	1
3 - Substantial (high)		**2** - Moderate (medium)		**1** - Slight (low)	

Core - II: Foundations of Networking and Cybersecurity

Unit	Content	No. of Hours
I	**Introduction to Networking:** What is a Network?- Local Area Network (LAN)- Wide Area Network (WAN)-Types of Mode **Open Systems Interconnection (OSI) Model:** Why we Need Open Systems Interconnection (OSI)- Open Systems Interconnection (OSI) Layers-Transmission Control Protocol (TCP) / User Datagram Protocol (UDP)- 3 Way Hand Shake-Real-world attack examples at each OSI layerPacket sniffing using Wireshark **TCP/IP Model:** Need of Transmission Control Protocol (TCP) / Internet Protocol (IP) ModelTransmission Control Protocol (TCP) / Internet Protocol (IP) Layer-TCP 3-Way Handshake with attack simulation. 1. Real-world attack examples at each OSI layer. 2. Packet sniffing using Wireshark. 3. TCP 3-Way Handshake with attack simulation	15
II	**Sub Netting:** Subnetting-Classless Inter Domain Routing (CIDR)- Create SubnetsUnderstanding Variable Length Subnet Masks (VLSM)- Private Internet Protocol (IP) Addresses-How subnetting helps with network segmentation for Zero Trust. **Packet Flow in Same & Different Network:** Domain Name System (DNS) and WorkingMap Hostnames to Internet Protocol (IP) Addresses-Configure Cisco Device as Domain Name System (DNS) Client-How to Configure a Cisco Router as a DNS Server? - no Internet Protocol (IP) domain-lookup Command-Address Resolution Protocol (ARP)- Analyze DNS tunneling, DNS spoofing attacks. **Information about Networking Device:** Network Devices-Hubs-Switch-Carrier Sense Multiple Access with Collision Detection (CSMA CD)- Collision & Broadcast DomainHow Switches Work? - Layer 2 Switching- Router-Layer 3 Switch and working-threat detection. 1. Design a segmented network for HR, IT, DevOps, and isolate with firewall rules. 2. Use Wireshark to detect a suspicious DNS . 3. Simulate port mirroring and analyze mirrored traffic	15

Unit	Content	No. of Hours
III	**Internet Protocol (IP) / Internet Control Message Protocol (ICMP):** What is Internet Control Message Protocol, How Ping process works, How Extended Ping Command works, what is Traceroute, How Traceroute Command works, show processes Command in detailed to map protocols-What is Ping sweeps Cyber Attacks, what is ICMP tunneling Cyber Attacks- How to Detect ICMP misuse in Cyber Security Industry. **Automatic Private IP Addressing (APIPA):** What is APIPA, why do we need of APIPA, How APIPA works. **Address Resolution Protocol (ARP):** What is Address Resolution Protocol (ARP)- Need and type of (ARP)- What is ARP poisoning & spoofing, Perform demo for Cyber Industry. **Routing Protocols (Static & Dynamic):** What are Routing Protocols- Comparing Internal Routing Protocols (IGPs)- Administrative Distance & Metric- Equal Cost Multi-Path (ECMP) Explanation & Configuration - Understanding Loopback Interfaces and Loopback Addresses - Passive-interface Command-Security risks in routing protocols (BGP hijack, OSPF poisoning)- How attackers use static routes to pivot within the network. 1. Simulate ICMP scanning with Nmap and monitor traffic. 2. Analyze ARP poisoning in a test environment.	15
IV	**Static - Next Hop / Exit Interface:** What is IP Routing- Local Routes and How they Appear in the Routing Table - Connected, Static, & Dynamic Routes - Floating Static Route - Explanation and Configuration - Default Static Route - Create a Static Host Route. **Dynamic - RIP / EIGRP / OSPF & BGP:** OSPF Overview - Differences Between OSPF and EIGRP - Cisco Bandwidth Command vs Clock Rate and Speed Commands - OSPF Routing Protocol Metric - OSPF Configuration - Designated & Backup Designated Router. **WAN Technologies:** What is Wide Area Network - Cisco VPN- WAN Connection TypesLeased Line Definition and Explanation - Multiprotocol Label Switching (MPLS)- VPN and split tunneling risks in Cyber Industry. **Network Address Translation (NAT):** Static Network Address Translation (NAT)- Dynamic Static Network Address Translation (NAT)- Port Address Translation (PAT) Configuration- Secure site-to-site connections with IPsec. 1. Simulate a compromised router path 2. Analyze a PCAP of a VPN session.	15

Unit	Content	No. of Hours
V	**Access Control List (ACL):** Access Control List and its types - Configuring Standard and Extended Access Control List (ACL)- Configuring Named Access Control List (ACL) - NAT traversal and how malwares use it – What are ACLs in firewalls – Work with Palo Alto/Cisco ASA for ACLs . **Dynamic Host Configuration Protocol:** Configure Cisco Router as Dynamic Host Configuration Protocol (DHCP) Server-DHCP Relay Agent- Configure Cisco Router as a DHCP Client- Automatic Private IP Addressing (APIPA)- Rogue DHCP server detection in Cyber Industry- MITM Cyber-attacks using DHCP starvation. **Telnet & Secure SHell (SSH):** Need of Telnet & Secure Shell (SSH)- Telnet & Secure Shell (SSH)- Setting Up Telnet- Setting Up Secure Shell (SSH)- SSH b DHCP attack simulation using Yersinia or better caprute-force tools and how to detect them in logs for Cyber Industry. **Virtual Local Area Network (VLAN):** Configuring Access & Trunk Ports- Configuring Voice Virtual and allowed Local Area Network (VLAN)- Cisco Dynamic Trunking Protocol (DTP)- Virtual Trunking Protocol (VTP) Modes and configuration- VLAN hopping attacks (e.g., double-tagging)- Proper VLAN segmentation in security zones. 1. Configure ACLs to prevent port scanning. 2. DHCP attack simulation using Yersinia or bettercap. 3. Simulate brute-force login and analyze logs in Fail2Ban/syslog 4. Simulate VLAN separation and test access control.	15
	Total Hours	**75**

Text Books

1	James F. Kurose and Keith W. Ross (2013), Computer Networking: A Top-Down Approach, Pearson Education, 6th Edition.
2	Behrouz A. Forouzan (2007), Data Communications and Networking, McGraw-Hill Companies, Incorporated.
3	Andrew S. Tanenbaum & David J. Wetherall (2011), Computer Networks, Prentice Hall, 5th Edition.
4	Lisa Bock (2019), Learn Wireshark: Confidently navigate the Wireshark interface and solve real-world networking problems, Packt Publishing Ltd.
5	William Stallings (2007), Network Security Essentials, Prentice Hall, 3rd Edition
6	Kevin R. Fall and Martin L. Stevens (2019), TCP/IP Illustrated, Volume 1: The Protocols AddisonWesley Professional,2nd Edition.
7	Gary A. Donahue (2011), Network Warrior, O'Reilly Media, 2nd Edition.
8	Jazib Frahim, Omar Santos, Andrew Ossipov (2019),Cisco ASA: All-in-one Next-Generation Firewall, IPS, and VPN Services, CISCO Press,3rd Edition.

Reference Books	
1	Wendell Odom (2013), CCNA Routing and Switching 200-120 Official Cert Guide Library, CISCO Press,1st Edition
2	Chris Sanders (2011), Practical Packet Analysis: Using Wireshark to Solve Real-World Network Problems, No Starch Press, 2nd Edition
3	Laura Chappell (2012), Wireshark Network Analysis, 2nd Edition.
4	Doug Barth, Evan Gilman (2017), Zero Trust Networks, O'Reilly Media, 1st Edition
Web Resources (Swayam / NPTEL)	
1	https://onlinecourses.swayam2.ac.in/cec24_cs09/preview
2	https://onlinecourses.nptel.ac.in/noc24_ee46/preview

Course Code	Course Name	Category	Hours / Week	Credits
25BCY16A	Linear Algebra and Discrete Mathematics	Allied-I	4	3

Course Objectives

The Course intends to cover

- The computational techniques and algebraic skills essential for the study of systems of linear equations and matrix algebra.
- The fundamental concepts and tools in discrete mathematics with emphasis on their applications to computer science.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Remember the concept and basic operations of matrices.	K1
CLO2	Describe various types of graphs and their representations in computer memory.	K2
CLO3	Apply the concepts of connectives and tautological implications in data analysis.	K3
CLO4	Apply the concepts of Boolean algebra and lattices.	K3
CLO5	Develop regular expressions and finite automata for recognizing regular languages.	K3
K1- Remember; **K2 -** Understand**; K3 -**Apply;		

CLO – PLO Mapping

CLOs/PLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	2	2	2	2	3
CLO2	3	2	3	3	2
CLO3	3	2	3	3	2
CLO4	3	3	3	3	3
CLO5	3	3	3	3	2
3 - Substantial (high)		**2 - Moderate (medium)**		**1 - Slight (low)**	

Allied I- Linear Algebra and Discrete Mathematics

Unit	Details	No. of Hours
I	**Matrix:** Introduction- Transpose- Properties of Transpose-Determinants- Inverse of a Matrix- Solving Simultaneous linear equations by matrix method-Rank of a Matrix- Characteristics roots and vectors.	12
II	**Graph Theory:** Basic terminology - Paths, cycle and connectivity - Sub graphs - Types of graphs - Representation of graphs in computer memory - Trees - Properties of trees - Binary trees - Traversing Binary trees - Computer representation of general trees**.**	12
III	**Mathematical Logic:** Propositional calculus - Basic logical operations - Tautologies- Contradiction- Argument- Method of proof- Predicate calculus.	12
IV	**Boolean algebra and Lattices:** Boolean algebra – Basics theorems on Boolean Algebra – Lattices -Duality-Types of lattices -join reducible elements.	12
V	**Languages:** Operations on languages - Regular Expressions and regular languages - Grammar – Types of grammars - Finite state machine - Finite state automata.	12
	Total Hours	**60**
Text Books		
1	Navanitham, P.A(2023), Business Mathematics & Statistics, Jai Publishers, Trichy. Unit I: Chapter 4 P.No. :147-190 P.R.Vittal (2012) ,Allied Mathematics, 6th Edition, Margham Publishers. Unit I: Chapter 5: P.No.: 5.50-5.75	
2	J.K. Sharma, (2022),Discrete Mathematics,2nd Edition, Macmillan India Ltd. Unit II: Chapter 9 Section 9.1 – 9.5, 9.8 Chapter 10 Section 10.1 -10.3, 10.6, 10.8 Unit III: Chapter 12 Section 12.1 – 12.3, 12.8 ,12.9,12.11,12.12, 12.14 Unit IV: Chapter13 Section 13.1-13.3 Chapter14 Section 14.1 -14.5 Unit V: Chapter 15 Section 15.3 – 15.7	
Reference Books		
1	K. Sankara Rao (2018), Numerical Methods for Scientists and Engineers, Prentice Hall India.	
2	J. P. Tremblay, R. Manohar (2002), Discrete Mathematics Structures with Applications to Computer Science, McGraw Hill International Edition.	
Web Resources (Swayam / NPTEL)		
1.	https://archive.nptel.ac.in/courses/111/106/111106086/	

Course Code	Course Name	Category	Hours / Week	Credits
25ENV1FC	Environmental Studies	FC - I	2	2

Unit	Content
I	The Multidisciplinary nature of environmental studies Definition; Scope and importance, Need for public awareness.
II	**Natural Resources:** Renewable and non-renewable resources: Natural resources and associated problems. - Forest resources: Use and Over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people. - Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams benefits and problems. - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. - Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Case studies. - Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.
III	**Ecosystems** - Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem. - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit	Content
IV	**Biodiversity and its Conservation** - Introduction-Definition: genetic, species and ecosystem diversity. - Bio geographical classification of India. - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. - Biodiversity at global, National and local levels. - India as a mega-diversity nation. - Hot-spots of biodiversity. - Threats to biodiversity: habitual loss, poaching of wildlife, man-wildlife conflicts. - Endangered and endemic species of India. - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
V	**Environmental Pollution Definition** - Causes, effects and control measures of: - a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards - Solid waste Management: Causes, effects and control measures of urban and industrial wastes. - Role of an individual in prevention of pollution. - Pollution case studies. - Disaster management: floods, earthquake, cyclone and landslides.

Unit	Content
VII	**Human Population and the Environment** - Population growth, variation among nations. - Population explosion-Family welfare Programme. - Environment and human health. - Human Rights. - Value Education. - HIV/AIDS. - Women and Child Welfare. - Role of information Technology in Environment and human health. - Case Studies. **Biosafety and Biosecurity** The basic principles of biosafety. - Biological hazards and assess risk in laboratory settings. - Biosafety protocols to minimize risks associated with biological agents. - Role of biosafety in the protection of public health, environment, and nationalsecurity. - The theoretical knowledge as well as practical applications to prepare learners for real-world biosafety challenges. 1. Introduction to Biosafety - Definition and importance of biosafety. - Historical perspective on biosafety incidents. - Biosafety vs. biosecurity: Key differences. 2. Biological Hazards and Risk Assessment - Classification of biological agents (e.g., bacteria, viruses, fungi, parasites). - Risk assessment methodology: Identifying hazards, evaluating risks, and control measures. 3. Biological Waste Management - Types of biological waste: Solid, liquid, sharps, etc. - Waste disposal techniques: Autoclaving, incineration, chemical disinfection. - Environmental impact and regulations surrounding waste management. 4. Standard Operating Procedures (SOPs) and Safety Practices - Developing and implementing SOPs for laboratory safety. - Practices for handling, storing, and disposing of biological materials.
VIII	**Field Work (Practical).** - Visit to a local area to document environmental assets-river/forest/grassland/ hill/mountain. - Visit to a local polluted site-Urban/Rural/Industrial/Agricultural. - Study of common plants, insects, birds. - Study of simple ecosystems-pond, river, hill slopes, etc.
	Total Hours **30**

Web Resources	
1.	https://www.ugc.gov.in/oldpdf/modelcurriculum/env.pdf
2.	Biosafety in Microbiological and Biomedical Laboratories (CDC, NIH). (BMBL) 6th Edition
3.	Sateesh, M. K. (2010). Bioethics and Biosafety. New Delhi: I. K. International Pvt Ltd.
4.	Additional Readings: Relevant journal articles, government publications, and guidelines (e.g., WHO, CDC, European Union, etc.). https://www.iberdrola.com/innovation/what-is-biosafety

Course Code	Course Name	Category	Hours / Week	Credits
25SOF1AE	Soft Skills	AECC - I	2	2

Course Objective

The course intends to cover

- The essential soft skills that is crucial for success in today's dynamic and interconnected workplace.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Understand the comprehensive skills to participate actively in conversation, writing short texts with expression	K1, K2, K3
CLO2	Infer the cohesive devices to describe and discuss any objects, pictures using compound, complex sentence forms.	K2, K3
CLO3	Comprehend the logic in the given situation to organize the ideas to write formal and informal letters.	K2, K3
CLO4	Understand the given material to organize it in a logical sequence to present a paragraph with main and supporting ideas with concluding sentences.	K3
CLO5	Present valuable ideas in conversation to emulate the main ideas and key points in short essays.	K3
K1 - Remember; **K2** - Understand; **K3** - Apply;		

Ability Enhancement Compulsory Course - I: Soft Skills

Module	Unit	Details	No. of Hours
Presentation Skills			
I	1	**Getting to Know You:** Grammar: Introduction to Tenses, Everyday English, Role-Play. Reading Activity: Different ways of communication. *Activities*: Fill in the blanks (Listening), Self Introduction (Speaking).	6
	2	**My Day:** Grammar: Present simple positive & negative/Adverbs of Frequency, Vocabulary & Speaking about Daily Activities. Listening: Observe and Answer/Telling the time. *Activities:* Reading & Writing: Describe where you live.	
	3	**Your World:** Grammar: Possessive determiners. Listening: Positive & negative contractions. Reading & Writing: Personal profile. *Activities:* Talk about countries, nationalities (Vocabulary & Speaking).	
	4	**The World of Work:** Grammar: Yes/No & Wh Questions. Vocabulary & Speaking: Jobs. Listening: Recognize the schwa sound. *Activities:* Opening and closing an email (Reading & Writing).	
	5	**Places and Things:** Grammar: There is / there are, articles. Vocabulary & Speaking: Talk about rooms & furniture. Listening: Directions. Reading & Writing: Imperatives.	
	6	**24 Hours:** Grammar: Likes & Dislikes. Vocabulary & Speaking: Speak about hobbies and interests. Reading: Match the photos with descriptions. Writing: Write complete sentence using prompt. *Activities:* Observe & answer *(*Listening).	
		Practice: Listening & Speaking Presentations - Talking about how you learn – Understanding key information in a presentation –Writing sentences about you.	
Confidence			
II	1	**Clothes and Shopping:** Grammar: Modal verbs/Adverbs of Frequency/Adjectives and Adverbs. Vocabulary & Speaking: Shopping. Reading & Writing: Product Review. *Activities:* Observe& answer *(*Listening).	6
	2	**Travel & Transport:** Grammar: Past simple questions. Vocabulary & Speaking: Talk about holidays. Listening: At the train station. *Activities:* Email - A perfect holiday (Reading & Writing).	
	3	**Health & Fitness:** Grammar: Past simple irregular verbs; Listening: Listen & Answer; Reading & Writing: Time sequencers; *Activities:* Talk about a healthy lifestyle (Vocabulary & Speaking)	
	4	**Music:** Grammar: Present perfect simple; Vocabulary & Speaking: Survey about music; Listening: Listen two people talk about music; *Activities:* Use adjectives and create sentences (Reading)	
	5	**Let's go shopping:** Vocabulary & Speaking: Town Survey; Listening: Listen and answer; Reading & Writing: Read and match; Activities: Countable & Uncountable **(**Grammar)	
		Practice: Writing a personal statement.	

Creativity			
III	1	**Cooking & Eating:** Grammar: Some & Any, Quantifiers. Vocabulary & Speaking about Food & Drink. *Activities* Kitchen conversation (Listening). Reading an article & answering.	6
	2	**Survival:** Grammar: Comparison of adjectives. *Activities* Describing people (Speaking and Vocabulary). Listening to an audio & Answering. Reading & Writing: Read and Answer.	
	3	**Working Together:** Grammar: Verb + Noun phrases. *Activities* Technology (Vocabulary & Speaking). Listening: Listen & Answer. Reading & Writing: Notice.	
	4	**Music:** Grammar: Present perfect simple. *Activities* Survey about music (Vocabulary & Speaking). Listen to two people talking about music (Listening). Reading: Use adjectives and create sentences.	
	5	**Culture and Arts:** Grammar: Present perfect. Vocabulary & Speaking activity: Speak on the phone. *Activities:* Listen and answer. Reading & Writing activity: Review.	
		Practice: Writing comparison sentences & paragraphs.	
Problem-Solving			
IV	1	**Do's and Don'ts:** Grammar, Modal Verbs. *Activities* Roleplay (Speaking). Holidays in January (Listening). Reading an article & answering.	6
	2	**Body:** Grammar: First conditional. Vocabulary & Speaking about Personality & Appearance. *Activities* Conversations about personality (Listening), Reading & Writing: Read and Answer about your skills.	
	3	**Speed:** Grammar: Present simple passive. Vocabulary & Speaking about relationships. Listening: Listen & Answer. Reading and Error spotting.	
	4	**Work:** Grammar: Adverbs of manner. Vocabulary & Speaking about work advice. Listening: Observe & Answer; Reading: Read & check your ideas.	
		Practice: Writing argumentative and descriptive essays.	
Critical Thinking			
V	1	**Influence:** Grammar: would / past habits. Listening: Sentence Correction. *Activities* Your inspiration (Speaking). Picture description (Reading).Rewrite the sentences (Writing).	6
	2	**Money:** Grammar: Second conditional. *Activities:* Radio programme (Listening). Talk about games (Speaking). Reading & Writing: Fill in the blanks.	
	3	**Things that changed the world:** Grammar: articles. *Activities*: Talk about chewing gum (Speaking & Listening). Reading & Writing: Read and write a book review.	
		Practice: Writing Emails, reports and proposals.	
		Total Hours	**30**

Components for Internal Assessment and Distribution of Marks for CIA and ESE (Theory)

Max Marks	Marks for		Components for CIA						
100	CIA	ESE	CIA		Model		Attendance	Active Engagement	Total
	25	75	Actual	Weightage	Actual	Weightage	5	5	25
			50	5	75	10			

Question Paper Pattern

Component	Duration in Hours	Section A			Section B			Section C			Total
		Type of Question	No. of Questions	Marks	Type of Question	No. of Questions	Marks	Type of Question	No. of Questions	Marks	
CIA	2	MCQ	8	8x1=8	Either or	3	3x6=18	Either or	3	3x8=24	50
Model Exam / **ESE**	3	MCQ	10	10x1=10	Either or	5	5x5=25	Either or	5	5x8=40	75

Components for Internal Assessment and Distribution of Marks for CIA (Lab)

Max Marks	Marks for		Components for CIA						
	CIA	ESE	Test		Model		Experiments / Programs	Observation	Total
100	40	60	Actual	Weightage	Actual	Weightage	Marks	5	40
			50	10	60	15	10		

Examination Pattern

Component	Duration in Hours	Marks			Total Marks
		Practical Exam	Record	Weightage	
Test	2	50	-	**10**	50
Model	3	60	-	**15**	60
Experiments	-	-	-	**10**	10
Observation	-	-	-	**05**	05
Total Marks - CIA				**40**	**40**
ESE	3	50	10	-	**60**

Components for Internal Assessment and Distribution of Marks for CIA (Foundation Course -Theory)

Max Marks	Marks for		Components for CIA				
50	CIA	ESE	CIA		Model		Total
	50	-	Actual	Weightage	Actual	Weightage	
			50	25	50	25	50

Question Paper Pattern

Duration in Hours	Mode of Exam	Type of Questions	No. of Questions	Marks
2	Offline	Open Choice	5 (Out of 8)	5 x 10=50

Components for and Distribution of Marks for ESE (Theory) Ability Enhancement Compulsory Courses (AECC) & Question Paper Pattern

Duration in Hours	Mode of Exam	Type of Questions	No. of Questions	Marks
2	Online	MCQ	50	50x1=50

Semester 2

Semester – 2									
Course Code	**Part**	**Course Category**	**Course Name**	**Hours/ Week**	**Examination**				**Credits**
					Duration in Hours	**Max Marks**			
						CIA	**ESE**	**Total**	
25TAM21L	I	Language - II	Tamil – II	4	3	25	75	100	3
25HIN21L	I		Hindi – II						
25MAL21L	I		Malayalam – II						
25FRE21L	I		French – II						
25ENG22L	II	English – II	English – II	4	3	25	75	100	3
25BCY23C	III	Core – III	Java Programming	5	3	25	75	100	4
25BCY24P	III	Core Lab - II	Java Programming Lab	4	3	40	60	100	2
25BCY25C	III	Core – IV	Security Fundamentals with Linux Operating System	5	3	25	75	100	4
25BCY26A	III	Allied – II	Optimization Techniques	4	3	25	75	100	3
25HUM2FC/	IV	FC – II	Human Rights/	2	2	50	-	50	2
25DIM2FC			Disaster Management						
25IDT2AE	IV	AECC – II	Innovation & Design Thinking	2	2	-	50	50	2
25IPR2AE			Intellectual Property Rights						
25END2AE			Entrepreneurship Development						
			Total	**30**				**700**	**23**

Course Code	Course Name	Category	Hours / Week	Credits
25TAM21L	Tamil – II	Language - I	4	3

Course Objectives

The Course intends to cover

- தமிழ் இலக்கியம் கற்பதன் மூலம் நாகரிகம் மற்றும் பண்பாட்டைப் புரிந்துகொள்ளுதல்.
- தனிப்பட்ட வளர்ச்சி, படைப்பாற்றல் திறனை வளர்த்தல்.
- வாழ்வியல் அறங்களைக் கற்றல் மற்றும் வாழ்வைச் செழுமையாக்க உதவும் நன்னெறிகளை அறிதல்.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	அற இலக்கியங்கள் வழி வாழ்வியல் ஒழுக்கங்களைப் பின்பற்றுதல்	K1 - K3
CLO2	பக்தி இலக்கியங்கள் வழி பக்தி நெறிகளை உணர்தல்.	K1 - K3
CLO3	உரைநடை இலக்கிய படைப்பாளர்களின் சிந்தனைகளைக் கற்று பின்பற்றுதல்	K1 - K3
CLO4	தமிழ் இலக்கிய வரலாற்றில் அற இலக்கியம் மற்றும் உரைநடையின் தாக்கம் குறித்து அறிதல்	K1- K3
CLO5	இலக்கணங்களைக் கற்று பிழையின்றி எழுதுதல்.	K1 - K3
K1 - Remember; **K2** - Understand; **K3** – Apply		

Unit	Content	No. of Hours
I	**(அறம்)** 1. திருக்குறள்(மூன்று அதிகாரங்கள்) • புகழ் • வினை செயல்வகை • நெஞ்சொடு கிளத்தல் 2. திரிகடுகம்(10, 16, 19, 26, 42 பாடல்கள் மட்டும்) 3. பழமொழி நானூறு(2,7,21,54,69,119,130,184,267,375 பாடல்கள் மட்டும்)	14
II	**(பக்தி)** 1. தாயுமானவர் பாடல்கள்(பராபரக் கண்ணி முதல் 10 பாடல்கள்) 2. உமர்கயாம் பாடல்கள் (தனிப்பாடல்கள்) - கவிமணி தேசிகவிநாயகம் பிள்ளை 3. வள்ளலார் பாடல்கள்(திருவருட்பா – வள்ளலார் விண்ணப்பம்) 4. இயேசுகாவியம் - மலைப்பொழிவு - கண்ணதாசன் 5. சித்தர் பாடல் - சிவவாக்கியார் பாடல்	14
III	**(கலை மற்றும் பண்பாடு)** 1. அறம் எனப்படுவது - அமுதன் 2. ஏட்டில் எழுதா இலக்கியம் - ஔவை துரைச்சாமி 3. கீழடி - தொல்லியல் துறை, வெளியீடு 4. மனம் எனும் சொர்க்கவாசல் - டாக்டர் எம்.எஸ்.உதயமூர்த்தி 5. ஆளுமைத் திறன் - அறிவுக்கதிர். அரசுப்பணி சிறப்பிதழ்	12
IV	**(இலக்கிய வரலாறு)** 1. பதினெண் கீழ்க்கணக்கு நூல்கள் 2. உரைநடையின் தோற்றமும் வளர்ச்சியும்	10

Unit	Content	No. of Hours
V	**(இலக்கணம்)** 1. சொல்லின் வகைகள் 2. வேற்றுமைத் தொகைகள் 3. பகுபத உறுப்புகள்	10
	Total Hours	**60**

Reference Books	
1	கவிஞர் கண்ணதாசன், (2006, 6-ஆம் பதிப்பு), இயேசு காவியம், கலைக்காவிரி பதிப்பகம்.
2	நடராசன் தி.சு. (2013, 16-ஆம் பதிப்பு), உரைகளும் உரையாசிரியர்களும், நியூ செஞ்சுரி புக் ஹவுஸ்.
3	முனைவர் சேதுராமன் சி.(2010, முதல் பதிப்பு), அபிராமி அந்தாதி, நியூ செஞ்சுரி புக் ஹவுஸ்.
4	முனைவர் பஞ்சாங்கம் கா. (2017, 4-ஆம் பதிப்பு), தமிழ் இலக்கிய வரலாறு, காவியா பதிப்பகம்.
5	வரதராசன் மு. (2021, 34-வது பதிப்பு), தமிழ் இலக்கிய வரலாறு, சாகித்திய அகாதமி பதிப்பு.
6	செல்வநாயகம் வி.(2003, முதல் பதிப்பு), தமிழ் உரைநடை வரலாறு, அடையாளம் பதிப்பகம்.
7	பேரா. முனைவர் பாக்கியமேரி, (2022, 6-ம் பதிப்பு), வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு, நியூசெஞ்சுரி புக் ஹவுஸ்(பி). லிட்.
8	டாக்டர் உதயமூர்த்தி எம். எஸ்.(2016, முதல் பதிப்பு), எண்ணங்கள், வெளியீடு கங்கை புத்தக நிலையம்.
9	புலவர்.பொன்மணிமாறன், (2011, முதல் பதிப்பு) அடோன் தமிழ் இலக்கணத் தொகுப்பு, அருண் பப்ளிஷிங்.
10	குமரன் கோ (2010, முதல் பதிப்பு), தமிழ் இலக்கணம் எளிய அறிமுகம் , சந்தியா பதிப்பகம்.

Course Code	Course Name	Category	Hours / Week	Credits
25HIN21L	Hindi - II	Language - I	4	3

Course Objectives

The Course intends to cover:

- A basic understanding of contemporary poetry can be gained and the nature of modern poetry can be realized.
- Realizing the nature of drama and its nature and improving the knowledge of reading and understanding the nature of contemporary plays.
- Understands the benefits of correspondence and can enhance the correspondence you need.
- Translation is especially useful for translating from Hindi to English

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Get a basic understanding of renewal poetry and the essence of the poem	K1
CLO2	It is possible to understand the genre of Drama	K2
CLO3	Translating skill improved specially from English to Hindi	K2, K3
CLO4	Knowledge is gained by using phrases and idioms	K3
CLO5	Learners can express opinion in small sentences	K4
K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyse		

Unit	Content	No. of Hours
I	**Modern Poetry :** Panchvati By Mythli Sharan Gupt	14
II	**One Act Play:** Ekaniki Piyush 1. Owrangjeb ki aakirirath– Ramkumar varma 2. Ek din - Lakshminarayan Misra 3. Vapasi - Vishnuprabhakar 4. Badsurath rajkumari – Krishnachandra 5. Aakket – Harijeeth	14
III	**Letter Writing :** (Leave Letter, Job Application, Ordering Books, Letter to Publisher, Personal Letter)	12
IV	**Conversation:**(Doctor & Patient, Teacher & Student, Storekeeper & Buyer, Two Friends, Booking Clerk & Passenger at Railway Station, Auto rickshaw driver and Passenger)Ref : Bolchal Ki Hindi Aur Sanchar by Dr. Madhu Dhavan Vani Prakashan, New Delhi.	10
V	**Translation:** Hindi-English only Lessons – 1-15 only Anuvadh Abyas -III	10
	Total Hours	**60**

Text Book

1.	Luca Giachino, Carla Baracco, Romain Chrétien(DELF), (2022), Nouvelle Génération A1, Didier FLE

Reference Books

1.	Kavya Parasar, Dr.Bolanath,(2018) Jawahar Pusthakalay, Sadar Bazaar,Mathura-U.P.281001.
2.	Sone ki Varsha (2020) Dakshin Bharat Hindi Prachar Sabha, Chennai – 600 017

Course Code	Course Name	Category	Hours / Week	Credits
25FRE21L	French - II	Language - I	4	3

Course Objectives

The course intends to

- Understand and use familiar everyday expressions and basic phrases aimed at the satisfaction of concrete needs.
- Recognize key aspects of Francophone cultures such as greetings, etiquette, daily life, and basic geography of French-speaking countries.
- Write short, simple texts such as postcards, emails, or short descriptions about themselves and their immediate environment.
- Construct simple sentences using correct word order and basic vocabulary.
- Develop sensitivity to cross-cultural differences in communication and social practices.
- Read and understand short, simple texts such as personal messages, advertisements, menus, and schedules.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Improve all the four French language skills (speaking, listening, reading, and writing) (Effective communicators)	K1
CLO2	Comprehend French and other Francophone nations' cultures and civilizations.	K2
CLO3	Comprehend the fundamentals of language structure, vocabulary, grammar, and phonetics (language skill).	K3
CLO4	The French DELF-A1 Certification is appreciated.	K3
CLO5	Developing Communication Skills	K4
K1 - Remember; **K2** - Understand; **K3** – Apply; **K4**-Analyse		

Unit	Content	No. of Hours
I	Portraits(pg 50-60) Grammaire: pg(140-144)	14
II	Communication(pg 61-65) Grammaire: pg(145-146)	14
III	Temps Libre(pg 66-68) Grammaire: pg(147)	12
IV	Mots Et Expressions((pg 69-76) Grammaire: pg(148-151)	10
V	Communication(pg 77-81) Grammaire: pg(152-155)	10
	Total Hours	**60**
Text Book		
1.	Luca Giachino, Carla Baracco, Romain Chrétien(DELF), (2022), Nouvelle Génération A1, Didier FLE.	
Reference Book		
1.	Nathalie Hirschsprung, Tony Tricot, (2017) Cosmopolite, Hachette.	

Course Code	Course Name	Category	Hours /Week	Credits
25ENG22L	English-II	Language - II	4	3

Course Objectives

The course intends to cover

- The literary elements in poetry.
- The critical contemplation and writing in styles of prose texts.
- The modernist techniques and ethics in the narratives of short stories.
- The interpersonal skills essential in the work environment.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Identify the common techniques underlying free verse and traditional forms of poetry for crafting poems.	K1
CLO2	Understand humour in prose texts psychologically to master the oratory skills.	K2
CLO3	Employ empathy and morale in diplomatic Day-to-day circumstances.	K3
CLO4	Strengthen the writing skills for documentation.	K3
CLO5	Demonstrate flexibility and mobility in the sequel LSRW Skills.	K3
K1 - Remember; **K2** - Understand; **K3** - Apply		

Language II - English II

Unit	Content	No. of Hours
I	**Poetry**: Motherhood 1. My Grand Mother's House – Kamala Das 2. Of mother, among others things – A.K Ramanujam 3. Night of the Scorpion – Nissim Ezekiel	12
II	**Prose**: Humour 1. With The Photographer – Stephen Leacock 2. Travel by Train – J.B.Priestley 3. On Forgetting – Robert Lynd	12
III	**Short Stories:** Integrity 1. The taxi driver – K.S. Duggal 2. A Retrieved Reformation- O Henry 3. Kabuliwala - Rabindranath Tagore	12
IV	**Language Competency : Vocabulary** 1. Homonyms, Homophones, Homographs Portmanteau words 2. Verbs and Tenses, Subject Verb Agreement 3. Error Correction Vocabulary : Synonyms, Antonyms, Word Formation	12
V	**English for Communication** 1. Listening with courtesy and adding ideas and giving opinions during the meeting and making concluding remarks 2. Participating in a meeting: face to face and online 3. Reading news and weather reports 4. Preparing first drafts of short assignments .	12
	Total Hours	**60**

Text Books	
1.	Ezekiel Nissim, 1989 .Collected Poems 1952-1988. Oxford University Press.
2.	Hewings, M. (2000). Advanced English Grammar. Cambridge. University Press.
Reference Books	
1.	Bakshi, S.P. & Sharma, R. (2019). Descriptive English. Arihant Publications (India) Ltd.
2.	Cameron S & Dempsey L. (2019). The Reading Book: A Complete Guide to Teaching Reading. S & L. Publishing.
3.	Sherman B. (2014) Skimming and Scanning Techniques. Liberty University Press.
Web Resources (Swayam / NPTEL)	
1.	https://nptel.ac.in/courses/109103020

Course Code	Course Name	Category	Hours / Week	Credits
25BCY23C	Java Programming	Core-III	5	4

Course Objectives

The Course intends to cover:

- Fundamentals of Object-Oriented Programming in Java.
- AWT controls, Event Handling, Swing and Graphical User Interface (GUI) concepts and Spring Boot.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Remember object-oriented features to build simple applications.	K1
CLO2	Understand the concept of Inheritance, Packages, Interfaces and Exception Handling.	K2
CLO3	Apply multithreaded programming and file handling concepts.	K3
CLO4	Understand the fundamental concepts of AWT controls, layouts and events to demonstrate the user-driven interactive applications.	
CLO5	Develop GUI Applications using Swing in Java, develop simple Application using Spring Boot.	K3
K1 - Remember; **K2** - Understand; **K3** – Apply		

CLO – PLO Mapping

CLOs/PLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	3	2	2	2	1
CLO2	3	2	2	2	1
CLO3	3	3	3	3	1
CLO4	3	3	3	3	1
CLO5	3	3	3	3	1
3 - Substantial (high)		**2** - Moderate (medium)		**1** - Slight (low)	

Core - III: Java Programming

Unit	Content	No. of Hours
I	**Introduction:** Review of Object-Oriented concepts – History of Java - Java buzzwords - JVM architecture – Data types – Variables - Scope and lifetime of variables – arrays – operators – control statements – type conversion and casting – Simple Java program – constructors – methods – Static Block - Static Data – Static Method String and String Buffer Classes.	15
II	**Inheritance:** Basic concepts - Types of inheritance - Member access rules - Usage of this and Super keyword - Method Overloading - Method overriding - Abstract classes - Dynamic method dispatch - Usage of final keyword. Packages: Definition - Access Protection - Importing Packages - Interfaces- Definition – Implementation – Extending. Exception Handling**:** try –catch - throw - throws – finally – Built–in exceptions - Creating own Exception classes.	15
III	**Multithreaded Programming:** Thread Class - Runnable interface - Synchronization – Using synchronized methods – Using synchronized statement - Interthread Communication – Deadlock. I/O Streams: Concepts of streams - Stream classes - Byte and Character stream - Reading console Input and Writing Console output - File Handling.	15
IV	AWT: Overview of AWT - Swing: Introduction to Swing - Hierarchy of swing components. Containers-Top level containers - JFrame - JWindow – Jdialog JPanel - JButton – JtoggleButton - JCheckBox - JRadioButton - JLabel, JTextField - JTextArea - JList - JComboBox - JScrollPane. Event Handling - Events – Event sources - Event Listeners - Event Delegation Model (EDM) - Handling Mouse and Keyboard Events – Adapter classes - Inner classes.	15
V	JavaFX: Introduction to JavaFX, Setting the Scene, Hello World- Spring Boot: Fundamentals of Spring Boot-Spring vs Spring Boot-Spring Boot Architecture-Develop Spring Boot Application step by step-Run Spring Boot Application-Creating first Spring Boot application. Introduction to Python-Basics of Python.	15
	Total Hours	**75**

Text Books

1.	Herbert Schildt (2017), The Complete Reference, Tata McGraw Hill, New Delhi, 9th Edition. (Unit – I, II, III, IV, V)
2.	E.Balagurusamy (2023), Programming with Java, Tata McGraw Hill, New Delhi, 7th Edition.
3.	Ashish Sarin, J. Sharma (2017), Getting Started with Spring Framework, CreateSpace Independent Publishing Platform.

Reference Books	
1.	Y. Daniel Liang (2018), Introduction to Java Programming, Pearson Education, India, 10th Edition.
2.	Kathy Sierra, Bert Bates, Trisha Gee (2022), Head First Java. O. Reilly Publications, 3rd Edition
Web Resources (Swayam / NPTEL)	
1.	https://onlinecourses.nptel.ac.in/noc22_cs47/preview
2.	https://onlinecourses.nptel.ac.in/noc20_cs84/preview

Course Code	Course Name	Category	Hours / Week	Credits
25BCY24P	Java Programming Lab	Core Lab-II	4	2

S. No.	List of Programs
1	Basic Java programs.
2	Java program that prompts the user for an integer and then prints out all the prime numbers up to that Integer.
3	Java program to multiply two given matrices.
4	Java program that displays the number of characters, lines, and words in a text.
5	Generate random numbers between two given limits using Random class and print messages according to the range of the value generated.
6	Java program to do String Manipulation using Character Array and perform the following string operations: a) String length b) Finding a character at a particular position c) Concatenating two strings.
7	Java program to perform the following string operations using String class: a) String Concatenation b) Search a substring c) To extract substring from the given
8	Java program to perform string operations using the String Buffer class: a) Length of a string b) Reverse a string c) Delete a substring from the given string.
9	Java program that implements a multi-thread application that has three threads. The first thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.
10	Threading program that uses the same method asynchronously to print the numbers 1 to 10 using Thread1 and to print 90 to 100 using Thread2.
11	Java program to demonstrate the use of the following exceptions. a) ArithmeticException b) NumberFormatException c) ArrayIndexOutofBoundException d) NegativeArraySizeException
12	Java program that reads on file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file, and the length of the file in bytes.

S. No.	List of Programs
13	Java program to accept a text and change its size and font. Include bold italic options. Use frames and controls.
14	Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. (Use adapter classes).
15	Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -, *, and % operations. Add a text field to display the result. Handle any possible exceptions like divide by zero.
16	Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with “stop” or “ready” or “go” should appear above the buttons in a selected color. Initially there is no message shown.
Total Hours	**60**

Text Books	
1.	Herbert Schildt (2017), The Complete Reference, Tata McGraw Hill, New Delhi, 9th Edition
2.	E. Balagurusamy (2023), Programming with Java, Tata McGraw Hill, New Delhi,7th Edition.
Reference Books	
1.	Cay S. Horstmann (2007), Gary Cornell, Core Java, Volume I– Fundamentals, rentice Hall, 8th Edition.
2.	Kathy Sierra, Bert Bates, Trisha Gee (2022), "Head First Java", (Grayscale Indian Edition) O‟Reilly Publications, 3rd Edition.
Web Resources (Swayam / NPTEL)	
1.	https://onlinecourses.nptel.ac.in/noc22_cs47/preview
2.	https://onlinecourses.nptel.ac.in/noc20_cs84/preview

Course Code	Course Name	Category	Hours / Week	Credits
25BCY25C	Security Fundamentals with Linux Operating System	Core- IV	5	4

Course Objectives

The course intends to cover

- Understand the basics of network-based Linux commands.
- Detect and mitigate attacker behaviors.
- Learns about secure data transfer and monitor network activity to prevent data exfiltration.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Learn the basics of Linux Fundamentals, Security Risk and Attacker Perspective	K2
CLO2	Understand the fundamentals of Linux Security & Administration with ATTACK Mapping	K2
CLO3	Understand the basics of File System Permissions, Secure Services and Daemons	K2
CLO4	Analyse the concepts of Secure Shell and Networking Configuration	K4
CLO5	Demonstrate managing file archives, secure file transfers and monitoring of Linux file systems to detect and prevent malicious activities.	K4
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze		

CLO – PLO Mapping

CLOs/PLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	3	2	3	2	2
CLO2	2	2	2	2	2
CLO3	3	2	3	3	2
CLO4	2	3	2	2	2
CLO5	2	3	2	1	1
3 - Substantial (high)		**2 - Moderate (medium)**		**1 - Slight (low)**	

Core - IV : Security Fundamentals with Linux Operating System

Unit	Content	No. of Hours
I	**Getting Started with Red Hat Enterprise Linux:** What Is Linux? -Linux distributions comparison for security use (e.g., RHEL vs. Debian vs. Kali)- Why attackers love misconfigured Linux machines- Map to ATTACK: Linux Initial Access & Execution techniques. **Accessing the Command Line:** Access the Command Line- Access the Command Line with the Desktop-Execute Commands with the Bash Shell- How attackers drop into bash, spawn PTY shells, or abuse restricted shells. 1. Install Red Hat Enterprise Linux (or CentOS/AlmaLinux as a substitute). 2. Compare package managers: yum/dnf (RHEL), apt (Debian/Ubuntu), apt + kali-tools (Kali). 3. Launch and access the Linux command line via TTY and terminal emulator. 4. Practice common shell commands (ls, cd, pwd, mkdir, rm, etc.). 5. Use bash to execute multiple commands with pipes and redirection.	15
II	**Managing Files from the Command Line:** Describe Linux file system Hierarchy Concepts- Specify Files by Name-Manage Files with Command-line Tools-Make Links Between Files- Match File Names with Shell Expansions Forensic traces in /tmp, /var/tmp, and hidden files. **Getting Help in Red Hat Enterprise Linux:** Use man, apropos to identify misuse of uncommon tools. **Creating, Viewing & Editing Text Files:** Redirect Output to a File or Program Edit Text Files from the Shell Prompt- Change the Shell Environment- Use cases of malicious crontab entries, .bashrc, .profile for persistence. **Managing Local Users and Groups:** Managing Local Users and Groups-Describe User and Group Concepts- Gain Superuser Access- Manage Local User Accounts- Manage Local Group Accounts- Manage User Passwords- Attack vectors like SUID/SGID abuse, shadow file tampering, UID 0 shell. 1. Navigate through /etc, /var, /home and identify critical directories. 2. Create, copy, move, and delete files with cp, mv, rm, touch 3. Create hard links and symbolic links using ln. 4. Explore /tmp and /var/tmp to identify hidden files (ls -la). 5. Use man and apropos to get help for less common commands. 6. Redirect outputs (> , >> , 2>), use pipelines. 7. Create a cron job that runs every minute and log outputs in /tmp/. 8. Add a malicious command to .bashrc for persistence and observe effects. 9. Create new users with useradd, set passwords, and assign groups. 10. Experiment with chmod u+s to create an SUID binary and detect it using find / -perm -4000. 11. Edit /etc/shadow in a lab environment to understand password storage risks.	15

Unit	Content	No. of Hours
III	**Controlling Access to Files:** Interpret Linux File System Permissions-Manage File System Permissions from the Command Line-Manage Default Permissions and File Access- Use find / - perm -4000 to detect suspicious SUID binaries. **Monitoring and Managing Linux Process:** Process States and Lifecycle Control Jobs- Kill Processes- Monitor Process Activity-Detect process injection, reverse shell behavior, or rogue daemons.**Controlling Services and Daemons:** Identify Automatically Started System Processes-Control System Services- Attacker abuse of system services to maintain persistence. 1. Set different file permissions (chmod 644, chmod 755) and test access with multiple users. 2. Use umask to change default permissions. 3. Run find / -perm -4000 to identify SUID/SGID binaries on your system. 4. Use ps aux, top, and htop to monitor active processes. 5. Start and kill a process (e.g., sleep 300 then kill PID). 6. Write a simple C reverse shell, run it, and detect using ps and netstat. 7. Create a custom systemd service and enable it for persistence. 8. Simulate attacker persistence by modifying a service unit file.	15
IV	**Configuring and Securing SSH:** Access the Remote Command Line with Secure Shell (SSH)- Configure Secure Shell (SSH) Key-based Authentication Customize Open Secure Shell (SSH) Service Configuration-SSH abuse scenarios: brute-force, key injection, pivoting. **Analyzing and Storing Logs:** Describe System Log Architecture- Review Syslog Files- Review System Journal Entries- Preserve the System Journal Maintain Accurate Time-: Map logs to incident detection: /var/log/secure, /var/log/messages, /var/log/audit/audit.log. **Managing Networking:** Describe Networking Concepts- Validate Network Configuration- Configure Networking from the Command Line-Edit Network Configuration Files-Configure Hostnames and Name Resolution-Detect rogue ports and connections using ss, netstat, iptables, tcpdump. 1. Install and configure openssh-server. 2. Generate SSH keys with ssh-keygen and configure key-based login. 3. Harden SSH by disabling root login and changing default port. 4. Attempt SSH brute-force with hydra (lab only). 5. Review SSH logs in /var/log/secure. 6. Use journalctl -xe to monitor suspicious login attempts. 7. Monitor real-time network connections with ss -tulnp and netstat -antp. 8. Capture packets with tcpdump and analyze login attempts. 9. Configure iptables firewall rules to block or allow certain ports.	15

Unit	Content	No. of Hours
V	**Archiving and Transferring Files:** Manage Compressed tar Archives- Transfer Files Between Systems Securely- Synchronize Files Between Systems Securely How attackers use tar/gzip to exfiltrate data-Install and Update Software Packages-Register Systems for Red Hat Support. **Accessing Linux File System:** Identify File Systems and Devices- Mount and Unmount File Systems- Locate Files on the System- Recognize attacker use of mounted hidden partitions or external USBs. 1. Create and extract tar archives with tar -cvf and tar -xvf. 2. Compress files using gzip and bzip2. 3. Transfer files between systems with scp and rsync. 4. Simulate attacker exfiltration: compress sensitive data and transfer to another machine. 5. Install and remove software using dnf install/remove. 6. List mounted filesystems with df -h and mount. 7. Mount and unmount USB/external drives. 8. Use find to locate hidden partitions and analyze /etc/fstab entries. 9. Detect rogue mount points simulating attacker persistence	15
	Total Hours	**75**
Text Books		
1.	William Shotts (2019), The Linux Command Line (A Complete Introduction), No Starch Press.	
2.	OccupyTheWeb (2018),Linux Basics for Hackers (Getting Started with Networking, Scripting & Security in Kali), No Starch Press, US.	
3.	Christopher Negus (2020), Linux Bible (The Comprehensive Tutorial Resource), 10th Edition, Wiley	
Reference Books		
1.	Daniel J. Barrett (2003), Linux Security Cookbook, 1st Edition, O'Reilly Media, Inc.	
2.	Bruce Nikkel (2021), Practical Linux Forensics,1st Edition, No Starch Press	
Web Resources (Swayam / NPTEL)		
1.	https://onlinecourses.swayam2.ac.in/cec24_cs09/preview	
2.	https://onlinecourses.nptel.ac.in/noc24_ee46/preview	

Course Code	Course Name	Category	Hour / Week	Credits
25BCY26A	Optimization Techniques	Allied-II	4	3

Course Objectives

The Course intends to cover

- Optimization methods such as linear programming, transportation problems, and game theory to address complex decision-making challenges in real-world scenarios.
- Employ analytical and computational techniques like PERT/CPM and replacement models to effectively manage resources and optimize project scheduling.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Recall the concepts of linear programming, including mathematical Formulation, graphical method, and simplex method.	K1
CLO2	Calculate Transportation and Assignment Problems, feasible solutions and the Traveling Salesman Problem.	K2
CLO3	Apply the models of queuing theory in the real-world applications.	K3
CLO4	Illustrate the knowledge of drawing project networks for quantitative analysis of projects.	K3
CLO5	Solve Two-Person Zero-Sum Games using the Maximin and Minimax Principles.	K3
K1 - Remember; **K2 -** Understand; **K3 -** Apply		

CLO - PLO Mapping

CLOs/PLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	2	2	2	2	3
CLO2	2	1	2	3	2
CLO3	1	1	3	2	3
CLO4	3	2	3	3	2
CLO5	2	2	2	3	2
3 - Substantial (High)		**2** - Moderate (Medium)		**1** - Slight (Low)	

Allied II: Optimization Techniques

Unit	Content	No. of Hours
I	**Linear Programming Problems:** Introduction to linear programming mathematical formulation of linear programming problem – graphical method – simplex method only.	12
II	**Transportation Problems:** Introduction to transportation problem – the transportation table – solution of transportation problem – finding an initial basic feasible solution. **Assignment Problems:** Introduction – mathematical formulation – solution methods – special case – the traveling salesman problem.	12
III	**Queuing Theory:** Introduction – queuing system – elements of queuing system – transient and steady states – Kendal's notation for representing queuing models – Model I (M/M/1) : (∞/FIFO), Model II (M/M/I): (N/FCFS).	12
IV	**Network Scheduling:** Introduction – network – basic components – rules of network construction – network computations – critical path analysis – floats – programming evaluation review technique – probability consideration in programming evaluation review technique – distinction between programming evaluation review technique and critical path method – applications of network techniques.	12
V	**Game Theory:** Introduction – two person zero – sum games – some basic terms – the maximin – minimax principle – games without saddle points – mixed strategies – graphical solution of 2 x n and m x 2 games – dominance property.	12
	Total Hours	**60**
Text Book		
1	Sundaresan.V, Ganapathy Subramanian. K.S, Ganesan .K (2013), Resource Management Techniques (Operations Research), A.R.S. publications. Unit I : Chapter 2 : Section 2.1 – 2.5 Chapter 3 : Section 3.1.1-3.1.3 Unit II : Chapter 7 : Section 7.1 Chapter 8 : Section 8.1 – 8.9 Unit III: Chapter 13 : Section 13.1 – 13.4,13.6,13.7 Unit IV: Chapter 15 : Section 15.1 – 15.7 Unit V : Chapter 16 : Section 16.1 – 16.4,16.6,16.7	
Reference Books		
1	Hamdy A Taha(2002), Operations Research, Pearson Education, 7th edition.	
2	P.K. Gupta, D.S. Hira(2015), Problems in Operations Research, S. Chand Publishers	
Web Resources (Swayam/NPTEL)		
1	https://archive.nptel.ac.in/courses/111/107/111107128/	

Course Code	Course Name	Category	Hours / Week	Credits
25HUM2FC	Human Rights	Foundation Course	2	2

Unit	Content
I	**Concept of Human Values, Value Education Towards Personal Development :** Aim of education and value education; Evolution of value oriented education; Concept of Human values; types of values; Components of value education. **Personal Development :** Self analysis and introspection; sensitization towards gender equality, physically challenged, intellectually challenged. Respect to - age, experience, maturity, family members, neighbours, co-workers. Character Formation Towards Positive Personality: Truthfulness, Constructivity, Sacrifice, Sincerity, Self Control, Altruism, Tolerance, Scientific Vision.
II	**Value Education Towards National and Global Development** **National and International Values:** Constitutional or national values - Democracy, socialism, secularism, equality, justice, liberty, freedom and fraternity. Social Values - Pity and probity, self-control, universal brotherhood. Professional Values - Knowledge thirst, sincerity in profession, regularity, punctuality and faith. Religious Values - Tolerance, wisdom, character. Aesthetic values - Love and appreciation of literature and fine arts and respect for the same. National Integration and international understanding.
III	**Impact of Global Development on Ethics and Values** Conflict of cross-cultural influences, mass media, cross-border education, materialistic values, professional challenges and compromise. Modern Challenges of Adolescent Emotions and behavior; Sex and spirituality: Comparison and competition; positive and negative thoughts. Adolescent Emotions, arrogance, anger, sexual instability, selfishness, defiance.
IV	**Therapeutic Measures** Control of the mind through a. Simplified physical exercise b. Meditation – Objectives, types, effect on body, mind and soul c. Yoga – Objectives, Types, Asanas d. Activities: (i) Moralisation of Desires (ii) Neutralisation of Anger (iii)Eradication of Worries (iv)Benefits of Blessings

Unit	Content
V	**Human Rights** 1. Concept of Human Rights – Indian and International Perspectives a. Evolution of Human Rights b. Definitions under Indian and International documents 2. Broad classification of Human Rights and Relevant Constitutional Provisions. a. Right to Life, Liberty and Dignity b. Right to Equality c. Right against Exploitation d. Cultural and Educational Rights e. Economic Rights f. Political Rights g. Social Rights 3. Human Rights of Women and Children a. Social Practice and Constitutional Safeguards (i) Female Feticide and Infanticide (ii) Physical assault and harassment (iii) Domestic violence (iv) Conditions of Working Women 4. Institutions for Implementation a. Human Rights Commission b. Judiciary 5. Violations and Redressal a. Violation by State b. Violation by Individuals c. Nuclear Weapons and terrorism d. Safeguards.
Total Hours	**30**

Web Resources	
1	https://syllabus.b-u.ac.in/syl_college/ug_ve.pdf

Course Code	Course Name	Category	Hours/Week	Credits
25DIM2FC	Disaster Management	FC-II	2	2

Unit	Content
I	**Unit I: Introduction to Disasters** 1.1. Definition of Concepts 1.2. Difference between hazards and vulnerability 1.3. Types of Disasters 1.4. Natural Disasters 1.5. Human - Made Disasters
II	**Unit II: Disasters Management** 2.1. Disaster Management 2.2. Disaster Management Cycle 2.3. Key Phases of Disaster Management 2.4. Disaster and Development 2.5. Disaster Impacts on Differential Groups
III	**Unit III: Vulnerability Assessment and Reduction** 3.1. Vulnerability 3.2. Vulnerability Assessment 3.3. Early Warning System 3.4. Factors Contributing to Vulnerability 3.5. Vulnerability Reduction 3.6. Impact of Development Projects such as Dams, Embankments, Changes in Land-use etc. 3.7. Climate Change Adaptation
IV	**Unit IV: Disaster Risk Reduction** 4.1. Disaster Risk Reduction (DRR), 4.2. Knowledge Management in Disaster Risk Reduction 4.3. The Knowledge Management Cycle 4.4. Role of Information and Knowledge in Disaster Risk Reduction 4.5. Indigenous Knowledge and Disaster Risk Reduction 4.6. Indigenous Knowledge and Early Warning Indicators 4.7. Indigenous Knowledge and Coping Strategies 4.8. Sendai Framework for Disaster Risk Reduction 4.9. Intergovermental Panel on Climate Change (IPCC) 4.10. IPCC Scenario in the Context of India
V	**Unit V: Institutional Framework for Disaster Management** 5.1. National Policy on Disaster Management 2009 5.2. The National Disaster Management Authority (NDMA) 5.3. State Disaster Management Authority (SDMA) 5.4. District Disaster Management Authorities (DDMAs) 5.5. Community-Based Disaster Management (CBDM) 5.6. NGOs and Disaster Management 5.7. Other Related Policies, Plans, Programmes and Legislation
	Total Hours **30**

Reference Resources	
1.	Agrawal A. (1995), Dismantling the divide between Indigenous Knowledge and Scientific Knowledge. Development Change 26: 413 – 439.
2.	Mrinalini Pandey (2014), Text Book of Disaster Management, Wiley India Pvt Ltd.
3.	Pradeep K Goyal,Anil K Gupta, Disaster Management, All India Council for Technical Education Nelson Mandela Marg, Vasant Kunj, New Delhi, 110070
4.	Sharma S.C (2020), Disaster Management (1st ed.), Khanna Book Publishing Co. (P) Ltd, New Delhi.
5.	Srivastava A.K (2021), Text Book of Disaster Management, Scientific Publishers, Jodhpur.
6.	Subramanian, (2018), Disaster Management, Vikas Publishing House, Noida.
7.	Tushar Bhattacharya (2015), Text Book of Disaster Science and Management, McGraw Hill Education.
8.	United Nation (2015), Sendai Framework for Disaster Risk Reduction. 2015 – 2030. Geneva: UNISDR
9.	www.EasyEngineering.net

Course Code	Course Name	Category	Hours / Week	Credits
25IDT2AE	Innovation & Design Thinking	AECC - II	2	2

Course Objectives

The Course intends to cover

- The principles and practices of innovation and design thinking.
- Creative problem-solving skills, and impactful solutions across diverse contexts.
- The user-centered research techniques, and practical tools to generate, prototype.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Understand the design thinking methodology for solving real-world problems.	K2
CLO2	Generate, prototype, and test innovative ideas.	K3
CLO3	Frame human-centered solutions and present them effectively.	K3
CLO4	Enhance their confidence in collaborative approaches to problem solving.	K3
CLO5	Integrate innovation strategies into business, social, and creative contexts to drive sustainable impact.	K4
K2 - Understand; **K3** – Apply ; **K4** - Evaluate		

Ability Enhancement Compulsory Courses (AECC) - II: Innovation & Design Thinking

Unit	Content	No. of Hours
I	**Principles of Design Thinking:** Usability, Human-centeredness, Empathy, Iteration. **Types of Innovation:** Product, Process, Business Model, Social Innovation.	6
II	**Empathy & Defining The Problem:** Understanding users - observation - ethnographic research - interviews - Empathy maps and personas - Identifying user pain points - Problem framing vs. problem solving.	6
III	**Ideation & Creativity Tools:** Divergent vs. Convergent Thinking - Brainstorming and mind mapping techniques – SCAMPER. Idea selection and prioritization frameworks.	6
IV	**Prototyping & Experimentation:** Low-fidelity vs. High-fidelity prototyping - Storyboarding, sketching, mock-ups, and role-playing - Rapid prototyping with simple materials.	6
V	**Testing & Feedback:** Testing prototypes with users - Iteration and learning from feedback. **Innovation Strategy & Implementation :** Scaling ideas into innovations - Measuring innovation impact - Barriers - Design Thinking for social change and sustainability.	6
	Total Hours	**30**
Text Books		
1	Kelley, T., & Kelley, D. (2013). Creative confidence: Unleashing the Creative Potential within us all. Crown Business.	
2	Dan Saffer, Designing for Interaction, New Riders Publications, 2010.	
Reference Books		
1	Plattner, H., Meinel, C., & Leifer, L. (Eds.). (2018). Design Thinking Research: Making Distinctions: Collaboration versus Cooperation. Springer.	
2	Liedtka, J., & Ogilvie, T. (2011). Designing for Growth: A Design Thinking Tool kit for Managers. Columbia University Press.	
3	Martin, R. (2009). The Design of Business: Why Design Thinking is the Next Competitive Advantage. Harvard Business Press.	
Web Resources (Swayam / NPTEL)		
1	https://onlinecourses.nptel.ac.in/noc22_mg32/preview	
2	https://onlinecourses.swayam2.ac.in/imb23_mg65/preview	
3	https://onlinecourses.nptel.ac.in/noc20_hs08/preview	

Course Code	Course Name	Category	Hours/Week	Credits
25IPR2AE	Intellectual Property Rights	AECC - II	2	2

Course Objectives

This course intends to cover

- Identify the objectives, forms, duration, and scope of protection for different types of intellectual property.
- Understand the global IP framework and India's compliance challenges.
- Recognize the role of IP as a policy tool for national, economic, social, and cultural growth.
- Gain knowledge of substantive laws and procedural mechanisms of IP in India.
- Analyze recent national and global trends in intellectual property rights.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Understand the core principles of intellectual property protection.	K1, K2
CLO2	Identify the key concepts and principles of trademarks.	K2
CLO3	Comprehend the legal implications and rights under copyright law.	K3
CLO4	Understand the legal consequences of patents and trade secrets.	K2
CLO5	Comprehend IP rights for plant varieties and farmers, along with their legal and social aspects.	K4
K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** – Analyze		

Ability Enhancement Compulsory Courses (AECC)-II:
Intellectual Property Rights

Unit	Content	No. of Hours
I	**Introduction to Intellectual Property:** Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.	6
II	**Trade Marks:** Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.	6
III	**Law of Copy Rights:** Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law**.**	6
IV	**Law of Patents, Trade Secrets:** Foundation of patent law, patent searching process, ownership rights and transfer. Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.	6
V	**Protection of Plant Varieties and Farmers' Rights:** Introduction -Meaning and Definition - Registrable Varieties of Plants - Procedure for Registration - Plant Varieties Protection.	6
	Total Hours	**30**

Text Books	
1	V K Ahuja - Law Relating To Intellectual Property Rights - Lexis Nexis; Third edition , 2017.
2	Elizabeth Verkey - Intellectual Property Law and Practice – Eastern Book Company – 2018.
3	S R Myneni - Law of Intellectual Property - Asia Law House – 2021.
Reference Books	
1	B.L. Wadehra - Law Relating To Intellectual Property – Universal Law Publishing House, New Delhi , 2011.
2	Avtar Singh - Intellectual Property Law - Eastern Book Company – 2015.
Web Resources (Swayam/NPTEL)	
1	https://onlinecourses.nptel.ac.in/noc22_hs59/preview

Course Code	Course Name	Category	Hours / Week	Credits
25END2AE	Entrepreneurship Development	AECC – II	2	2

Course Objectives

This course intends to cover

- Basics of starting and managing entrepreneurial ventures.
- Tools for planning, funding, and entrepreneurial growth.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Understand the concept of entrepreneurship.	K2
CLO2	Gain knowledge on entrepreneurial motivation	K2
CLO3	Apply business idea evaluation	K3
CLO4	Create systematic Business plan	K3
CLO5	Analyse business finance and support	K4
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4** - Analyse		

Ability Enhancement Compulsory Course – II: Entrepreneurship Development

Unit	Content	No. of Hours
I	**Entrepreneurship:** Meaning of Entrepreneurship - Characteristics, Functions and Types of entrepreneurs - Intrapreneur vs. Entrepreneur - Need for Entrepreneurship in economic development - Contribution to GDP, Employment, Innovation.	5
II	**Entrepreneurial Motivation:** Meaning - Need for Achievement Theory - Risk-taking Behaviour - Innovation and Entrepreneur – Economic & non-economic factors affecting entrepreneurial growth.	5
III	**Business Ideas:** Sources of Business Ideas & Opportunity Identification – Idea generation techniques (Brainstorming, Design Thinking). Business incubation - Technical Assistance for small business – Preparation of Feasibility Reports, Legal Formalities and Documentation	7
IV	**Business Plan:** Meaning and importance of Business Plan – Structure and components – Market Study.	7
V	**Entrepreneurial finance:** Sources of finance (Bank, Angel investors, Venture Capital, Crowdfunding, Mudra Loans) - Institutional support to entrepreneurs (DIC, KVIC, EDII and MSME).	6
	Total Hours	**30**
Text Books		
1	C.B. Gupta and N.P. Srinivasan (2020), Entrepreneurship Development, Sultan Chand and Sons.	
2	Dr. Vasant Desai and Dr. Kulveer Kaur (2021), Entrepreneurship Development and Management, Himalaya Publications.	
Reference Books		
1	Dr. Jayashree Suresh (2021), Entrepreneurial Publications, Margham Publications	
2	S S Khanka (2020), Entrepreneurial Development, Sultan Chand and Sons, New Delhi.	
Web Resources (Swayam/NPTEL)		
1	https://onlinecourses.nptel.ac.in/noc25_mg95/preview	

Components for Internal Assessment and Distribution of Marks for CIA and ESE (Theory)

Max Marks	Marks for		Components for CIA						
100	CIA	ESE	CIA		Model		Attendance	Active Engagement	Total
	25	75	Actual	Weightage	Actual	Weightage	5	5	25
			50	**5**	75	**10**			

Question Paper Pattern

Component	Duration in Hours	Section A			Section B			Section C			Total
		Type of Question	No. of Questions	Marks	Type of Question	No. of Questions	Marks	Type of Question	No. of Questions	Marks	
CIA	2	MCQ	8	8x1=8	Either or	3	3x6=18	Either or	3	3x8=24	50
Model Exam / **ESE**	3	MCQ	10	10x1=10	Either or	5	5x5=25	Either or	5	5x8=40	75

Components for Internal Assessment and Distribution of Marks for CIA (Lab)

Max Marks	Marks for		Components for CIA						
	CIA	ESE	Test		Model		Experiments / Programs	Observation	Total
100	40	60	Actual	Weightage	Actual	Weightage	Marks	5	40
			50	**10**	60	**15**	**10**		

Examination Pattern

Component	Duration in Hours	Marks			Total Marks
		Practical Exam	Record	Weightage	
Test	2	50	-	**10**	50
Model	3	60	-	**15**	60
Experiments	-	-	-	**10**	10
Observation	-	-	-	**05**	05
Total Marks - CIA				**40**	**40**
ESE	3	50	10	-	**60**

Components for Internal Assessment and Distribution of Marks for CIA (Foundation Course -Theory)

Max Marks	Marks for		Components for CIA				
50	CIA	ESE	CIA		Model		Total
	50	-	Actual	Weightage	Actual	Weightage	
			50	**25**	50	**25**	**50**

Question Paper Pattern

Duration in Hours	Mode of Exam	Type of Questions	No. of Questions	Marks
2	Offline	Open Choice	5 (Out of 8)	5 x 10=50

Components for and Distribution of Marks for ESE (Theory) Ability Enhancement Compulsory Courses (AECC) & Question Paper Pattern

Duration in Hours	Mode of Exam	Type of Questions	No. of Questions	Marks
2	Online	MCQ	50	50x1=50

Semester 3

Semester – 3									
Course Code	**Part**	**Course Category**	**Course Name**	**Hours / Week**	**Examination**				**Credits**
					Duration in Hours	**Max Marks**			
						CIA	**ESE**	**Total**	
25TAM31L	I	Language – I	Tamil – III	4	3	25	75	100	3
25HIN31L	I		Hindi – III						
25MAL31L	I		Malayalam – III						
25FRE31L	I		French – III						
25ENG32L	II	Language – II	English – III	4	3	25	75	100	3
25BCY33C	III	Core – V	Data Structures	6	3	25	75	100	4
25BCY34P	III	Core Lab – III	Data Structures Lab	4	3	40	60	100	2
25BCY35C	III	Core – VI	Cyber Law	6	3	25	75	100	4
25BCY36A	III	Allied – III	Number Theory	4	3	25	75	100	3
25BCY37P	III	SEC – I	Ethical Hacking Lab	2	3	40	60	100	2
25BAT3FC/	IV	FC – III	Basic Tamil /	-	2	50	-	50	2
25ADT3FC/			Advanced Tamil/						
25IKS3FC			Indian Knowledge Systems (IKS)*						
25MOO3AE	IV	AECC – III	Online Course - MOOC	-	-	50	-	50	2
			Total	**30**				**800**	**25**

Part –I : Language – I - Tamil – III

(All the Undergraduate Programmes)

பயன்பாட்டுத் தமிழ்

Course Code	Course Name	Category	Hours / Week	Credits
25TAM31L	Tamil - III	Language - I	4	3

Course Objectives

The course intends to cover

- தமிழரின் பிற துறை சார்ந்த சிந்தனைகளைக் கற்பித்தல்.
- இன்றைய அறிவியல் வளர்ச்சி மற்றும் கணினியின் பயன்பாட்டுத் தேவையை உணர்த்துதல்
- இயற்கை பாதுகாப்பு குறித்த விழிப்புணர்வை வளர்த்தல்

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	வணிகத் தமிழ் - கணினித் தமிழின் நுட்பங்கள் மற்றும் பயன்பாடுகளை அறிந்து பின்பற்றுவர்	K1, K2
CLO2	ஊடகம் மற்றும் உளவியல் தன்மை குறித்த சிந்தனைகளை வளர்த்துக் கொள்வர்	K2
CLO3	சுற்றுலா - சுற்றுச்சூழலியல் தேவை மற்றும் மீட்டுருவாக்கம் குறித்து உணர்த்து செயல்படுதல்	K3
CLO4	மேலாண்மை பற்றி அறிதல் மற்றும் சுயக்கற்றல் திறனை வளர்த்துக் கொள்ளுதல்	K1, K3
CLO5	பன்முக ஆளுமைகள் குறித்து அறிந்து தனித்திறன்களை உருவாக்கிக் கொள்வர்.	K2, K3
K1 - Remember; **K2** - Understand; **K3** - Apply		

Language – I: Part – I : Tamil – III

பயன்பாட்டுத் தமிழ்

Unit	Content	No. of Hours
I	**வணிகம் மற்றும் கணினித் தமிழ்** தமிழரின் வணிகம் - வணிகக் கடிதங்கள் – உலகமயமாக்கல் - செயற்கை நுண்ணறிவு கற்றல் - இணைய நூலகம் - இணையத் தமிழ் பயன்பாடு	12
II	**ஊடகம் மற்றும் உளவியல் தமிழ்** ஊடகத்தின் இன்றியமையாமை - நிகழ்வுகளைச் செய்திகளாக வடிவமைத்தல் - ஊடகத் துறையில் மொழியின் பங்கு - உளவியல் வரையறை - உளவியல் பிரிவுகள் - வகுப்பறை உளவியல் (ஆசிரியர், மாணவர்)	12
III	**சுற்றுச்சூழலியல் மற்றும் சுற்றுலாவியல்** தமிழரின் சூழலியல் அறிவு - சுற்றுச்சூழல் மாசுபாடு - சுற்றுச்சூழல் பாதுகாப்பு - சுற்றுலா வகைகள் - உலகப் புகழ்பெற்ற சுற்றுலாத் தலங்கள் - சுற்றுலா வளர்ச்சி மற்றும் பயன்கள்	12
IV	**மேலாண்மைத் தமிழ் மற்றும் மொழிப்பயிற்சி** மேலாண்மையும் அணுகுமுறைகளும் - மேலாண்மை செயல்பாடுகள் மற்றும் வகைகள் - வகுப்பறை மேலாண்மை – நேர்காணல் - நூல் திறனாய்வு மற்றும் மதிப்பீடு - படிவங்கள் பூர்த்தி செய்தல் மற்றும் விண்ணப்பங்கள்	12
V	**பன்முக ஆளுமைகள்** ஜி.டி.நாயுடு(அறிவியல்) – பத்மஸ்ரீ டாக்டர் பக்தவத்சலம்(மருத்துவம்) - நாமகாலிங்கம்(தொழில்) - மயில்சாமி அண்ணாதுரை(விஞ்ஞானம்) - என் ஜி ராமசாமி(சமூகம்) - நம்மாழ்வார்(விவசாயம்)	12
	Total Hours	**60**

Reference Books	
1	சுந்தரம்.இல, (2022) கணினித் தமிழ், விகடன் பிரசுரம்
2	மணியரசன்.துரை, (2019), இணையமும் இனியத் தமிழும், இசை பதிப்பகம்
3	பொன்னவைக்கோ.மு, (2015) இணையத் தமிழ் வரலாறு, பாரதிதாசன் பல்கலைக் கழகம்.
4	தங்கமணி இரா.ம, (2018) சுற்றுலாவியல், கொங்கு பதிப்பகம்
5	இலக்கியா க.வி, நந்தினி சா.சு,(2022), விடியல் பதிப்பகம்
6	சின்னத்தம்பி முருகேசன்.பொன்(2016) சுற்றுச் சூழலியல்(உலகம் தழுவிய வரலாறு), எதிர் வெளியீடு
7	இறையன்பு.வெ (2018) இலக்கியத்தில் மேலாண்மை, நியூ செஞ்சுரி புக் ஹவுஸ்
8	ஸ்ரீனிவாசன்.வி, (2009), திருக்குறளில் மேலாண்மை, விகடன் பிரசுரம்
9	பட்டனத்தி மைந்தன், (2018), ஜி.டி நாயுடு, ராமையா பதிப்பகம்
10	டாக்டர் பக்தவத்சலம்.ஜி (2009) இதயம் ஒரு கோவில், விஜயா பதிப்பகம்

Part – I: Language – I- Hindi – III

Course Code	Course Name	Category	Hours / Week	Credits
25HIN31L	Hindi - III	Language - I	4	3

Course Objectives

The course intends to

- Have knowledge of the contents of primitive poetry.
- Learn about contemporary poetry and its techniques.
- Interest in reading poetry and the ability to express social thoughts
- Understand the basics of Hindi literature properly.
- Provide knowledge of the elements of poetry and subtle translation will improve.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Get a basic knowledge of the history of Hindi literature.	K1
CLO2	Enhances the art and taste of Hindi literary works	K2
CLO3	Literary genres can be learned	K3
CLO4	Create an interest to read and enjoy Hindi poetry	K4
CLO5	Get the basic Knowledge of poetry techniques like Anlankar.	K4
K1 - Remember; **K2** - Understand; **K3** – Apply;**K4** - Analyze		

Part – I: Language – I - Hindi – III

Unit	Content	No. of Hours
I	**Poetry:Kavya Tharang – by Dr. Niranjan** **Pracheen Kavitha** 1. Mahatma kabeer – sakhi & padh (2) 2. Goswamy tulsidas – pad(4) 3. Mahatma soordas- pad(3) 4. Kavivar rahim – dohe(6)	12
II	**Modern Poetry : Kavya Tharang- by Dr. Niranjan** 1. Nirjar – Mythili sharan gupth 2. Parichay – Ramdhari singh Dinkar 3. Prethibimb – Sumithra nandan Panth 4. Kavi kaha ththa – Sooryakanth Tripati Nirala 5. Kah de mam Kya ab dekoon – Mahadevi varma 6. Kanu ke prathi – Darmveer Bharathi 7. Loha ka swad – Dhumil 8. Bhanth Kidikkiyon ki Takrahat – Gorakh pande	12
III	**History of Hindi Literature :(Tippaniyan)** 1. Bhakthi kal ka samanya parichaya (Kabeer, Jaysi, Soor, Thulsi, Meera, Raskhan, Rahim)	12
IV	**Ras Chad & Alankar:** 1. Srungar & veer Ras 2. Anupras & Upama 3. Dhoha & Rola	12
V	**Translation : English-Hindi only** 1. Anuvadh Abhyas – III (16-30 Lessons Only)	12
	Total Hours	**60**
Text Books		
1.	Kavya Tharang – by Dr. NIRANJAN, Jawahar Pusthakalay, Sadar Bazaar,Mathura U.P.281001.	
2.	Anuvadh abyas-III,Dakshin Bharath Hindi Prachar Sabha Chennai – 17.	
Reference Books		
1.	Hindi sahithya ka saral ithihaas,by Rajnath sharma, vinod pustak mandir, agra-282	
2.	Kavya Pradeep Rambadri Shukla, Hindi Bhavan, 36, Tagore Town, Allahabad – 211 002.	

Part – I: Language – I- Malayalam – III

Course Code	Course Name	Category	Hours / Week	Credits
25MAL31L	Malayalam - III	Language - I	4	3

Course Objectives

The course intends to cover

- Knowledge of the contents of primitive poetry.
- Learn about contemporary poetry and its techniques.
- Reading poetry and the ability to express social thoughts will improve.
- Basics of Malayalam Poetry and to understand Malayalam literature properly.
- Provide knowledge of the elements of poetry.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Get a basic knowledge of the history of Malayalam literature.	K1
CLO2	Enhances the art and taste of Malayalam literary works	K1
CLO3	Literary genres can be learned	K2
CLO4	Create more to read and enjoy Malayalam poetry	K3
CLO5	Get the basic Knowledge of poetry techniques	K4
K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** - Analyze		

Part – I: Language – I - Malayalam – III

Unit	Content	No. of Hours
I	Poetry – Sishyanum makanum - Vallaththol Narayana Menon	12
II	Poetry – Sishyanum makanum - Vallaththol Narayana Menon	12
III	Poetry - Rafeeque Ahammed (Selected poetries Thoramazha, Madhuranarangakal, Athrayum,Umma,Pakaram)	12
IV	Poetry-RafeequeAhammed(Selectedpoetries-Ammathottil,Vidhyalayam,	12
V	Thottakutty,Sivakami,Ithanu prarthana)	12
	Total Hours	**60**

Text Books

1.	Sishyanum makanum - Vallaththol Narayana Menon,Poorna Publishers.
2.	Rafeeque Ahammed – Selected poetries ,Mathrubhumi Books, Kozhikkode
3.	Aayisha – Vayalar Ramavarma - Kerala Book Store Publishers.

Reference Books

1.	Kavitha SahithyaCharitram-Dr.M.Leelavathi (Kerala SahithyaAcademy,Trichur)
2.	Kavitha Dwani-Dr.M.Leelavathi (D.C.Books, Kottayam)
3.	Aadhunika Sahithyacharithram Prasthanangalilude-Dr.K.M.George (D.C.Books, Kottayam)
4.	Padya SahithyaCharithram – T.M.Chummar (Kerala SahithyaAcademy,Trichur)

Part– I: Language – I- French – III

Course Code	Course Name	Category	Hours / Week	Credits
25FRE31L	French - III	Language - I	4	3

Course Objectives

The course intends to

- Understand and use familiar everyday expressions and basic phrases aimed at the satisfaction of concrete needs.
- Recognize key aspects of Francophone cultures such as greetings, etiquette, daily life, and basic geography of French-speaking countries.
- Write short, simple texts such as postcards, emails, or short descriptions about themselves and their immediate environment.
- Construct simple sentences using correct word order and basic vocabulary.
- Develop sensitivity to cross-cultural differences in communication and social practices.
- Read and understand short, simple texts such as personal messages, advertisements, menus, and schedules.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Improve all the four French language skills (speaking, listening, reading, and writing) (Effective communicators)	K1
CLO2	Comprehend French and other Francophone nations' cultures and civilizations.	K2
CLO3	Comprehend the fundamentals of language structure, vocabulary, grammar, and phonetics (language skill).	K3
CLO4	The French DELF-A1 Certification is appreciated.	K4
K1 - Remember; **K2** - Understand; **K3** – Apply;**K4**- Analyse		

Part – I: Language – I - French – III

Unit	Content	No. of Hours
I	Vendre Et Acheter pg (82-92). Grammaire: pg(156-160)	12
II	Communication(pg 93-97). Grammaire: pg(161-162)	12
III	Tout Le Monde s'amuse(pg 98-100). Grammaire: pg(163)	12
IV	Mots Et Expressions(pg 101-107). Grammaire: pg(164-167)	12
V	Communication(pg 108-120). Grammaire: pg(168-171)	12
Semester III Portions from Textbook « Nouvelle Génération A1» : UNITÉ 5, UNITÉ 6(Pg 82-120) Cahier d'exercices (Pg156-171)		
	Total Hours	**60**

Text Book

1.	Luca Giachino,Carla Baracco, Romain Chrétien(DELF), 2022, Nouvelle Génération A1, Didier FLE

Reference Book

1.	Nathalie Hirschsprung, Tony Tricot, 2017, Cosmopolite, Hachette

Language-II: Part – II: English –III

(All the Undergraduate Programmes)

Course Code	Course Name	Category	Hours / Week	Credits
25ENG32L	English III	Language II	4	3

Course Objectives

The course intends to cover

- The values of patriotism, empowerment and social responsibility through Biographies and Speeches.
- The use of grammar for communication.
- The essential interpersonal skills for effective group interaction.
- The analytical reading and ethical digital writing skills.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Identify key themes in biographies and speeches, and understand the basic structure of the content.	K1
CLO2	Understand the ideas and rhetorical strategies in texts and relate them to social awareness.	K2
CLO3	Apply grammar rules to form clear and accurate sentences in speech and writing.	K3
CLO4	Demonstrate effective listening and speaking skills by participating confidently in group discussions with appropriate body language and voice modulations.	K3
CLO5	Develop reading and writing skills to communicate effectively across different digital platforms with digital integrity.	K3
K1 - Remember; **K2-** Understand; **K3 -** Apply		

Language-II: Part – II: English –III

Unit	Content	No. of Hours
I	**Biographies : Patriotism** 1. Nehru – AF Toynbee 2. Martin Luther King – R N Roy 3. C.V. Raman – H. Kusumakar	12
II	**Renowned Speeches : Empowerment** 1. UN Youth Assembly Speech - Malala Yousafzai 2. Give Us a Role Model - A.P.J. Kalam 3. Inaugural Address Nelson Mandela	12
III	**Grammar** 1. Sentence Structure 2. Types of Sentences (Declarative, Interrogative, Imperative, Exclamatory), Transformation of Sentences 3. Active Voice and Passive Voice 4. Direct and Indirect Speech	12
IV	**Listening and Speaking Skills:** 1. **Group Discussion**: Structure of Group Discussion , Types of Group Discussion, Phrases for participating in a Group Discussion ,Do's and Don'ts in a Group Discussion. 2. **Group Dynamics (Nonverbal and Behavioural Aspects)**: Body Language, Personal Appearance, Posture, Gestures, Facial Expression, Eye Contact, Space Distancing 3. **Paralinguistic Cues:** Tone, Pitch, Volume, Speed (rate of speech), Pauses, Stress and Intonation.	12
V	**Reading and Writing Skills : Digital Communication** 1. **Reading and Understanding Digital Texts**: Skills for Analysing Digital Texts (connotative and denotative skills). 2. **Introduction to Digital Writing**: Types of Digital Writing, Website content, Blog Writing, Social Media Writing, SEO Writing, Review and Opinion Writing 3. Editing Digital Content, Digital Integrity and Ethics in Writing.	12
	Total Hours	**60**

Reference Books

1.	Rengasamy, P. Ed.(2012). Paths of Glory An Anthology of Biographies. Macmillan Publishers India Ltd.
2.	Yousafzai, M. (2013, July 12). Speech at the United Nations Youth Assembly. United Nations. https://www.un.org/en/events/malalayousafzaispeech
3.	A.P.J. Abdul Kalam.(2012). Ignited Minds - Unleashing the Power within India. Penguin Books.
4.	Mandela, N. (1994). Inaugural Address. In Long Walk to Freedom. Little, Brown and Company.
5.	Raymond Murphy. (2016). English Grammar in Use : A Self-study Reference and Practice Book for Intermediate Learners of English. Cambridge University Press.
6.	Kumar, S., & Lata, P. (2018). Communication Skills: A Workbook. Oxford University Press India.
7.	Mitra, B. K. (2012). Personality Development and Soft Skills (3rd ed.). Oxford University Press India.
8.	Butterfield, J. (2023). Written Communication: Soft Skills for a Digital Workplace (3rd ed.). Cengage India.

Web Resources (Swayam / NPTEL)

1.	https://onlinecourses.swayam2.ac.in/e-learning/preview/cec26_hs08
2.	https://onlinecourses.nptel.ac.in/noc26_hs111/preview

Course Code	Course Name	Category	Hours / Week	Credits
25BCY33C	Data Structures	Core - V	6	4

Course Objectives

The course intends to cover

- Various data structures algorithms.
- Data representation techniques such as Stack, Queue, List, Trees, Graphs.
- Hash Tables , Hashing Functions
- Sorting and searching methods.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Recite the basics of algorithm and elementary data structures.	K1
CLO2	Understand the various types of linked lists and dynamic storage management.	K2
CLO3	Infer the concepts of trees , binary tree traversal and graph	K3
CLO4	Understand Static and Dynamic Symbol Tables , Hashing and apply different Hashing Functions	K3
CLO5	Apply sorting and searching techniques to organize and process data efficiently for various computational problems	K3
K1 - Remember; **K2** - Understand; **K3** – Apply		

CLO – PLO Mapping

CLOs/PLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	1	3	1	-	-
CLO2	1	3	2	1	2
CLO3	2	2	2	2	2
CLO4	1	3	2	1	2
CLO5	2	3	3	2	2
3 - Substantial (high)		**2** - Moderate (medium)		**1** - Slight (low)	

Core V : Data Structures

Unit	Content	No. of Hours
I	**Introduction:** Introduction of Algorithms – Analyzing Algorithms. Abstract Data Type. **Arrays:** The Sparse Matrices-Representation of Arrays. **Stacks and Queues:** The Stack Abstract Data Type - The Queue Abstract Data Type - Evaluation of Expressions –Infix to Postfix Conversion, Multiple Stacks and Queues.	18
II	**Linked List:** Singly Linked List – Linked Stacks and Queues –Representing Polynomials as Singly Linked List– Polynomial Addition - Doubly Linked List and Dynamic Storage Management, More on Linked Lists – Garbage Collection and Compaction.	18
III	**Trees:** Basic Terminology – Binary Tree Representations - Binary Trees – traversal. **Binary Search Trees :** Introduction - Searching a Binary Search Tree - Inserting into a Binary Search Tree - Deletion from a Binary Search Tree - Height of a Binary Search Tree. **Graphs:** Terminology and Representations- Traversals - State Space Search in AI-Shortest Paths, Transitive Closure.	18
IV	**Symbol Table**s: Static Tree Tables-Dynamic Tree Tables. **Hash Tables:** Hashing Functions -Overflow Handling, Dynamic Hashing using Directories.	18
V	**Searching :** Sequential Search - Binary Search- Definitions. Insertion Sort- Radix sort, Quick Sort- 2Way Merge Sort , Heap Sort. **Case Study:** Analysis various Sorting techniques.	18
	Total Hours	90
Text Books		
1.	Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed (1993),Fundamentals of Data Structures in C	
2.	Samanta, D. (2017). Classic data structures (2nd ed.). PHI Learning.	
Reference Books		
1.	Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education Asia.	
2.	Ellis Horowitz, Sartaj Sahani and Dinesh Mehta (2008), Fundamentals of Data Structures in C++, 2nd Edition, University Press.	
Web Resources (Swayam / NPTEL)		
1.	https://onlinecourses.swayam2.ac.in/nou24_cs06/preview	
2.	https://onlinecourses.swayam2.ac.in/cec19_cs04/preview	
3.	https://onlinecourses.swayam2.ac.in/e-learning/preview/aic20_sp06	
4.	https://www.geeksforgeeks.org/artificial-intelligence/state-space-search-in-ai/	

Core Lab - III : Data Structures Lab

Course Code	Course Name	Category	Hours / Week	Credits
25BCY34P	Data Structures Lab	Core Lab - III	4	2

S. No.	List of Programs	
1.	Implementation of Array Operations.	
2.	Implementation of Stack using arrays.	
3.	Implementation of Queue using arrays.	
4.	Implementation of Singly Linked List	
5.	Conversion of Infix to Postfix Expression.	
6.	Evaluation of Postfix Expression.	
7.	Polynomial Addition.	
8.	Implementation of Binary Tree and Binary tree traversal techniques.	
9.	Searching Techniques: Linear search and Binary search	
10.	Sorting Techniques: Insertion Sort, Quick Sort, Radix Sort, Heap Sort.	
	Total Hours	**60**

Text Books

1.	Ellis Horowitz, Sartaj Sahni, Susan Anderson Freed(2014), 2nd Edition, Fundamentals of Data Structures in C, University Press
2.	Thareja,R. (2023). Data Structures Using C (3rd ed.). Oxford University Press.

Reference Books

1.	Ellis Horowitz, Sartaj Sahani and Dinesh Mehta (2008), Fundamentals of Data Structures in C++, 2nd Edition, University Press.
2.	Kamthane, A. N. (2024). Data Structures using C. Pearson India.

Web Resources (Swayam / NPTEL)

1.	https://onlinecourses.swayam2.ac.in/cec19_cs04/preview
2.	https://onlinecourses.nptel.ac.in/noc24_cs78/preview
3.	https://onlinecourses.swayam2.ac.in/aic20_sp06/preview

Course Code	Course Name	Category	Hours / Week	Credits
25BCY35C	Cyber Law	Core-VI	6	4

Course Objectives

The Course intends to cover

- Various facets of Cyber Crimes.
- Problems in online transactions.
- Find solutions for cybercrime.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Understand the fundamentals of cyberspace & cyber law frameworks.	K1,K2
CLO2	Explain legal aspects of E-Commerce including online contracts, digital payments	K2
CLO3	Identify various types of cybercrimes and outline investigation procedures	K2
CLO4	Apply intellectual property laws in cyberspace including copyright, trademark, and domain name regulations	K3
CLO5	Demonstrate understanding of electronic evidence, digital signatures , electronic agreements, electronic messages.	K3
K1 - Remember; **K2** - Understand; **K3** – Apply		

CLO – PLO Mapping

CLOs/PLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	3	1	1	1	1
CLO2	3	2	1	-	1
CLO3	3	2	-	1	1
CLO4	3	1	2	-	1
CLO5	3	2	1	1	1
3 - Substantial (high)		**2** - Moderate (medium)		**1** - Slight (low)	

Core – VI- Cyber Law

Unit	Content	No. of Hours
I	**Introduction to Cyber Space:** UNCITRAL Model Law – Information Technology Act, 2000 with Recent Amendments - Jurisdictional Issues - Digital Signatures – Regulation of Certifying Authorities - Cyber Regulation Appellate Tribunal – Human Rights Issues. **Concept of Cyberspace Governance:** Evolution of Cyber Law in India – E-Governance Legal Framework – Legal Recognition of Electronic Records – Cyber Ethics and Professional Responsibility-The ethical use of AI in cybersecurity.	18
II	**Formation of online contracts :** E Banking Transactions - Online Payment Options- Online Advertising - Electronic and Digital Signatures - Taxation Issues in Cyber Space- Indirect Tax- Tax Evasion- Double Tax-International Tax- Permanent Establishment – Protection of Trade Secrets and Deceptive Trade Practices. **Legal Issues in E-Commerce Platforms :** Consumer Protection in Online Transactions – Legal Aspects of Digital Payments (UPI, Wallets) – Cyber Risks in Online Banking – Legal Issues in Cloud Computing Services.	18
III	**Understanding cybercrimes:** Identifying Theft and Frauds - Types of crimes in the Internet- Against Person, Against Property, Against Government - Digital Evidence- Investigation and Adjudication of Cybercrimes in India- Cyber Arbitration- Cyber Conflict Investigation- Cyber Terrorism. **Cyber Stalking and Online Harassment:** Identity Theft and Phishing Attacks – Role of Cyber Cells and Law Enforcement – Admissibility of Electronic Evidence (Indian Evidence Act) – Basics of Cyber Forensics and Chain of Custody - Laws related to Social Media.	18
IV	**Copyright Issues in the Internet :** Protection of Computer Software – Caching International Regime-OSS, DMCA, Data Protection Directive - Trademark Issues in the Internet – Domain Name Registration - Domain Name Registration - Domain Name Dispute- ICANN UDRP Policy – Linking – Framing- Tagging - Database issues in the Internet. **Software Licensing (Proprietary vs Open Source):** Creative Commons Licensing – Patent Issues in Software – Digital Content Piracy – Legal Issues in OTT and Streaming Platforms.	18
V	**Status of Electronic Records as Evidence:** Proof and Management of Electronic Records- Relevancy - Admissibility and Probative Value of E-Evidence- Proving Digital Signatures- Proof of Electronic Agreements - Proving Electronic Messages. **Case Study : Protection of Cyber Consumers in India:** Are Cyber Consumers Covered Under the Consumer Protection Act? Goods and Services - Consumer Complaint- Defect in Goods and Deficiency in Services - Restrictive and Unfair Trade Practice - Instances of Unfair Trade Practices - Reliefs Under CPA - Beware Consumers.	18
	Total Hours	90

Text Books

1.	Karnika Seth (2021), Computers, Internet and New Technology Laws, 3rd Edition, LexisNexis Butterworths Wadhwa, Nagpur
2.	S.K. Verma & Raman Mittal (2004), Legal Dimensions of Cyberspace, 1st Edition, Indian Law Institute, New Delhi.
3.	Karnika Seth (2012), Law Relating to Computers, Internet and E-Commerce: A Guide to Cyber Laws and the Information Technology Act, Rules, Regulations and Notifications along with Latest Case Laws, 1st Edition, LexisNexis Butterworths Wadhwa, Nagpur.

Reference Books

1.	Jeff Kosseff (2025), Cybersecurity Law, 4th Edition, Wiley Publications
2.	Ian J. Lloyd (2020), Information Technology Law, 8th Edition, Oxford University Press.

Web Resources(NPTEL/Swayam/Others)

1.	https://onlinecourses.swayam2.ac.in/e-learning/preview/cec24_cs14
2.	https://kpmg.com/us/en/articles/2025/ethical-ai-cybersecurity-balancing-security-privacy-digital-age.html

Course Code	Course Name	Category	Hours / Week	Credits
25BCY36A	Number Theory	Allied-III	4	3

Course Objectives

The Course intends to cover

- The fundamental concepts and definitions of number theory.
- The properties and theorems of congruence theory.
- Fermat's theorem to solve the factorization method

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Remember the fundamental concepts of natural numbers.	K1
CLO2	Understand relationships among whole numbers through factors, remainders, common measures, and linear equations	K2
CLO3	Apply methods to identify prime numbers, express numbers as products of primes, and analyze patterns in their distribution	K3
CLO4	Apply the properties of congruence theory to represent integers.	K4
CLO5	Analyze Fermat's method in the study of pseudoprimes and factorization	K4
K1 - Remember**; K2 -** Understand**; K3 –** Apply**; K4 -** Analyze		

CLO - PLO Mapping

CLOs/PLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	2	2	2	2	3
CLO2	3	2	3	3	2
CLO3	3	2	3	3	2
CLO4	3	3	3	3	3
CLO5	3	3	3	3	2
3 - Substantial (High)		**2 - Moderate (Medium)**		**1 - Slight (Low)**	

Allied III- Number Theory

Unit	Content	No. of Hours
I	**Early Number Theory:** Peano's Axiom - Mathematical Induction - The Binomial Theorem - Early Number Theory .	12
II	**Divisibility Theory in Integers:** Divisibility Theory in Integers - The Division Algorithm - The G.C.D. - Euclidean Algorithm - The Diophontine Equation ax + by = c.	12
III	**Primes and their Distributions:** Primes and their Distributions - The fundamental Theorem of Arithmetic - The Seive of Eratosthenes - The Goldbach Conjecture	12
IV	**The Theory of Congruence:** The Theory of Congruence - Basic Properties of Congruence - Binary and Decimal representations of Integers - Linear Congruence- Chinese Reminder Theorem .	12
V	**The Theory of Congruence:** The Theory of Congruence - Basic Properties of Congruence - Binary and Decimal representations of Integers - Linear Congruence- Chinese Reminder Theorem .	12
	Total Hours	**60**
Theory - 60% & Problems-40 %		
Text Books		
1.	David M. Burton (2023), Elementary Number theory (6th Edition) - McGraw Hill Companies, New York. Unit I : Chapter 1 : Section 1.1-1.2 ,Chapter 2 : Section 2.1 Unit II : Chapter 2 : Section 2.2-2.5 Unit III: Chapter 3 : Section 3.1-3.3 Unit IV: Chapter 4 : Section 4.2-4.4 Unit V : Chapter 5 : Section 5.2-5.4	
Reference Books		
1.	Prof. S.Kumaravelu and Prof. Susheela Kumaravelu (2018), Elements of Number Theory (1st Edition) , Raja Sankar offset Printers ,Sivakasi.	
2.	Marty Erickson, Anthony Vazzana and David Garth (2019), Introduction to Number Theory (2nd Edition) - CRC Press, Taylor and Francis Group.	
Web Resources (Swayam / NPTEL)		
1	https://nptel.ac.in/courses/111101137	
2.	https://en.wikipedia.org/wiki/RSA_cryptosystem	

Course Code	Course Name	Category	Hours / Week	Credits
25BCY37P	Ethical Hacking Lab	SEC Lab I	2	2

S. No	List of Programs	
1.	Installation of VM work station and Kali Linux/Parrot Operating System	
2.	Scan and identify the network range, different types of ports available on different networks, and Operating systems used by the target system/network.	
3.	Test the different web applications on the internet and write about security issues found for each website. Demonstration of man –in –the –middle attack.	
4.	Perform the vulnerability scan and identify the different types of vulnerabilities present in the network	
5.	Perform vulnerability Scan, Exploitation, and Hardening on Windows/Linux OS using Shell Script/C/Python Program	
6.	Perform code injection attacks on any Database and take over it.	
7.	Gain access to the WiFi router without having a password and modify configurations	
8.	Configure Windows and Linux firewalls/Snort and manage user permissions by writing firewall rules	
9.	Install and Configure IDS system and identify the attacks performed on it. Mitigate the attacks by modifying the rules	
10.	Configure, Perform, and Detect attacks on Honeypot	
	Total Hours	**30**
Text Books		
1.	Georgia Weidman (2014), Penetration Testing: A Hands –On Introduction to Hacking, No Starch Press.	
Reference Books		
1.	Dafydd Stuttard and Marcus Pinto (2011), The Web Application Hacker's Handbook, 2nd Edition, Wiley	
2.	Rob Wilson (2023), Hands –On Ethical Hacking and Network Defense, 4th Edition, Cengage Learning	
Web Resources (Swayam / NPTEL)		
1.	https://onlinecourses.nptel.ac.in/noc25_cs142/preview?	

Part – IV – Foundation Course

(All the Undergraduate Programmes)

Course Code	Course Name	Course Category	Hours/Week	Credits
25IKS3FC	Indian Knowledge Systems (IKS)	FC-III	-	2

Unit	Content
1	**Indian Knowledge Systems (IKS) Basic Concepts** - Introduction - Journey of Indian Culture and Civilization - Hindu Philosophical System - Contribution of Indian Knowledge System in Science and Arts - Indian Knowledge System and Way of Life - The Implicit Concepts in Indian Knowledge System - Social Viewpoint in Indian Knowledge system - Idea of Vasudhaiva Kutumbakam.
2	**Indian Culture, Art & Architecture** - Introduction - Concept of Culture - Culture and Heritage - General Characteristics of Culture - Indian Culture - Indian Culture during the Modern and Contemporary Period -The Factors of Unity in Diversity - Aspects of Indian culture - Indian Architecture - Architecture of Tamil Nadu.
3	**Vedic Mathematics** - Introduction - History of Vedic Mathematics - Addition - Subtraction - Base Method - Sub Base Method - Multiplication by numbers consisting of all 9s - Division - Special Methods of Division - Straight Division.
4	**Science and Technology in Indian Knowledge System -** Introduction - The Indian S & T Heritage - Metals and Metalworking Technology - Lost wax casting of Idols and Artefacts - Literary sources for Science and Technology - Technology in Ancient India - Significant Science and Technology Discovery in Ancient India - Council of Scientific and Industrial Research - Animal Science in Ancient India - Biodiversity and folk traditions.
5	**History of Trade and Commerce in Ancient India** - Introduction - Indigenous Banking System - Rise of Intermediaries - Transport - Major Trade Centres - Major Exports and Imports - Position of Indian Subcontinent in World Economy.

Unit	Content
6	**Indigenous Agriculture in IKS** - Introduction - History of Indian Agriculture - Indigenous Knowledge - Organic Farming and Natural Fertilization - Mixed Cropping and Crop Rotation - Ecological and Socioeconomic Impacts of Indigenous Farming - Challenges and Future Directions.
7	**Traditional Water Management Systems of India** - Introduction - Traditional Water Management Systems - Northern Region - North Western Region - North Eastern Region - Central Indian Region - Southern Indian Region.
8	**Traditional Foods and Festival of India** - History - Introduction - Foods Consumed in Different Regions of India - Eating Styles of India - Traditional Equipment's used for Cooking - Changes in Consumption of Traditional Foods - Traditional Foods/Modern Functions - The Future of Traditional Foods - Traditional Festivals of India.
9	**Sports in India-From Ancient Period to Modern Period** - Introduction - Indus Valley Civilization - Early Hindu Period/ Epic Period - Traditional Indoor and Outdoor Games - British Period - Post Independence - Modern Period.
10	**Nobel Laureates of Indian Origin & Inspiring Scientists of India and their Contributions** - History of the Nobel Prize - Nobel Prize Insignia - Indian Nobel Prize winners and their Biography - Inspiring Scientists and their Contributions.

Reference Resources	
1.	https://www.education.gov.in/shikshakparv/docs/background_note_Stimulating_Indian_Knowledge_Systems_Arts_Culture.pdf
2.	Singh, R. K., King, C. A., & Barrett, D. A. (2010). Traditional ecological knowledge and agricultural sustainability in India. Indian Journal of Traditional Knowledge, 9(2), 231- 243

Components for Internal Assessment and Distribution of Marks for CIA and ESE (Theory)

Max Marks	Marks for		Components for CIA						
100	CIA	ESE	CIA		Model		Attendance	Active Engagement	Total
	25	75	Actual	Weightage	Actual	Weightage	5	5	25
			50	**5**	75	**10**			

Question Paper Pattern

Component	Duration in Hours	Section A			Section B			Section C			Total
		Type of Question	No. of Questions	Marks	Type of Question	No. of Questions	Marks	Type of Question	No. of Questions	Marks	
CIA	2	MCQ	8	8x1=8	Either or	3	3x6=18	Either or	3	3x8=24	50
Model Exam / **ESE**	3	MCQ	10	10x1=10	Either or	5	5x5=25	Either or	5	5x8=40	75

Components for Internal Assessment and Distribution of Marks for CIA (Lab)

Max Marks	Marks for		Components for CIA						
	CIA	ESE	Test		Model		Experiments / Programs	Observation	Total
100	40	60	Actual	Weightage	Actual	Weightage	Marks	5	40
			50	**10**	60	**15**	**10**		

Examination Pattern

Component	Duration in Hours	Marks			Weightage
		Practical Exam	Record	Total Marks	
Test	2	50	-	**50**	10
Model	3	60	-	**60**	15
Experiments Completed	-	-	-	**10**	10
Observation Note	-	-	-	**05**	05
				Total Marks - CIA	**40**
ESE	3	50	10	-	**60**

Components for Internal Assessment and Distribution of Marks for CIA (Foundation Course -Theory)*

Max Marks	Marks for		Components for CIA				
50	CIA	ESE	CIA		Model		Total
			Actual	Weightage	Actual	Weightage	
	50	-	50	25	50	25	50

*FC-III: Indian Knowledge Systems(IKS) – A self-study course with open book assessment.

Question Paper Pattern

Duration in Hours	Mode of Exam	Type of Questions	No. of Questions	Marks
2	Offline	Open Choice	5 (Out of 8)	5 x 10=50

Components for and Distribution of Marks for ESE (Theory) Ability Enhancement Compulsory Courses (AECC) & Question Paper Pattern

Duration in Hours	Mode of Exam	Type of Questions	No. of Questions	Marks
2	Online	MCQ	50	50x1=50

Components of Internship (Internal Assessment Only)

Components	Marks
Submission of Internship Report	20
Performance in viva-voce	30
Total Marks	**50**

***Certification of Completion is Mandatory for the award of Internal Marks and to avail the credits**



Semester 4

Semester – 4									
Course Code	**Part**	**Course Category**	**Course Name**	**Hours/ Week**	**Examination**				**Credits**
					Duration in Hours	**Max Marks**			
						CIA	**ESE**	**Total**	
25TAM41L	I	Language - I	Tamil – IV	4	3	25	75	100	3
25HIN41L	I		Hindi – IV						
25MAL41L	I		Malayalam – IV						
25FRE41L	I		French – IV						
25ENG42L	II	Language - II	English – IV	4	3	25	75	100	3
25BCY43C	III	Core – VII	RDBMS Programming	5	3	25	75	100	4
25BCY44P	III	Core Lab – IV	RDBMS Programming Lab	4	3	40	60	100	2
25BCY45C	III	Core – VIII	Blockchain Technology	5	3	25	75	100	4
25BCY46A	III	Allied – IV	Security in IoT	4	3	25	75	100	3
25BCY47P	III	SEC Lab – II	Security Analysis Lab	2	3	40	60	100	2
25QUA4AE	IV	AECC – IV	Quantitative Aptitude	2	2	-	50	50	2
25EXC4LA	V	Extra-Curricular & Co-Curricular Activities	Liberal Arts	-	-	50	-	50	2
			Total	**30**				**800**	**25**

Course Code	Course Name	Category	Hours / Week	Credits
25TAM41L	Tamil - IV	Language - I	4	3

Course Objectives

The Course intends to cover

- தமிழ்நாடு அரசுப் பணியாளர் தேர்வாணையம் நடத்தும் போட்டித் தேர்வுகளை எதிர்கொண்டு வேலைவாய்ப்பினைப் பெறும் வகையில் மாணவர்களைத் தயார்படுத்துதல்.
- நீதி இலக்கியங்கள் மற்றும் ஔவையார் பாடல்களின் வழியாக வாழ்வியலுக்குத் தேவையான அறநெறிகளையும், ஒழுக்க விழுமியங்களையும் மாணவர்களுக்கு அறிமுகப்படுத்துதல்.
- தமிழுக்குத் தொண்டாற்றிய சான்றோர்கள், கவிஞர்கள் மற்றும் விடுதலைப் போராட்ட வீரர்களின் இலக்கிய, சமூகப் பங்களிப்புகளை எடுத்துரைத்தல்.
- அடிப்படைத் தமிழ் இலக்கண விதிகளையும் சொல் அமைப்புகளையும் அறிமுகம் செய்து, பிழையற்ற மொழிப் பயன்பாட்டை உருவாக்குதல்.
- திணை மற்றும் பால் அடிப்படையிலான சொற்பயன்பாட்டையும், மரபுசார்ந்த வினைகளையும் கற்பித்து, சரியான தொடரமைப்பை உருவாக்க வழிகாட்டுதல்.
- வாசிப்புப் புரிதலை மேம்படுத்துதல், மரபுசார் தொடர்களின் பொருளை விளக்குதல் மற்றும் எளிய ஆங்கிலச் சொற்களைத் தமிழாக்கம் செய்யப் பயிற்றுவித்தல்.

Course Learning Outcomes

On the successful completion of the course

CLO	CLO Statements	Knowledge Level
CLO1	மாணவர்கள் பதினெண்கீழ்க்கணக்கு நூல்களின் வாழ்வியல் உண்மைகளைப் புரிந்து, சமுதாயத்தில் ஒழுக்கத்தோடும் நற்பண்புகளோடும் வாழும் நெறியைக் கற்றுக் கொண்டு பின்பற்றுவர்.	K1, K2
CLO2	மாணவர்கள் தமிழ் அறிஞர்களின் ஆளுமை மிக்க வாழ்வியல் நெறிகளை உணர்ந்து, மொழிப்பற்று, தேசப்பற்று மற்றும் படைப்பாற்றல் மிக்கவர்களாக செயல்படுவர்.	K2
CLO3	மாணவர்கள் எழுத்து மற்றும் சொல் வேறுபாடுகளைப் புரிந்து, பிழையின்றி எழுதவும் பேசவும் கற்றுக்கொள்வர்	K3
CLO4	மாணவர்கள் வாக்கியங்களில் திணை வழு, பால் வழு ஆகியவற்றைத் தவிர்த்து, மரபுச் சொற்களைச் சரியான சூழலில் கையாளும் ஆளுமை மிக்கவர்களாகத் திகழ்வர்.	K3
CLO5	மாணவர்கள் பத்திகளைப் படித்துப் புரிந்து விடையளிப்பர். பழமொழிகளின் பொருளை உணர்ந்து, அன்றாடப் பிறமொழிச் சொற்களுக்கு இணையான தமிழ்ச் சொற்களைக் கையாள கற்றுக்கொள்வர்.	K3
K1 - Remember; **K2** - Understand; **K3** – Apply		

Part - I: Language - I - தமிழ் - IV

Unit	Content	No. of Hours
I	**இலக்கிய வரலாறு** 1. நாலடியார் 2. பழமொழி நானூறு 3. திரிகடுகம் 4. இன்னா நாற்பது 5. சிறுபஞ்சமூலம் 6. ஔவையார் பாடல்கள்	12
II	**தமிழ் அறிஞர்களும், தமிழ்த்தொண்டும்** 1. உ.வே.சாமிநாத ஐயர் 2. வீரமாமுனிவர் 3. டி.கே.சிதம்பரனாதர் 4. கண்ணதாசன் 5. வேலுநாச்சியார் 6. நாமக்கல் கவிஞர்	12
III	**இலக்கணம்** 1. குறில், நெடில் வேறுபாடு 2. சுட்டெழுத்துக்கள் 3. வினா எழுத்துக்கள் 4. இனவெழுத்துக்கள் 5. ஒருமைப் பன்மை அறிதல் 6. ஓரெழுத்து ஒருமொழி	12
IV	**திணை மரபு மற்றும் பால் மரபு** 1. உயர்திணை 2. அஃறிணை 3. ஆண்பால் 4. பெண்பால் 5. பலர்பால் 6. வினைமரபு	12
V	**வாசித்தல், புரிந்து கொள்ளும் திறன் மற்றும் எளிய மொழி பெயர்ப்பு** **வாசித்தல்**: கொடுக்கப்பட்ட பத்தியை வாசித்து கேட்கப்பட்ட வினாக்களுக்கு சரியான விடையைத் தேர்ந்தெடுத்தல். **புரிந்துகொள்ளும் திறன்:** உவமைத் தொடரின் பொருளறிதல், மரபுத்தொடரின் பொருளறிதல், பழமொழிகள் பொருளறிதல்.	

Unit	Content	No. of Hours
V	**எளிய மொழி பெயர்ப்பு:** ஆங்கிலம் மற்றும் பிறமொழிச் சொற்களுக்கு இணையான தமிழ்ச் சொற்கள் அறிதல், பயன்பாட்டில் உள்ள ஆங்கிலச் சொற்களை மொழிபெயர்த்தல்.	12
	Total Hours	**60**

Reference Books

1	வரதராசன் மு. (2021, 34-வது பதிப்பு), தமிழ் இலக்கிய வரலாறு, சாகித்திய அகாதமி பதிப்பு.
2	டாக்டர் தமிழண்ணல், (2010, 26-ம் பதிப்பு), புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு, மீனாட்சி புத்தக நிலையம்.
3	பேரா. முனைவர் பாக்கியமேரி, (2022, 6-ம் பதிப்பு), வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு, நியூசெஞ்சுரி புக் ஹவுஸ்(பி). லிட்.
4	பாலசுப்பிரமணியம் சி. (2016, 27-ம் பதிப்பு), தமிழ் இலக்கிய வரலாறு, சாரதா பதிப்பகம்.
5	டாக்டர் பூவண்ணன், (2019, முதல் பதிப்பு), தமிழ் இலக்கிய வரலாறு, வர்த்தமான் பதிப்பகம்
6	பேராசிரியர்.விமலானந்தம் மது.ச. (2017, முதல் பதிப்பு), தமிழ் இலக்கிய வரலாறு, பாரி நிலையம்
7	விஜயராகவன், முனைவர் கண்ணன் கு. (2018, முதல் பதிப்பு), தமிழ் இலக்கியம் இலக்கணம் வரலாறு, பாவை பப்ளிக்கேஷன்.
8	முனைவர் இராசா கி. (2019, 4-ம் பதிப்பு), தமிழ் இலக்கிய வரலாறு, நியூ செஞ்சுரி புக் ஹவுஸ் (பி). லிட்.
9	முனைவர் அருணாச்சலம் மு. (2017 6-ம் பதிப்பு), தமிழ் இலக்கிய வரலாறு, அருண் பதிப்பகம்.
10	குமரன் கோ (2010, முதல் பதிப்பு), தமிழ் இலக்கணம் எளிய அறிமுகம், சந்தியா பதிப்பகம்.

Course Code	Course Name	Category	Hours / Week	Credits
25HIN41L	Hindi - IV	Language - I	4	3

Course Objectives

The course intends to cover

- Contemporary drama contents of Hindi literature.
- Novels and its techniques.
- Litigation messages in Hindi and news on speech techniques
- Article writing and Translation of text

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Understand the text styles and grammatical elements	K1, K2
CLO2	Develop an interest in the appreciation of short stories	K3
CLO3	Use Lokokti and Muhavare appropriately in Hindi communication.	K3
CLO4	Develop essays on general topics in Hindi.	K3
CLO5	Translate passages between Hindi and English.	K3
K1 - Remember; **K2 -** Understand; **K3 -** Develop, Use, Translate		

Part - I: Language - I Hindi - IV

Unit	Content	No. of Hours
I	Drama: Dhuvasaminy By Jayashankar Parsad	12
II	Novel - Nirmala – Premchand	12
III	Lokkothi & Muhavare - Naveen Hindi Vyakaran (Selected Lokkokthi -10 & Muhavare-10)	12
IV	General Essay :Aadarsh Nibandh	12
V	Translation : Hindi-English Only Anuvadh Abhyas – III (16-30 Lessons Only)	12
	Total Hours	**60**
Text Books		
1	Jayashankar Prasad (2015), Dhuvasaminy – Drama, Dakshin Bharath Hindi Prachar Sabha, Chennai.	
2	Premchand (2015), Nirmala – Novel, Rajkamal Prakashan,1B Nethaji Subash Marg, New Delhi.	
Reference Books		
1	Rajnath Sharma , Hindi Sahithya Ka Saral Ithihaas by, Vinod Pustak Mandir, Agra.	
2	Kavya Pradeep Rambadri Shukla, Hindi Bhavan, 36, Tagore Town, Allahabad.	

Course Code	Course Name	Category	Hours / Week	Credits
25MAL41L	Malayalam - IV	Language - I	4	3

Course Objectives

The course intends to cover

- Knowledge of contemporary drama contents of Malayalam literature
- Screen play and its techniques.
- Drama and express criticism about it and the ability to express social thoughts will improve
- Litigation messages in Malayalam and news on speech techniques
- Article writing and creative skills.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Understand the themes and characters of the screenplay.	K1, K2
CLO2	Relate the narrative elements to the development of the screenplay.	K2
CLO3	Create interest in art literature courses	K3
CLO4	Apply dramatic techniques to interpret the conflicts in the play.	K3
CLO5	Present the thematic significance of the play through its dramatic elements.	K3
K1 - Remember; **K2 -** Understand; **K3 -** Relate, Create, Apply, Present		

Part - I: Language - I Malayalam - IV

Unit	Content	No. of Hours
I	Screen Play – Perumthachan	12
II	Screenplay – Perumthachan	12
III	Drama – Saketham	12
IV	Drama – Saketham	12
V	Drama – Saaketham	12
	Total Hours	**60**

Text Books	
1	Perumthachan – M.T.Vasudevan Nair, DC Books
2	Saketham – C.N.Sreekandan Nair, DC Books.
Reference Books	
1	Malayala Nataka Sahithya Charithram, G Sankara Pillai (Kerala Sahithya Akademi, Trissur)
2	Malayala NatakaSahithya Charithram, Vayala Vasudevan Pillai (Kerala SahithyaAkademi Thrissur).
3	Natakam- Oru Patanam (C.J. Smaraka Prasanga Samithi, Koothattukulam)
4	Natakaroopacharcha, Kattumadam Narayanan (NBS, Kottayam)
5	Chalachithra sameeksha – Vijayakrishanan.
6	Cinemayude Paadangal Visakalanavum Veekshanavum , Jose K.Manual.

Course Code	Course Name	Category	Hours / Week	Credits
25FRE41L	French - IV	Language - I	4	3

Course Objective

To communicate during easy or habitual tasks requiring a basic and direct information exchange on familiar subjects to use simple words to describe his or her surroundings and communicate immediate needs

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Comprehend the grammatical structures in various genres	K1, K2
CLO2	Understand the text styles and poetical elements	K2
CLO3	Develop an interest in the appreciation of literature	K3
CLO4	Discuss and respond to content of a reading passage	K3
CLO5	Apply vocabulary and grammatical structures	K3
K1 - Remember; **K2 –** Comprehend, Understand; **K3 -** Develop, Discuss, Apply		

Part - I: Language - I : French - IV

Unit	Content	No. of Hours
I	Etape 5 (Lecons 1 - 3)	12
II	Etape 6 (Lecons 1 - 3)	12
III	Etape 7 - Leçons 1 – 2	12
IV	Etape 7 – Leçon 3 Etape 8 – Leçon 1	12
V	Etape 8 – Leçons 2 - 3	12
Etapes 5 to 8, Pages 63 to 114		
	Total Hours	**60**
Text Book		
1.	Himber, C., Brillant, C., & Erlich, S. (n.d.). Adomania 2: Méthode de français. Hachette FLE, Goyal Publishers and Distributors Pvt Ltd, New Delhi.	
Reference Book		
1.	Loiseau, Y., & Mérieux, R. (n.d.). Latitudes 1. French and European Publications, Goyal publishers and distributors Pvt Ltd, New Delhi	
Web Resources (NPTEL/Swayam)		
1.	https://swayam.gov.in/nd2_cec19_lg04/preview	

Course Code	Course Name	Category	Hours / Week	Credits
25ENG42L	English - IV	Language - II	4	3

Course Objectives

The course intends to cover

- The Shakespearean soliloquies through understanding the psychological phenomena and morality of the characters.
- The social issues, values and justice through themes, characters, conflicts in one-act plays.
- The essential grammar rules, sentence structures, punctuation, and its usage in English.
- Vocabulary skills, sentence ordering abilities, and core professional writing skills for career readiness.
- Reading comprehension and effective writing skills through understanding, organizing, summarizing, and expressing ideas clearly.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Understand the psychology of the characters by reflecting on emotions and well-being based on the soliloquies.	K1, K2
CLO2	Imbibe human values like social justice, gender equality and empathy in real - life.	K2
CLO3	Construct grammatically correct sentences using appropriate grammatical structures, capitalization and punctuation.	K3
CLO4	Compose effective career communication using appropriate vocabulary, language conventions and professional correspondence skills.	K3
CLO5	Prepare coherent written responses by organising, summarising and presenting information from diverse texts.	K3
K1 - Remember; **K2** - Understand, Imbibe ; **K3** - Construct, Compose, Prepare		

Language II : Part II: English IV

Unit	Content	No. of Hours
I	**Shakespearean Soliloquies - Human Conflicts and well-being** 1.1. All The World's A Stage by Jacques in As You Like It 1.2. To Be or Not To Be by Hamlet in Hamlet 1.3. The Raven Himself is Hoarse by Lady Macbeth in Macbeth	12
II	**One Act Play – Social Justice** 2.1. Trifles - Susan Glaspell 2.2. Mine Eyes Have Seen - Alice Dunbar-Nelson 2.3. They That Sit in Darkness – Mary Burrill	12
III	**Grammar** 3.1. Infinitives, Concord, Gerunds, Participles, Regular and Irregular Verbs, Question Tags 3.2. Phrases and Clauses, Synthesis of Sentences 3.3. Simple, Compound and Complex Sentences 3.4. Capitalization and Punctuations.	12
IV	**English Language and Career Communication Skills** 4.1. **Language and Vocabulary Skills:** British and American English, Figures of speech, Jumbled sentences, Rearranging the right order of sentences, Making queries, Inferences, Idioms & Phrases, Phrasal verbs. 4.2. **Professional Correspondence for Careers:** Job Application Letters, Covering Letters, CV/Resume Preparation.	12
V	**Reading and Writing Comprehension** 5.1. **Reading Comprehension:** Introduction to Reading Strategies - Comprehending various types of texts and question - Strong question, Weak question, Match the following, Multiple choice, Identifying information, Sentence Completion, Ascertainment of facts 5.2**. Writing Comprehension:** Understanding the Topic – Organising Ideas – Sentence and Paragraph Construction – Types of Paragraphs - Description, Sequence, Comparison and Contrast, Cause and Effect, Persuasion, Argumentation - Writing opinion pieces on travel, food, film and book reviews – Summarizing Information.	12
	Total Hours	**60**

Unit Mapping with SDGs

Units	Primary SDG
Unit – I: Shakespearian Soliloquies - Human Conflicts and well-being	SDG 3 , 4
Unit – II: One Act Play – Social Justice	SDG 5 , 16
Unit - V: Reading and Writing Comprehension	SDG 4

Reference Books	
1.	Burrill, M., (1918), They That Sit in Darkness, 1st ed, The Birth Control Review.
2.	Dunbar Nelson, A., (1918), Mine Eyes Have Seen, 1st ed, Mint Editions.
3.	Glaspell, S., (1916), Trifles, 1st ed., Gyan Publishing House.
4.	Kumar, S., & Pushp Lata., (2011), English Language and Communication Skills for Engineers. 1st ed., Oxford University Press.
5.	Kumar, S., & Pushp Lata., (2015), Communication Skills: A Workbook, 2nd ed. ,Oxford University Press.
6.	Shakespeare, W. (1998), The Complete Works of William Shakespeare. 1st ed. , Wordsworth Editions.
7.	Wren, P. C., & Martin, H. (2016). High School English Grammar and Composition, 36th ed., S. Chand Publishing.
Web Resources (Swayam / NPTEL)	
1.	https://onlinecourses.swayam2.ac.in/e-learning/preview/cec24_lg01

Course Code	Course Name	Category	Hours /Week	Credits
25BCY43C	RDBMS Programming	Core - VII	5	4

Course Objectives

This course intends to cover

- The concepts of databases, DBMS and their role in building reliable digital infrastructure.
- Types of databases and the use of SQL commands to create tables for developing smart solutions that support Sustainable Cities and Communities.
- DML commands and joins for effective data manipulation.
- PL/SQL programming concepts, control structures for the execution of cursors.
- Composite data types and NoSQL databases and their differences from SQL databases.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Understand the basic concepts of databases and DBMS for effective digital information management supporting industry and innovation.	K1, K2
CLO2	Design a well-structured database contributing to urban planning and sustainable smart cities & communities by applying DDL Commands.	K3
CLO3	Retrieve and manipulate data from databases using DML commands.	K3
CLO4	Develop database programs using PL/SQL concepts.	K3
CLO5	Construct PL/SQL programs using composite data types and named blocks along with the understanding of NoSQL databases**.**	K3
K1 - Remember**; K2** - Understand; **K3** - Design, Retrieve, Develop, Construct.		

CLO – PLO Mapping

CLOs/PLOs	PLO1	PLO2	PLO3	PLO4	PLO5	Primary SDG
CLO1	1	1	3	2	2	SDG 9
CLO2	1	1	3	2	2	SDG 11
CLO3	1	1	3	1	2	-
CLO4	1	1	3	1	2	-
CLO5	1	1	3	1	2	-
3 - Substantial (high)		**2 - Moderate (medium)**		**1 - Slight (low)**		

Core – VII: RDBMS Programming

Unit	Content	No. of Hours
I	**Database Concepts**: A Relational approach: Database - Relationships - DBMS - Relational Data Model - Integrity Rules - Theoretical Relational Languages - Database Design. **Data Modeling and Normalization:** Data Modeling - Dependency - Database Design - Normal forms - Dependency Diagrams - De-Normalization - Another Example of Normalization.	15
II	**Oracle9*i*: Overview:** Personal Databases - Client/Server Databases -Oracle 9i an Introduction - SQL *Plus Environment - SQL - Logging into SQL *Plus - SQL *Plus Commands - Errors & Help - Alternate Text Editors - SQL *Plus Worksheet - *i*SQL *Plus. **Oracle Tables:** DDL: Naming Rules and Conventions - Data Types - Constraints - Creating Oracle Table - Displaying Table Information - Altering an Existing Table - Dropping, Renaming, Truncating Table - Table Types - Spooling– Error Codes.	14
III	**Working with Table:** Data Management and Retrieval: DML - Adding a new Row/Record - Customized Prompts - Updating and Deleting an Existing Rows/Records - Retrieving Data from Table - Arithmetic Operations - Restricting Data with WHERE Clause - Sorting - Revisiting Substitution Variables - DEFINE command - CASE structure. **Functions and Grouping:** Built-in Functions -Grouping Data. **Multiple Tables:** Joins and Set operations - Join - Cross Join - Natural Join - Join Using Clause - Join on Clause - Outer Join. **Sub Queries and Correlated Queries**. AI-Assisted Generation of SQL Queries.	17
IV	**PL/SQL:** A Programming Language: History - Fundamentals - Block Structure - Comments - Data Types - Other Data Types - Declaration - Assignment Operation -Bind Variables - Substitution Variables - Printing - Arithmetic Operators. **Control Structures and Embedded SQL:** Control Structures - Nested Blocks - SQL in PL/SQL - Data Manipulation - Transaction Control statements. **PL/SQL Cursors and Exceptions:** Cursors - Implicit & Explicit Cursors and Attributes - Cursor FOR Loops - SELECT…FOR UPDATE - WHERE CURRENT OF Clause - Cursor with Parameters - Cursor Variables - Exceptions - Types of Exceptions.	15
V	**PL/SQL Composite Data Types:** Records - Tables - Arrays. **Named Blocks**: Procedures - Functions - Packages – Triggers - Data Dictionary Views. **NoSQL:** Overview of NoSQL - Difference between SQL and NoSQL - Database Ethics.	14
	Total Hours	**75**

Unit Mapping with SDGs

Units	Primary SDG
Unit I - Database Design	SDG 09
Unit II - DDL Commands	SDG 11

Text Books

1. Nilesh Shah, (2016), Database Systems using Oracle, PHI.
2. Oracle Corporation, (2025), Oracle Database SQL Language Reference. (e-book)
3. Bill Pribyl, Steven Feuerstein, (2014), Oracle PL/SQL Programming, O'Reilly Media, Inc., 6th Edition. (e-book)

Reference Books

1. Majumdar & Bhattacharya, (2015), Database Management Systems, TMH.
2. Gerald V Post, Database Management Systems,3rd edition, TMH.

Web Resources (Swayam / NPTEL / Others)

1. http://www.nptel.ac.in/courses/106105175
2. http://www.digimat.in/nptel/courses/video/106105175/L01.html
3. https://catchwisdom.com/course/ai-assisted-sql-query-writing
4. https://www.mdpi.com/2624-800X/4/3/24

Course Code	Course Name	Category	Hours /Week	Credits
25BCY44P	RDBMS Programming Lab	Core Lab - IV	4	2

S. No.	List of Programs
1	Implementation of DDL commands of SQL with suitable examples Create table, Alter table, Drop Table.
2	Implementation of DML commands of SQL with suitable examples Insert, Update, Delete.
3	Implementation of different types of function with suitable examples Number function, Aggregate Function, Character Function, Conversion Function, Date Function.
4	Implementation of different types of operators in SQL Arithmetic Operators, Logical Operators, Comparison Operator, Special Operator, Set Operation.
5	Implementation of different types of Joins Inner Join, Outer Join, Natural Join etc.
6	Creating Database/Table Space Managing Users: Create User, Delete User Managing roles:- Grant, Revoke.
7	Create a table for Employee details with Employee Number as primary key and following fields: Name, Designation, Gender, Age, Date of Joining and Salary. Insert at least ten rows and perform various queries using anyone Comparison, Logical, Set, Sorting and Grouping operators.
8	Write a PL/SQL to update the rate field by 20% more than the current rate in inventory table which has the following fields: Prono, ProName and Rate. After updating the table a new field (Alter) called for Number of item and place for values for the new field without using PL/SQL block.
9	Write a PL/SQL program to implement the concept of Trigger.
10	Write a PL/SQL program to implement the concept Procedures.
11	Write a program to connect to a SQL database and insert student details into a table.
12	Write a program to connect to a SQL database and search and display student details based on the student ID.
	Total Hours **60**

Text Books

1.	Nilesh Shah, (2005), Database Systems using Oracle, 2nd edition, PHI.
2.	Bill Pribyl, Steven Feuerstein, (2014), Oracle PL/SQL Programming, 6thedition, O'Reilly Media, Inc., (e-book)

Reference Books

1.	Majumdar & Bhattacharya, (2015), Database Management Systems, TMH.
2.	Gerald V Post, Database Management Systems,3rd edition, TMH.

Web Resources (Swayam / NPTEL/Others)

1.	http://www.nptel.ac.in/courses/106105175
2	http://www.digimat.in/nptel/courses/video/106105175/L01.html

Course Code	Course Name	Category	Hours /Week	Credits
25BCY45C	Blockchain Technology	Core - VIII	5	4

Course Objectives

The Course intends to cover

- Blockchain concepts and applications for innovative digital infrastructure.
- Design methodology and Ethereum tools for blockchain application development.
- Smart Contract Deployment and Interaction using Geth and Mist wallets.
- DApps implementation and blockchain applications.
- Blockchain network operations using mining and swarm.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Understand the applications of Blockchain technology to support secured digital services.	K1, K2
CLO2	Design blockchain solutions using Ethereum tools.	K3
CLO3	Implement smart contracts using Geth and Mist wallets for secured digital transactions.	K3
CLO4	Develop and deploy DApps that interacts with blockchain - based smart contracts.	K3
CLO5	Implement basic swarm setup for decentralized data storage.	K3
K1 - Remember; **K2 -** Understand; **K3 -** Design, Implement, Develop.		

CLO-PLO Mapping

CLOs/PLOs	PLO1	PLO2	PLO3	PLO4	PLO5	Primary SDG
CLO1	1	1	3	2	2	SDG 09
CLO2	1	1	3	2	2	
CLO3	1	2	3	3	2	
CLO4	1	3	3	3	2	
CLO5	1	3	3	2	2	
3 - Substantial (high)		**2 - Moderate (medium)**		**1 - Slight (low)**		

Core – VIII : Blockchain Technology

Unit	Content	No. of Hours
I	**Blockchain Concepts:** Evolution - Structure - Characteristics - Blockchain Application Example: Escrow - Blockchain Stack - From Web 2.0 to the Next Generation Decentralized Web - Domain Specific Blockchain Applications and its Benefits & Challenges.	15
II	**Blockchain Components and Application Templates:** Blockchain Application Components, Design Methodology, Application Templates - AI-Enabled Blockchain Applications. **Blockchain Applications:** Setting up Ethereum Development Tools - Ethereum Clients - Ethereum Languages - TestRPC - Mist Ethereum Wallet - MetaMask - Web3 JavaScript API - Truffle. **Ethereum Accounts**: Ethereum Accounts - Keypairs - Working with EOA Accounts - Working with Contract Accounts.	15
III	**Smart Contracts:** Structure of a Contract - Setting up and Interacting with a Contract using Geth Client and Mist Wallet - Smart Contract Examples - Smart Contract Patterns - AI-Enabled Smart Contracts.	15
IV	**Decentralized Applications and Case Studies :** Implementing DApps for secured services. **Case Studies:** Crowdfunding - Event Registration - Document Verification- Call Option - Interest Rate Swap - Solar Charging Stations. Industrial IoT - Machine Maintenance - AI-based Predictive Maintenance.	15
V	**Concept of Mining and Swarm: Mining**: Consensus on Blockchain Network - Mining - Block Validation - Setting up Mining Node - State Storage in Ethereum. **Swarm**: Swarm Architecture and Concepts - Incentive Mechanisms in Swarm - Swarm Setup - Working with Swarm - Ethical concerns in blockchain technology**.**	15
	Total Hours	**75**

Unit Mapping with SDGs

The entire course aligns with SDG 09 by fostering innovation and resilient technology solutions for secured digital transactions.

Text Books

1.	Arshdeep Bahga and Vijay Madisetti, (2017), Blockchain Applications - A Hands - On Approach, 1st Edition, VPT Publisher.
2.	Saurabh Kumar and Ashutosh Saxena,(2023), Blockchain Technology: Concepts and Applications, Wiley India Pvt. Ltd.

Reference Books

1.	Asharaf S, N. Sivadas, A. S, and J. Franklin, (2023), Blockchain Technology: Algorithms and Applications, Wiley India Pvt. Ltd.
2.	Imran Bashir, (2023), Mastering Blockchain: Inner workings of blockchain, from cryptography and decentralized identities, to DeFi, NFTs and Web3,4th Edition, Packt Publisher.

Web Resources (Swayam / NPTEL/Others)

1.	https://nptel.ac.in/courses/106105235
2.	https://onlinecourses.swayam2.ac.in/e-learning/preview/aic21_ge01
3.	https://chain.link/blog/blockchain-ai-use-cases
4.	https://komodoplatform.com/en/academy/ai-smart-contracts/
5.	https://www.ibm.com/think/insights/ai-in-predictive-maintenance
6.	https://link.springer.com/article/10.1007/s43545-026-01642-y

Course Code	Course Name	Category	Hours /Week	Credits
25BCY46A	Security in IoT	Allied - IV	4	3

Course Objectives

The course intends to cover

- Fundamentals, architecture and uses of IoT in smart environments.
- Design principles, communication technologies and connectivity protocols for IoT systems.
- Data management, analytics, sensing and wireless sensor networks for IoT applications.
- Threats, vulnerabilities and attacks affecting IoT systems.
- IoT privacy, security, profiles and protocols for data protection and ethical principles for IoT security.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	CLO Statements	Knowledge Level
CLO1	Understand architecture and applications of IoT in smart environments.	K1, K2
CLO2	Differentiate wired and wireless communication technologies used in IoT/M2M.	K2
CLO3	Apply IoT data analytics and sensing technologies to support smart cities industrial application and environmental monitoring.	K3
CLO4	Establish safe and secure digital systems by identifying IoT threats, attacks and security risks.	K3
CLO5	Apply data protection and ethical principles to support IoT security.	K3
K1 - Remember; **K2** - Understand, Differentiate; **K3** - Establish, Apply.		

CLO – PLO Mapping

CLOs/PLOs	PLO1	PLO2	PLO3	PLO4	PLO5	Primary SDG
CLO1	1	1	3	3	2	SDG 09
CLO2	1	2	3	2	2	-
CLO3	1	2	3	3	2	SDGs 09,11,13
CLO4	1	2	3	3	2	-
CLO5	1	1	3	3	2	-
3 - Substantial (high)		**2 - Moderate (medium)**		**1 - Slight (low)**		

Allied – IV : Security in IoT

Unit	Content	No. of Hours
I	**Introduction to Internet of Things (loT):** IoT Definition - Conceptual Framework - Architectural View - Technology behind IoT - Sources of loT - Machine to Machine (M2M) Communication - Examples of IoT usage.	12
II	**Design Principles of IoT:** Layers and Designs Standardization of IoT and M2M. **Communication Technologies:** Wireless Communication Technology - Wired Communication Technology. **Design Principles for Web Connectivity**: Web Communication and Message Communication Protocols for Connected Devices.	11
III	**Data Acquisition and Storage:** Introduction - Organising the Data-Transactions, Business Processes, Integration and Enterprise Systems - Analytics - AI-Based IoT Data Analytics - Knowledge Acquiring, Managing and Storing Processes of data. **Sensors, Participatory Sensing and Wireless Sensor Networks:** Sensor Technology - Digital Sensors - Participatory Sensing, Industrial IoT and Automotive IoT - Actuators and Sensors - Wireless Sensor Networks Technology.	13
IV	**Threats and Attacks:** Internet of Things as Interconnections of Threats - Phase attacks - Data leakage or breach - Data sovereignty - Data loss - Data authentication - Attack on availability - Modification of sensitive data - IoT Network Attacks and Security Threats - Attacks as per architecture - Attacks based on components.	12
V	**IoT Privacy, Vulnerabilities and Security:** Privacy and Vulnerabilities, Security Requirements and Threat Analysis - Use Cases and Misuse Cases - IoT Security Tomography and Layered Attacker Model-Identity Management and Establishment - Access Control and Secure Message Communication - Security Models, Profiles and Protocols for IoT - Ethical Considerations in IoT.	12
	Total Hours	**60**

Unit Mapping with SDGs

Units	Primary SDG
Unit I - IoT Architectural Framework.	SDG 09
Unit III - Actuators and Sensors, Wireless Sensor Networks Technology.	SDG 09,11,13

Text Books

1. Raj Kamal, Internet of Things: Architecture and Design Principles, (2018),2nd Edition, McGraw Hill Education.
2. Fei Hu, Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations, (2016), 1st Edition, CRC Press / Taylor & Francis.

Reference Books

1. Arshdeep Bagha and Vijay Madisetti, (2015), Internet of Things: A Hands–on Approach, Universities Press, ISBN: 9788173719547.
2. Qinghao Tang, Fan Du, (2021), Internet of Things Security: Principles and Practice,1st Edition Springer Singapore.

Web Resources (Swayam / NPTEL/Others)

1. https://nptel.ac.in/courses/106105166
2. https://nptel.ac.in/courses/106105195
3. https://www.iotusecase.com/en/building-blocks/ai-based-iot-analytics
4. https://wizzdev.com/blog/what-are-the-ethical-considerations-when-using-iot-devices/

Course Code	Course Name	Category	Hours /Week	Credits
25BCY47P	Security Analysis Lab	SEC Lab - II	2	2

S. No.	List of Programs
1	Identify IP configuration on both the Kali Linux and Windows Server VMs, then use ping and traceroute/tracert to observe how traffic hops across the network and relate the output back to the OSI and TCP/IP models.
2	Work through a simulated queue of 10–12 mixed-severity sample alerts, individually decide which to prioritize, investigate, or escalate, and compare reasoning as a group to build SOC analyst judgment.
3	On the Windows Server VM, trigger and interpret failed logon, successful logon, and service-restart events in Event Viewer; on the Kali VM, generate equivalent activity and locate the corresponding entries in syslog/journalctl.
4	Research a set of sample Indicators of Compromise (file hashes, IP addresses, domains) using free threat-intelligence sources, and document a verdict - malicious, suspicious, or benign - with supporting reasoning for each.
5	Install and enroll the Wazuh agent on the Windows Server VM to a centrally hosted Wazuh manager, confirm the endpoint appears as a connected agent on the shared dashboard, and verify a test event flows through end to end.
6	Simulate a port scan from the Kali VM against the Windows Server VM while capturing the traffic on the receiving end, then apply filters to isolate and identify the scan pattern in the capture.
7	Install and configure Sysmon on the Windows Server VM, trigger a simulated suspicious process execution from the Kali VM, and locate the resulting Sysmon events both locally and on the Wazuh dashboard.
8	Review Snort and Wazuh alerts generated from Kali-driven attack activity against the Windows Server VM, classify each as a true or false positive with a severity rating, and document at least three investigations in a runbook entry.
9	Using alert data generated from earlier tasks, build three visualizations - alert trend over time, top source IPs, and severity breakdown - and combine them into a single SOC shift-view dashboard.
10	Analyze sample phishing emails by examining headers (SPF/DKIM/DMARC) and extracting IOCs, check them against threat-intelligence sources, and document a phishing verdict. Then complete a capstone simulated SOC shift - monitor the live Wazuh dashboard as a scripted mix of alerts fires, and triage, investigate, and document each one.
	Total Hours **30**

Text Book

1.	Joseph Muniz, Gary McIntyre, and Nadhem AlFardan (2015), Security Operations Center: Building, Operating, and Maintaining your SOC, Cisco Press.

Reference Books

1.	Don Murdoch (2018), Blue Team Handbook: SOC, SIEM, and Threat Hunting Use Cases - A Condensed Field Guide for the Security Operations Team, CreateSpace Independent Publishing Platform.
2.	Chris Sanders and Jason Smith (2014), Applied Network Security Monitoring: Collection, Detection, and Analysis, Syngress.

Web Resources (Swayam / NPTEL)

1.	https://onlinecourses.nptel.ac.in/noc25_cs120/preview
2.	https://onlinecourses.swayam2.ac.in/nou26_ge21/preview

Ability Enhancement Compulsory Course – II : Quantitative Aptitude

Course Code	Course Name	Category	Hours / Week	Credits
25QUA4AE	Quantitative Aptitude	AECC - IV	2	2

Unit	Details	No. of Hours
I	Average - Basic concepts - Equation - Mistaken value - Replacement - Including/Excluding - Ratio and Proportion - Basic concepts - Types of ratios - Proportion - Application problems.	6
II	Blood Relations - Family relationship problems - Relationship identification - Directions - Direction sense - Distance and direction - Turning and orientation problems.	6
III	Problems on Ages - Present, past and future ages - Age ratios - Application problems - Alligation and Mixture - Basic concepts - Rule of alligation - Mixture replacement problems.	6
IV	Coding and Decoding - Letter coding - Number coding - Symbol coding - Pattern-based coding- Alphanumeric Series - Letter, number and symbol sequences - Series identification - Missing term problems.	6
V	Percentage - Increase/decrease - Net change - Profit and Loss - Profit/loss percentage - Cost price and selling price – Discount- Simple Interest - Principal, rate, time and amount-Compound Interest - Principal, rate, time and amount - Difference between simple and compound interest.	6
	Total Hours	**30**

Text Book

1.	Arora, A.(2022) Quanta Quantitative Aptitude. Kiran Institute of Career Excellence Pvt. Ltd.

Reference Book

1.	Guha, A. (2017). Quantitative aptitude for all competitive examinations (6th ed.). McGraw Hill Education.

Web Resources

1.	https://prepinsta.com/learn-aptitude/
2.	https://www.indiabix.com/aptitude/questions-and-answers/

Components of Assessment (CIA & ESE)

Components for Internal Assessment and Distribution of Marks for CIA and ESE (Theory)

Max Marks	Marks for		Components for CIA						
100	CIA	ESE	CIA		Model		Attendance	Active Engagement	Total
	25	75	Actual	Weightage	Actual	Weightage	5	5	25
			50	**5**	75	**10**			

Question Paper Pattern (CIA & ESE)

Component	Duration in Hours	Section A			Section B			Section C			Total
		Type of Question	No. of Questions	Marks	Type of Question	No. of Questions	Marks	Type of Question	No. of Questions	Marks	
CIA	2	MCQ	8	8x1=8	Either or	3	3x6=18	Either or	3	3x8=24	50
Model Exam / **ESE**	3	MCQ	10	10x1=10	Either or	5	5x5=25	Either or	5	5x8=40	75

Components for Internal Assessment and Distribution of Marks for CIA (Lab)

Max Marks	Marks for		Components for CIA						
	CIA	ESE	Test		Model		Experiments / Programs	Observation	Total
100	40	60	Actual	Weightage	Actual	Weightage	Marks	5	40
			50	**10**	60	**15**	**10**		

Examination Pattern

Component	Duration in Hours	Marks			Weightage
		Practical Exam	Record	Total Marks	
Test	2	50	-	**50**	10
Model	3	60	-	**60**	15
Experiments	-	-	-	**10**	10
Observation	-	-	-	**05**	05
				Total Marks - CIA	**40**
ESE	3	50	10	-	**60**

Components for Internal Assessment and Distribution of Marks for CIA (Foundation Course -Theory)

Max Marks	Marks for		Components for CIA				
	CIA	ESE	CIA		Model		Total
			Actual	Weightage	Actual	Weightage	
50	50	-	50	**25**	50	**25**	**50**

Question Paper Pattern

Duration in Hours	Mode of Exam	Type of Questions	No. of Questions	Marks
2	Offline	Open Choice	5 (Out of 8)	5 x 10=50

Components for and Distribution of Marks for ESE (Theory) Ability Enhancement Compulsory Courses (AECC) & Question Paper Pattern

Duration in Hours	Mode of Exam	Type of Questions	No. of Questions	Marks
2	Online	MCQ	50	50x1=50