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 Postgraduate Programme

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

Programme: M.Sc. Software Systems (M.Sc. SS)
Programme Code: MSS

(Applicable for the Students admitted during the Academic Year 2025-26 onwards)

Eligibility

The student should have passed Higher Secondary Examination with Mathematics / Business Mathematics / Applied Mathematics. (As per the eligibility condition given by Bharathiar University Ref. BU/R/B3-B4/ Eligibility Condition /2025/7960 dated 08/05/2025).

Program Learning Outcomes (PLOs)

The successful completion of the M.Sc. Software Systems programme shall enable the students to:

PLO1	Assimilate technical concepts well to contribute code reviews and meet modern demands effectively in the area of Artificial Intelligence and Machine Learning.
PLO2	Develop skills for effective leadership in IT support, Network Architect, Web Developer and successful Entrepreneur as well.
PLO3	Use logical skills, analytical skills and programming skills relevant to Full Stack Development and DB Administration.
PLO4	Creatively use the knowledge in computational science, mathematics and statistics for Data Analysis, Data Science and Business Analysis to solve real world problems.
PLO5	Engage in lifelong learning with ethical principles for the betterment of self as well as society.

M.Sc. Software Systems
Distribution of Credits and Hours for all the Semesters

Part	Course Category	No. of Courses	Hours		Credits	Total Credits		Semester
I	Language-I	4	4 X 3	12	2 X 3	12	12	1 - 4
II	Language-II	4	4 X 3	12	2 X 3	12	12	1 - 4
III	Core Theory **(6 hrs./week)**	2	2 X 6	12	2 X 4	8	200	3
	Core Theory **(5 hrs./week)**	9	9 X 5	45	9 X 4	36		1 – 3, 5 – 8
	Core Theory **(4 hrs./week)**	13	13 X 4	52	13 X 4	52		4,6 - 9
	Core Lab **(4 hrs./week)**	16	16 X 4	64	16 X 3	48		1 - 9
	Allied	4	4 X 4	16	4 X 3	12		1 - 4
	Elective	3	3 X 5	15	3 X 4	12		5, 6, 8
	Skill Enhancement Course (SEC) Lab	3	3 X 2	6	3 X 2	6		4,5,9
	SEC : Internship	1	-	-	1 X 2	2		5
	Project Work	2	-	-	2 X 12	24		
IV	Ability Enhancement Compulsory Course (AECC)	3	3 X 2	6	3 X 2	6	6	1, 2, 4
	Ability Enhancement Compulsory Course (AECC) Online Course MOOC	1	-	-	1 X 2	2	2	3
	Foundation Course (FC)	1	-	-	1 X 2	2	2	3
Total		**66**		**240**		**234**	**234**	

Consolidated Semester wise and Component wise Hours and Credits Distribution

Semester	Part I		Part II		Part III		Part IV		Total	
	Hrs.	Credits	Hrs.	Credits	Hrs.	Credits	Hrs.	Credits	**Hrs.**	**Credits**
1	3	3	3	3	22	17	2	2	**30**	**25**
2	3	3	3	3	22	17	2	2	**30**	**25**
3	3	3	3	3	24	17	-	4	**30**	**27**
4	3	3	3	3	22	19	2	2	**30**	**27**
5	-	-	-	-	30	26	-	-	**30**	**26**
6	-	-	-	-	30	26	-	-	**30**	**26**
7	-	-	-	-	-	13	-	-	**-**	**12**
8	-	-	-	-	30	26	-	-	**30**	**26**
9	-	-	-	-	30	26	-	-	**30**	**28**
10	-	-	-	-	-	13	-	-	**-**	**12**
Total	**12**	**12**	**12**	**12**	**210**	**200**	**6**	**10**	**240**	**234**

Curriculum

M.Sc. Software Systems

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	3	3	25	75	100	3
25HIN11L			Hindi – I						
25MAL11L			Malayalam – I						
25FRE11L			French – I						
25ENG12L	II	Language –II	English – I	3	3	25	75	100	3
25MSS13C	III	Core – I	C Programming	5	3	25	75	100	4
25MSS14P	III	Core Lab -I	C Programming Lab	4	3	40	60	100	3
25MSS15C	III	Core – II	Digital Electronics and Microprocessor	5	3	25	75	100	4
25MSS16P	III	Core Lab-II	Python and Big Data Fundamentals Lab	4	3	40	60	100	3
25MSS17A	III	Allied – I	Numerical Analysis	4	3	25	75	100	3
25SOF1AE	IV	AECC - I	Soft Skills	2	2	-	50	50	2
Total				**30**				**750**	**25**

Semester – 2									
Course Code	Part	Course Category	Course Name	Hours/ Week	Examination				Credits
					Duration in Hours	Max Marks			
						CIA	ESE	Total	
25TAM21L	I	Language – I	Tamil – II	3	3	25	75	100	3
25HIN21L			Hindi – II						
25MAL21L			Malayalam – II						
25FRE21L			French – II						
25ENG22L	II	Language –II	English – II	3	3	25	75	100	3
25MSS23C	III	Core – III	C++ Programming	5	3	25	75	100	4
25MSS24P	III	Core Lab -III	C++ Programming Lab	4	3	40	60	100	3
25MSS25C	III	Core – IV	Computer Networks	5	3	25	75	100	4
25MSS26P	III	Core Lab-IV	Big Data Analytics Lab	4	3	40	60	100	3
25MSS27A	III	Allied – II	Applied Mathematics	4	3	25	75	100	3
25IDT2AE	IV	AECC - II	Innovation and Design Thinking	2	2	-	50	50	2
25IPR2AE			Intellectual Property Rights						
25END2AE			Entrepreneurship Development						
Total				**30**				**750**	**25**

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	3	3	25	75	100	3
25HIN31L			Hindi – III						
25MAL31L			Malayalam – III						
25FRE31L			French – III						
25ENG32L	II	Language – II	English – III	3	3	25	75	100	3
25MSS33C	III	Core – V	Object Oriented Programming with Java	6	3	25	75	100	4
25MSS34P	III	Core Lab - V	Java Programming Lab	4	3	40	60	100	3
25MSS35C	III	Core - VI	Data Structures and Applications	6	3	25	75	100	4
25MSS36P	III	Core Lab -VI	Data Warehousing and Data Pipeline Engineering Lab	4	3	40	60	100	3
25MSS37A	III	Allied - III	Discrete Structures	4	3	25	75	100	3
25BAT3FC/	IV	Foundation Course	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**	**27**

Semester – 4									
Course Code	Part	Course Category	Course Name	Hours /Week	Examination				Credits
					Duration in Hours	Max Marks			
						CIA	ESE	Total	
	I	Language - I	Tamil-IV/ Hindi-IV/ Malayalam-IV/ French-IV	3	3	25	75	100	3
	II	Language - II	English – IV	3	3	25	75	100	3
	III	Core - VII	Relational Database Management Systems	4	3	25	75	100	4
	III	Core Lab - VII	Relational Database Management Systems Lab	4	3	40	60	100	3
	III	Core - VIII	Visual Programming	4	3	25	75	100	4
	III	Core Lab - VIII	Visual Programming Lab	4	3	40	60	100	3
	III	Allied - IV	Operations Research	4	3	25	75	100	3
	III	SEC Lab - I	Arduino Programming Essentials Lab	2	3	40	60	100	2
	IV	AECC - IV	Innovation and Design Thinking/ Intellectual Property Rights/ Entrepreneurship Development	2	2	-	50	50	2
Total				**30**				**850**	**27**

Semester – 5									
Course Code	**Part**	**Course Category**	**Course Name**	**Hours / Week**	**Examination**				
					Duration in Hours	**Max Marks**			**Credits**
						CIA	**ESE**	**Total**	
	III	Core – IX	Python Programming	5	3	25	75	100	4
	III	Core Lab - IX	Python Programming Lab	4	3	40	60	100	3
	III	Core - X	Web Designing	5	3	25	75	100	4
	III	Core Lab - X	Web Designing Lab	4	3	40	60	100	3
	III	Core - XI	Computer Networks	4	3	25	75	100	4
	III	Elective - I	Foundation of Data Science	4	3	25	75	100	4
			Cyber Security						
			Design Thinking						
	III	SEC - I	Smart Sensors	4	3	25	75	100	4
Total				**30**				**700**	**26**

Semester – 6									
Course Code	Part	Course Category	Course Name	Hours / Week	Examination				Credits
					Duration in Hours	Max Marks			
						CIA	ESE	Total	
	III	Core – XII	Data Mining and Warehousing	5	3	25	75	100	4
	III	Core Lab - XI	Data Mining Lab	4	3	40	60	100	3
	III	Core - XIII	PHP Programming	5	3	25	75	100	4
	III	Core Lab-XII	PHP Programming Lab	4	3	40	60	100	3
	III	Core - XIV	Software Engineering	4	3	25	75	100	4
	III	Core - XV	Mobile Computing	4	3	25	75	100	4
	III	Elective - II	Exploratory Data Analysis	4	3	25	75	100	4
			Ethical Hacking						
			Augmented Reality / Virtual Reality						
Total				**30**				**700**	**26**

Semester – 7									
Course Code	Part	Course Category	Course Name	Hours / Week	Examination				Credits
					Duration in Hours	Max Marks			
						CIA	ESE	Total	
	III	Project	Project Work – I and Internship	-	-	80	120	200	13
Total				**-**	**-**			**200**	**13**

Semester – 8									
Course Code	Part	Course Category	Course Name	Hours / Week	Examination				Credits
					Duration in Hours	Max Marks			
						CIA	ESE	Total	
	III	Core – XVI	Advanced Java Programming	5	3	25	75	100	4
	III	Core Lab- XIII	Advanced Java Programming Lab	4	3	40	60	100	3
	III	Core - XVII	Software Testing	5	3	25	75	100	4
	III	Core Lab-XIV	Software Testing Lab	4	3	40	60	100	3
	III	Core - XVIII	Information Security	4	3	25	75	100	4
	III	Core - XIX	Big Data Analytics	4	3	25	75	100	4
	III	Elective - III	Generative AI and Prompt Engineering	4	3	25	75	100	4
			Digital and Mobile Forensics						
			3D Printing and Design						
Total				**30**				**700**	**26**

Semester – 9									
Course Code	Part	Course Category	Course Name	Hours / Week	Examination				Credits
					Duration in Hours	Max Marks			
						CIA	ESE	Total	
	III	Core – XX	Artificial Intelligence and Machine Learning	5	3	25	75	100	4
	III	Core Lab - XV	Artificial Intelligence and Machine Learning Lab	4	3	40	60	100	3
	III	Core - XXI	Digital Image Processing	5	3	25	75	100	4
	III	Core - XXII	Block Chain Technology	4	3	25	75	100	4
	III	Core - XXIII	Cloud Computing	4	3	25	75	100	4
	III	Core Lab-XVI	Cloud Computing Lab	4	3	40	60	100	3
	III	SEC - II	Agile Software Development	4	3	25	75	100	4
Total				**30**				**700**	**26**

Semester – 10									
Course Code	Part	Course Category	Course Name	Hours / Week	Examination				Credits
					Duration in Hours	Max Marks			
						CIA	ESE	Total	
	III	Project	Project Work – II and Internship	-	-	80	120	200	13
Total				**-**	**-**	**100**	**100**	**200**	**13**
Grand Total				**240**				**6350**	**234**

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	3	3	25	75	100	3
25HIN11L			Hindi – I						
25MAL11L			Malayalam – I						
25FRE11L			French – I						
25ENG12L	II	Language –II	English – I	3	3	25	75	100	3
25MSS13C	III	Core – I	C Programming	5	3	25	75	100	4
25MSS14P	III	Core Lab -I	C Programming Lab	4	3	40	60	100	3
25MSS15C	III	Core – II	Digital Electronics and Microprocessor	5	3	25	75	100	4
25MSS16P	III	Core Lab-II	Python and Big Data Fundamentals Lab	4	3	40	60	100	3
25MSS17A	III	Allied – I	Numerical Analysis	4	3	25	75	100	3
25SOF1AE	IV	AECC - I	Soft Skills	2	2	-	50	50	2
Total				**30**				**750**	**25**

Course Code	Course Name	Category	Hours / Week	Credits
25TAM11L	Tamil – I	Language – I	3	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: 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	11
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)	11
III	**சிறுகதை** 1. காஞ்சனை - புதுமைப்பித்தன் 2. சுமைதாங்கி - ஜெயகாந்தன் 3. சோற்றுக் கணக்கு - ஜெயமோகன் **4.** ஆறு யானைகள் - எஸ்.ராமகிருஷ்ணன் **5.** மரத்தைக் கர்ப்பம் சுமந்தவள் - ஆண்டாள் பிரியதர்சினி	9

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	7
V	**இலக்கணம்** 1. எழுத்துகள் (முதல் எழுத்துகள், சார்பெழுத்துகள்) 2. எழுத்துக்களின் பிறப்பு 3. மாத்திரைகள் 4. பயிற்சிக்குரியன - மொழிபெயர்ப்பு (ஆங்கிலத்திலிருந்து தமிழுக்கு மொழிபெயர்த்தல்)	7
	Total Hours	**45**

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

குறிப்பு : ஆ, இ பிரிவுகளில் வினாக்கள் "இது" அல்லது "அது" என்ற வகையில் அந்தந்த அலகுகளிலிருந்து அமைத்தல் வேண்டும்.

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

CLO - PLO Mapping

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

Language – 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.	11
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	11
III	**Grammar: Shabdha Vichar Only** (Noun, Pronoun, Adjective, Verb, Tense, Case, Endings) Theoretical & Applied.	9
IV	**Translation: English – Hindi Only.** Anuvadh Abhyas – Iii (1-15 Lessons Only)	7
V	**Comprehension**: 1 Passage From Anuvadh Abhyas–III (16-30)	7
	Total Hours	**45**

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	3	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 the thoughts and life of the people of this state
- 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		

CLO - PLO Mapping

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

Language – I: Malayalam – I

Unit	Content	Hours
I	Novel – Pathummayude Aadu - Vaikam Muhammed Basheer	11
II	Novel- - Pathummayude Aadu - Vaikam Muhammed Basheer	11
III	Short Story - Ente Priyappeta Kadhakal – Akbar Kakkattil)	9
IV	Short Story - Ente Priyappeta Kadhakal – Akbar Kakkattil)	7
V	Composition & Translation(English to Malayalam)	7
	Total Hours	**45**

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	3	3

Course Objective

The course intends to

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 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		

Language – I: French – I

Unit	Content	Hours
I	Etape 0	11
	Etape1 (Lecons 1 - 3)	
II	Etape2 (Lecons 1 - 3)	11
III	Etape 3 - Leçons 1 - 2	9
IV	Etape 3 – Leçon 3	7
	Etape 4 – Leçon 1	
V	Etape 4 – Leçons 2 - 3	7
	Total Hours	**45**

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	3	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		

Language - 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	9
II	**Prose** : Friendship 1. The Man in Black - Oliver Goldsmith 2. Of Friendship - Francis Bacon 3. The Blessing of Friends - Sir John Lubbock	9
III	**Short Stories:** Morality 1. The Necklace – Guy de Maupassant 2. The Lottery - Shirley Jackson 3. The Monkey's Paw - W. W. Jacobs	9
IV	**Language Competency** 1. Vocabulary : Synonyms, Antonyms, Word Formation 2. Parts of Speech 3. Error correction	9
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.	9
	Total Hours	**45**

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
25MSS13C	C Programming	Core - I	5	4

Course Objectives

This course intends to cover:

- Basics of C Programming.
- Real world problems using control structures, arrays, functions and pointers.

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 programming languages.	K1
CLO2	Understand the concepts of variables, expressions, control structures, arrays and strings.	K2
CLO3	Infer the concept of functions, structures and union.	K3
CLO4	Apply the concepts of pointers.	K3
CLO5	Explore the BIOS and DOS Interrupts.	K4
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze		

CLO – PLO Mapping

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

Core – I : C Programming

Unit	Content	No. of Hours
I	**Programming Languages:** Planning the Computer Program – Flow Chart – Types of Logic used in Flowchart – Computer Languages – Classification of Programming Languages – Popular Programming Languages – Program development process – Characteristics of a Good Program – Program Development Environment - Error in Programming. Problem Solving: Introduction – Analyzing and defining the problem.	16
II	**Overview of C:** An overview of C – Data types and sizes – Declarations – Variables – Constants – Operators – Expressions Formatted and Unformatted Input / Output statements - Program Control Structures – Loop Control Structures – Arrays – Strings.	15
III	**Functions:** Introduction- Function Arguments – Function Prototype – Recursion – Storage Classes. Structures and Union**:** Structures –Array of Structures- Unions–Self - Referential Structures – Dynamic Memory Allocation.	15
IV	**Pointers:** Pointers – Introduction – Pointers and Arrays – Pointers and Strings – Pointers and Functions - Pointers and Structures.	14
V	**File processing**: Basic methods for FILE - Sequential Files – Random Access Files – C Preprocessors – Command Line Arguments – File Pointers and Navigation – Temporary Files - Working with multiple files - Error Handling in File Operations – Simple Text Editor.	15
	Total Hours	**75**

Text Books

1	Balagurusamy.E, (2024), Programming in ANSI C, 9th Edition, Tata McGraw Hill.
2	Yeswanth P Kanetkar, (2022), Let us C, 19th Edition, BPB Publications.

Reference Books

1	Deitel & Deitel, (2022), C How to Program, 9th Edition, PHI/Pearson Education Asia.
2	Balagurusamy E, (2017), Computing Fundamentals and C Programming, 2nd Edition, McGraw Hill.
3	Ashok N.Kamthane, (2006), Programming with ANSI and Turbo C, Pearson Education Asia.
4	Yeswanth P Kanetkar, (1995), Writing TSR through C, BPB Publication.

Web Resources (Swayam, NPTEL)

1	https://onlinecourses.nptel.ac.in/noc24_cs02/preview
2	https://onlinecourses.swayam2.ac.in/cec20_cs02/preview

Course Code	Course Name	Category	Hours / Week	Credits
25MSS14P	C Programming Lab	Core Lab - I	4	3

S. No.	List of Programs
1	Basic programs in C.
2	Find the sum, average, standard deviation for a given set of numbers.
3	Develop a program using control structures.
4	Develop a program using loop.
5	Program to print magic square using relational operators.
6	Develop a program to sort the given set of numbers in ascending order using arrays.
7	Check whether the given string is a palindrome or not using pointers.
8	Develop a program to find the length of string using pointers.
9	Develop a program to compare two strings using pointers
10	Develop a program to count the number of vowels in the given sentence using loop.
11	Develop a program using recursive function.
12	Print the students Mark sheet assuming roll no, name, and marks in 5 subjects in a structure. Create an array of structures and print the mark sheet in the university pattern.
13	Function using pointers to add two matrices and to return the resultant matrix to the calling functions.
14	Develop a program which receives two filenames as arguments and check whether the file contents are same or not. If same delete the second file.
15	Develop a program which takes a file as command line argument and copy it to another file. At the end of the second file write the total i) no of chars ii) no. of words and iii) no. of lines.
16	Perform basic operations using Github platform.
	Total Hours **60**

Text Books

1	Balagurusamy.E, (2024), Programming in ANSI C, 9th Edition, Tata McGraw Hill.
2	Yeswanth P Kanetkar, (2022), Let us C, 19th Edition, BPB Publications.

Reference Books

1	Deitel & Deitel (2022), C How to Program, 9th Edition, PHI/Pearson Education Asia.
2	Balagurusamy.E, (2019), Programming in ANSI C, 8th Edition, Tata McGraw Hill.
3	Ashok N.Kamthane, (2006), Programming with ANSI and Turbo C, Pearson Education Asia.

Web Resources (Swayam / NPTEL)

1	https://onlinecourses.nptel.ac.in/noc24_cs02/preview
2	https://onlinecourses.swayam2.ac.in/cec20_cs02/preview

Course Code	Course Name	Category	Hours / Week	Credits
25MSS15C	Digital Electronics and Microprocessor	Core - II	5	4

Course Objectives

The course intends to cover:

- Principles of digital electronics, binary numbers, boolean algebra, logic gates and truth tables.
- Combinational logic circuits, complex logic circuits, multiplexers and decoders.
- Architecture and operation of the 8085 microprocessors.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Identify and summarize the basic characteristics of various number systems and logic gates.	K1, K2
CLO2	Explain the functionalities of basic combinational circuits like half adders, full adders, subtractors, multiplexers, and demultiplexers.	K2
CLO3	Analyze the operation and functionality of various sequential circuits like flip-flops, counters, and shift registers.	K4
CLO4	Identify the functional units of the 8085 architecture and explain the basic concepts of 8085 operation, including instruction and data formats, addressing modes, and machine cycles.	K1, K2
CLO5	Apply their knowledge of 8085 microprocessor to interface with external devices and develop basic programs to control their operation.	K3
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** – Analyze		

CLO-PLO Mapping

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

Core - II: Digital Electronics and Microprocessor

Unit	Content	No. of Hours
I	**Number System and Logic Gates:** Number systems: Binary, Decimal, Octal and Hexadecimal – Conversions: Decimal to Binary, Octal, Hexadecimal conversions - Binary to Decimal, Octal, Hexadecimal conversions - Octal to Binary, Decimal, Hexadecimal conversions - Hexadecimal to Binary, Decimal, Octal conversions - Binary Addition, Binary Subtraction - One's and Two's Complements Representation. Logic Gates: AND, OR, NOT, NAND, NOR, and EX-OR.	15
II	**Combinational Circuits:** Boolean algebra - Basic Laws – Demorgan's Laws - K-map representation: SOP and POS - Simplification of logic functions using K-map, Don't care conditions. Half Adder – Full Adder- Half Subtractor – Full Subtractor – Multiplexer: 4x1 MUX, 8x1 MUX – Demultiplexer: 1x4 DEMUX, 1x8 DEMUX - Encoders: 4x2 and 8x3 – Decoders: 2x4 and 3x8	15
III	**Sequential Circuits:** RS flip flop, Clocked RS Flip Flop – JK Flip Flop – JK Master Slave Flip Flop - D Flip Flop - T Flip Flop - Applications of Flip Flops. Counters: Asynchronous (Ripple) Mod – 3 and Mod - 5 Counter, Synchronous Mod – 3 and Mod - 5 Counter – Synchronous Up down Counter – Decade Counter - Applications of Counters.	15
IV	**8085 Microprocessors:** Pin Diagram of 8085 – Architecture of 8085 – Addressing modes – Instruction set: Data Transfer Instructions, Arithmetic Instructions, Logical Instructions, Branching Instructions, Machine control Instructions - Arithmetic and Logical Programs: Addition and Subtraction of Two 8-bit Numbers, Largest Number in an Array, Smallest Number in an Array, Arranging Numbers in an Ascending Order and Descending Order, Block Data Transfer.	15
V	**Interfacing and Applications:** Parallel communication interface (8255 PPI): 8255 Pin Diagram , 8255 Block Diagram, Modes of 8255 - Serial communication interface (8251 USART): 8251 Pin Diagram, 8251 Block Diagram, Modes of 8251- DMA controller: 8237/8257 Pin Diagram, Block Diagram – Applications: Traffic Light Control System – Water Level Control System– Temperature Measurement Control.	15
	Total Hours	**75**

Text Books	
1	Morris Mano, (2022), Computer System Architecture, 3rd Edition, Pearson Education.
2	Salivahanan S, (2012), Digital Circuits and Design, 3rd Edition, McGraw Hill Education.
3	Ramesh Gaonkar (2019), Microprocessor Architecture, Programming and Application with the 8085, 6th Edition, Pearson International Publishing.
Reference Books	
1	Puri V K (2017), Digital Electronics: Circuits and Systems, McGraw Hill Education.
2	Badri Ram (2012), Advanced Microprocessor and Interfacing, McGraw Hill Education.
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
25MSS16P	Python and Big Data Fundamentals Lab	Core Lab - II	4	3

Unit	Content	No. of Hours
I	**Python Fundamentals:** Overview – Introduction to Python Programming Language – Control Flow – Python Data Structures – Functions 1. Program to demonstrate conditional statements and loops in Python 2. Program to implement list, tuple, set, and dictionary operations 3. Program to define and invoke functions with parameters and return values	12
II	**Advanced Python:** Object-Oriented Programming – Exception Handling – File Handling – Python-SQL Connectivity 1. Program to implement a class with constructors and methods 2. Program to demonstrate exception handling using try-except blocks 3. Program to perform file read/write operations in Python 4. Program to connect Python with a SQL database and perform CRUD operations	12
III	**Hadoop & Big Data Foundations:** Big Data Overview - Characteristics of Big Data, Big Data Ecosystem, Hadoop Architecture - Components of Hadoop (HDFS, MapReduce), Data Lakes vs. Data Warehouses, Distributed Computing Principles - HDFS Design and Usage 1. Program to demonstrate file storage and retrieval in HDFS 2. Program to implement basic MapReduce logic using Word Count	12
IV	**Apache Spark and Data Processing:** Introduction to Spark - Spark Architecture, RDDs (Resilient Distributed Datasets), DataFrames - Spark SQL 1. Program to process structured data using Spark DataFrames 2. Program to perform data transformation using RDDs in PySpark	12
V	**Big Data Project Implementation:** Overview of a Big Data Project Lifecycle – Text Processing at Scale – Storage of Unstructured and Structured Data in HDFS – Performance Analysis Using Spark vs MapReduce – Real-Time vs Batch Processing Overview – Sample End-to-End Project with Reporting and Visualization 1. Program to process and analyze a large text file using Spark (Word Count) 2. Program to store and retrieve project data in HDFS 3. Program to implement a mini Big Data pipeline using PySpark 4. Program to compare execution time between local and distributed file systems	12
	Total Hours	**60**

Text Book	
1	Luciano Ramalho, (2022), Fluent Python, 2nd Edition, O'Reilly Media.
Reference Books	
1	Tom White, (2015), Hadoop: The Definitive Guide, 4th Edition, O'Reilly Media.
2	Jan Kunigk, Ian Buss, Paul Wilkinson & Lars George, (2020), Practical Data Lake Architecture, O'Reilly Media.
Web Resources (Swayam / NPTEL)	
1	https://onlinecourses.nptel.ac.in/noc22_cs32/preview
2	https://onlinecourses.nptel.ac.in/noc21_cs45/preview
3	https://onlinecourses.nptel.ac.in/noc20_cs92/preview

Course Code	Course Name	Category	Hours / Week	Credits
25MSS17A	Numerical Analysis	Allied - I	4	3

Course Objective

The course intends to cover:

- A set of strategies and approaches used to generate approximate solutions to mathematical problems that cannot be solved analytically.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Obtain numerical solutions of algebraic and transcendental equations.	K1
CLO2	Understand the numerical solutions of simultaneous linear equations using different methods.	K2
CLO3	Understand the concept of numerical solutions in differentiation of functions.	K2
CLO4	Compute the definite integrals using numerical methods.	K3
CLO5	Demonstrate the use of various numerical methods for solving first-order ordinary differential equations.	K4
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** – Analyze		

CLO-PLO Mapping

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

Allied I: Numerical Analysis

Unit	Content	No. of Hours
I	**The Solution of Numerical Algebraic and Transcendental Equations:** Bisection method – Iteration Method – Convergence condition – Regula Falsi Method – Newton - Raphson method.	12
II	**Solution of Simultaneous Linear Algebraic Equations:** Gauss Elimination Method - Gauss Jordan Method- Gauss Jacobi Method - Gauss Seidel Method**.**	12
III	**Numerical Differentiation:** Newton's Forward Difference - Newton's Backward Difference - Derivative using Stirling's formula.	12
IV	**Numerical Integration:** Newton Cote's formula- Trapezoidal rule -Simpson's 1/3rd and 3/8 th rules.	12
V	**Numerical Solution of First Ordinary Differential Equation:** Taylor series method - Euler's method - Modified Euler's method- Runge Kutta method (Second & fourth order Runge Kutta method only).	12
	Total Hours	**60**
Text Book		
1	P. Kandasamy, K.Thilagavathy & K. Gunavathi (2007)" Numerical methods", S. Chand and Company Ltd, New Delhi. Unit I : Chapter 3 : Section 3.1 – 3.4 Unit II : Chapter 4 : Section 4.1, 4.2, 4.8, 4.9 Unit III: Chapter 9 : Section 9.1 – 9.4 Unit IV: Chapter 9 : Section 9.7 – 9.9, 9.13, 9.14 Unit V: Chapter 11 : Section 11.5, 11.6, 11.9, 11.11- 11.13	
Reference Books		
1	M.K. Venkataraman (1999), "Numerical Methods in Science and Engineering", National Publishing company.	
2	K. Sankara Rao (2018), "Numerical Methods for Scientists and Engineers", Prentice Hall India.	
3	S.S. Sastry (2006),"Introductory Methods of Numerical Analysis", 4th Edition, Prentice Hall of India Pvt. Ltd.	
Web Resources (Swayam / NPTEL)		
1	https://archive.nptel.ac.in/courses/111/107/111107105/	

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 Outcome

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
I		**Presentation Skills**	
	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.	
II		**Confidence**	
	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.	

III	**Creativity**		
	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.	
IV	**Problem-Solving**		
	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.	
V	**Critical Thinking**		
	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						
	CIA	ESE	CIA		Model		Attendance	Active Engagement	Total
100	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 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 – I	Tamil – II	3	3	25	75	100	3
25HIN21L			Hindi – II						
25MAL21L			Malayalam – II						
25FRE21L			French – II						
25ENG22L	II	Language –II	English – II	3	3	25	75	100	3
25MSS23C	III	Core – III	C++ Programming	5	3	25	75	100	4
25MSS24P	III	Core Lab -III	C++ Programming Lab	4	3	40	60	100	3
25MSS25C	III	Core – IV	Computer Networks	5	3	25	75	100	4
25MSS26P	III	Core Lab-IV	Big Data Analytics Lab	4	3	40	60	100	3
25MSS27A	III	Allied – II	Applied Mathematics	4	3	25	75	100	3
25IDT2AE	IV	AECC - II	Innovation and Design Thinking	2	2	-	50	50	2
25IPR2AE			Intellectual Property Rights						
25END2AE			Entrepreneurship Development						
Total				**30**				**750**	**25**

Part – I: Language – I : தமிழ் – II

Course Code	Course Name	Category	Hours / Week	Credits
25TAM21L	Tamil – II	Language - I	3	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)	11
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	11
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	9
IV	**(இலக்கிய வரலாறு)** 1. பதினெண் கீழ்க்கணக்கு நூல்கள் 2. உரைநடையின் தோற்றமும் வளர்ச்சியும்	7

Unit	Content	No. of Hours
V	**(இலக்கணம்)** 1. சொல்லின் வகைகள் 2. வேற்றுமைத் தொகைகள் 3. பகுபத உறுப்புகள்	7
	Total Hours	**45**

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.

Part – I: Language – I - Hindi - II

Course Code	Course Name	Category	Hours / Week	Credits
25HIN21L	Hindi - II	Language - I	3	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 Hour
I	**Modern Poetry :** Panchvati By Mythli Sharan Gupt	10
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	10
III	**Letter Writing :** (Leave Letter, Job Application, Ordering Books, Letter to Publisher, Personal Letter)	9
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.	8
V	**Translation:** Hindi-English only Lessons – 1-15 only Anuvadh Abyas -III	8
	Total Hours	**45**

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

Part – I: Language – I
French – II

Course Code	Course Name	Category	Hours / Week	Credits
25FRE21L	French - II	Language - I	3	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)	10
II	Communication(pg 61-65) Grammaire: pg(145-146)	10
III	Temps Libre(pg 66-68) Grammaire: pg(147)	9
IV	Mots Et Expressions((pg 69-76) Grammaire: pg(148-151)	8
V	Communication(pg 77-81) Grammaire: pg(152-155)	8
	Total Hours	**45**

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.

Part – II: Language-II - English -II

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

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	9
II	**Prose**: Humour 1. With The Photographer – Stephen Leacock 2. Travel by Train – J.B.Priestley 3. On Forgetting – Robert Lynd	9
III	**Short Stories:** Integrity 1. The taxi driver – K.S. Duggal 2. A Retrieved Reformation- O Henry 3. Kabuliwala - Rabindranath Tagore	9
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	9
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 .	9
	Total Hours	**45**

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
25MSS23C	C++ Programming	Core - III	5	4

Course Objectives

The course intends to

- Understand the C++ concepts from the basis of C Language.
- Learn Object Oriented Programming concepts and streams.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Learn the basic concepts of OOPs.	K1
CLO2	Understand the functions in C++.	K2
CLO3	Apply the constructors, destructor, operator overloading and type conversion in C++.	K3
CLO4	Explore the different types of inheritance.	K4
CLO5	Analyze the file pointers using I/O streams.	K4
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** – Analyze		

CLO-PLO Mapping

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

Core – III : C++ Programming

Unit	Content	No. of Hours
I	**Principles of Object-Oriented Programming:** Software crisis - Software Evolution – Procedure oriented programming - Object oriented programming paradigm - Basic concepts and benefits of OOP - Object oriented language - Application of OOP - structure of C++ - Applications of C++ - Tokens, Expressions and control structures - Operators in C++ - Manipulators.	15
II	**Functions in C++:** Function prototyping - Call by reference - Return by reference – Inline functions - Default, Const arguments - Functions overloading - Friend and virtual functions - Classes and Objects - Member functions - Nesting of member functions - Private member functions - Memory allocations for objects - Static data numbers - Static member functions - Arrays of objects - Objects as function arguments – Friend functions - Returning objects – Const member functions - Pointers to members - Standard Template Library (STL) basics.	16
III	**Constructors:** Parameterized constructor - Multiple constructors in a class - Constructor with default arguments - Dynamic initialization of objects - Copy and dynamic constructors - Destructors - Operator overloading -Overloading unary and binary operators – Overloading operators using friend functions.	14
IV	**Inheritance:** Defining derived classes - Single inheritance - Making a private member inheritable - Multiple inheritance - Hierarchy inheritance - Hybrid inheritance - Virtual base classes – Abstract classes - Constructed and derived classes - Member classes - Nesting of classes.	15
V	**Streams:** String I/O - Character I/O - object I/O - I/O with multiple objects - File pointers – Disk I/O with member functions - Error handling - Redirection - Command line arguments - Overloading extraction and insertion operators.	15
	Total Hours	**75**
Text Books		
1	Balagurusamy E (2013), Object Oriented Programming with C++, New Delhi 6th Edition, Tata McGraw Hill Education (India) Private Limited.	
2	Ashok N.Kamthane (2003), Object - Oriented Programming with ANSI & Turbo C++, First Indian Print, Pearson Education.	
Reference Books		
1	Paul Deitel, Harvey Deitel (2014), C++ How to Program, 9th Edition, PHI.	
2	Herbert Schildt (2021), C++ The Complete Reference, 3rd Edition, Tata McGraw Hill.	
Web Resources (Swayam/ NPTEL)		
1	https://onlinecourses.nptel.ac.in/noc21_cs02/preview	
2	https://onlinecourses.nptel.ac.in/noc24_cs44/preview	
3	https://onlinecourses.nptel.ac.in/noc21_cs38/preview	
4	https://onlinecourses.nptel.ac.in/noc22_cs103/preview	

Course Code	Course Name	Category	Hours / Week	Credits
25MSS24P	C++ Programming Lab	Core Lab - III	4	3

S. No.	List of Programs
1	Program to get and print the string.
2	Program to implement stack operations.
3	Create a class named Arithmetic that carries out basic arithmetic operations as member functions.
4	Program for constructors, destructors, and inline functions.
5	Program to implement increment ++ and decrement -- operator overloading in C++.
6	Implement operator overloading by creating a STRING class to concatenate two strings using the ++ and to compare two strings using the = = operator.
7	Program to find the number of vowels, consonants, digits and white spaces in the given string.
8	Create a class shape which consists of two virtual functions to calculate area and perimeter of various figures. Derive three classes square, rectangle, triangle. Calculate Area and Perimeter of each class separately to display the result.
9	Create a friend function that accepts objects of two classes along with their respective integer and float values, and then displays the result based on the provided data.
10	Implement a function overloading in C++.
11	Check whether the given string is a palindrome or not using C++
12	Create a file and to display the contents of that file with line numbers.
13	Program that merges the contents of two files into a single file.
14	Create a program with basic file I/O operations using Copilot tool.
	Total Hours **60**
Text Books	
1	Balagurusamy E (2013), Object Oriented Programming with C++, 6th Edition, McGraw Hill Education (India) Private Limited, New Delhi.
2	Ashok N.Kamthane, (2003), Object-Oriented Programming with ANSI & Turbo C++, First Indian, Pearson Education.
3	Robert Lafore (1993), Object Oriented Programming in Turbo C++, Galgotia Publications.
Reference Books	
1	Paul Deitel, Harvey Deitel (2014), C++ How to Program, 9th Edition, PHI.
2	Herbert Schildt (2021), C++ The Complete Reference, 3rd Edition, Tata McGraw Hill
3	Bjarne Stroustrup (1991), The C++ Programming, Addition Wesley.
Web Resources (Swayam / NPTEL)	
1	https://onlinecourses.nptel.ac.in/noc21_cs02/preview
2	https://onlinecourses.nptel.ac.in/noc24_cs44/preview
3	https://onlinecourses.nptel.ac.in/noc21_cs38/preview
4	https://onlinecourses.nptel.ac.in/noc22_cs103/preview

Course Code	Course Name	Category	Hours / Week	Credits
25MSS25C	Computer Networks	Core - IV	5	4

Course Objectives

The course intends to

- Learn the basics of computer networks and reference models.
- Understand the concepts of wireless transmission, sliding window protocol, congestion control algorithm, routing and design issues of session layer.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Learn the basic concepts of computer networks and reference model.	K1
CLO2	Understand the concepts of physical layer for data communication and telephone system.	K2
CLO3	Understand the concepts of data link layer.	K2
CLO4	Apply the routing and congestion control algorithms, UDP and TCP in network and transport layer.	K3
CLO5	Analyze the session layer, presentation layer, application layer and network security.	K3
K1 - Remember; **K2** - Understand; K**3** – Apply; **K4** - Analyze		

CLO-PLO Mapping

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

Core IV: Computer Networks

Unit	Content	No. of Hours
I	**Introduction**: Use of computer networks – Network Hardware – Network software – Reference models. **Example of networks**: Internet, ATM, Ethernet and Wireless LANs.	14
II	**Physical Layer**: The Theoretical basis for data communication – Guided transmission Media – Wireless transmission – Communication satellites. **Telephone System**: Structure, Local Loop, Trunks and Multiplexing and Switching - The Public switched Telephone network – Cable Television - Mobile telephone system.	15
III	**Data Link Layer**: Data link layer design issues – Error detection and correction – Elementary data link protocols – Sliding window protocols – Data Link Layer in the Internet - Medium Access Layer – Channel Allocation Problem - Protocol Verification – Bluetooth.	15
IV	**Network Layer**: Network layer design issues – Routing algorithms – Congestion Control algorithms – Quality of service – Internetworking – Network layer in the internet. **Transport layer**: The transport service – Elements of transport protocol – A simple transport protocol. **The internet Transport Protocols**: UDP – TCP - Performance issues.	16
V	**Session Layer**: Design issues, synchronization. **Presentation Layer**: Design issues. **Application Layer**: Design issues, file transfer, E-mail. **Network Security**: Cryptography.	15
	Total Hours	**75**

Text Book

1	Andrew S. Tanenbaum, Nick Feamster, David J. Wetherall (2022), Computer Networks, 6th Edition, Pearson Publication.

Reference Books

1	B. A. Forouzan (2017), Data Communications and Networking, 4th Edition, Tata McGraw Hill.
2	F. Halsall (2008), Data Communications, Computer Networks and Open Systems, Pearson Education.
3	D.Bertsekas and R. Gallagher (2008), Data Networks, 2nd Edition, PHI.
4	Lamarca (2002), Communication Networks, Tata McGraw- Hill.

Web Resources (Swayam / NPTEL)

1	https://onlinecourses.nptel.ac.in/noc22_cs19/preview
2	https://onlinecourses.swayam2.ac.in/cec21_cs04/preview

Course Code	Course Name	Category	Hours / Week	Credits
25MSS26P	Big Data Analytics Lab	Core Lab - IV	4	3

Unit	Content	No. of Hours
I	**The Hadoop Ecosystem & HDFS:** Big Data Challenges (3V's) - Introduction to Hadoop (HDFS, YARN, MapReduce) - HDFS Architecture (NameNode, DataNode, Secondary NameNode) - HDFS Shell Commands (ls, put, get, mkdir, copyFromLocal, copyToLocal, cat) - YARN Architecture (ResourceManager, NodeManager, ApplicationMaster) 1. Basic HDFS operations 2. Explore HDFS Structure	12
II	**Batch Processing with MapReduce:** MapReduce Programming Model (Mapper, Reducer, Driver, Context object) - Writing MapReduce programs in Java or using Hadoop Streaming with Python - Running a JAR file on a Hadoop cluster - Analyzing the Job Tracker Web UI - Optimizations: Using Combiners and Partitioners 1. Program to implement the classic MapReduce algorithm 2. Program to analyzing Sales Data	12
III	**Data Warehousing with Apache Hive:** Hive: Managed vs. External Tables, Partitions, Bucketing - HiveQL: CREATE TABLE, LOAD DATA, SELECT, GROUP BY, JOIN, ORDER BY - Built-in Functions (String, Date, Mathematical). 1. Use Hive to analyze the employee data – find department wise average salaries and highest paid employees.	12
IV	**Pig**: Introduction to Pig Latin: LOAD, FOREACH, FILTER, GROUP, JOIN, STORE - Difference between Hive (SQL-like) and Pig (procedural scripting). 1. Analyze temperature data to find the maximum and minimum temperature per city using Pig.	12
V	**Additional Projects:** 1. MapReduce Project: Word Count Analysis 2. Perform data analysis using Hive queries 3. Use Apache Pig to compute average ratings per movie	12
	Total Hours	**60**

Text Book	
1	Tom White (2015), Hadoop: The Definitive Guide, Core Hadoop concepts, HDFS, MapReduce, 4th Edition, O'Reilly.
Reference Books	
1	Nathan Marz & James Warren, Manning (2015)**,** Big Data: Principles and Best Practices of Scalable Real-Time Data Systems
2	Jules S. Damji, Brooke Wenig, Tathagata Das, Denny Lee (2020), Lightning-Fast Big Data Analytics, 2nd Edition, O'Reilly.
Web Resources (Swayam / NPTEL)	
1	https://onlinecourses.nptel.ac.in/noc20_cs92/preview
2	https://nptel.ac.in/courses/110106072

Course Code	Course Name	Category	Hours / Week	Credits
25MSS27A	Applied Mathematics	Allied - II	4	3

Course Objectives

The Course intends to cover

- The fundamental concepts of Mathematics which emphasis on series, differentiation, integration, and statistics.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Recall the basic concepts of matrices in solving linear problems.	K1
CLO2	Relate and apply binomial, exponential, logarithmic & summation series	K1
CLO3	Remember the formulae and problems associated with differentiation.	K1
CLO4	Understand the various ideas of Partial Differentiation problems.	K2
CLO5	Apply the measures of central tendency and dispersion in data analysis.	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	1	1
3 - Substantial (High)		**2** - Moderate (Medium)		**1** - Slight (Low)	

Allied - II: Applied Mathematics

Unit	Content	No. of Hours
I	**Matrices:** Introduction to matrix - types of matrix - operations of matrix- determinant of a matrix – inverse of a matrix – rank of a matrix – eigen values and eigen vectors of a matrix (problems only).	12
II	**Differentiation:** Differential coefficient of algebraic, Exponential, logarithmic and trigonometric functions – differentiation of hyperbolic and inverse hyperbolic function.	12
III	**Differentiation:** Logarithmic differentiation – transformations – differentiation of implicit functions – differentiation of one function with respect to another. **Successive differentiation :** The n^{th} derivative – trigonometrical transformation.	12
IV	**Partial differentiation:** Successive partial derivatives-function of function rule- total differential coefficient-implicit function- homogeneous function -partial derivatives of a function of two functions.	12
V	**Measures of central tendency:** Mean, median, mode. **Measure of dispersion:** Range – standard deviation **Correlation:** Karl Pearson's coefficient of correlation – Spearman's rank correlation.	12
	Total Hours	**60**

Text Books

1.	R.Vittal (2004), Allied Mathematics, Margham publications. Unit-I : Chapter 5 : Page No. 5.1-5.37 , 5.50 – 5.73
2.	S. Narayanan., T.K. Manickavachagom Pillay (2009), Calculus (Vol. I), Viswanathan, S. Printers & Publishers Pvt Ltd. Unit II : Chapter 2 : Page No:24- 48 Unit III : Chapter 2 : Page No. 49-68 Chapter 3 : Page No.69- 77 Unit IV: Chapter 8 : Page No:178- 204
3.	Prof.A.R.Navnitham (2023) , Business Statistics and Mathematics, Jai Publishers Unit V: Chapter 7: Page No. 159-174,196 -209,212-238 Chapter 8: Page No. : 305-307,325-340. Chapter 12: Page No. 506 – 522.

Reference Book

1.	Dr.Venkataraman, M. K. (2012*).* Engineering Mathematics (Vol.2). National Publishing Company.

Web Resources (Swayam / NPTEL)

1.	https://archive.nptel.ac.in/courses/111/101/111101153/
2.	https://archive.nptel.ac.in/courses/111/101/111101164/

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. **'ypes 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**				
					Duration in Hours	**Max Marks**			**Credits**
						CIA	**ESE**	**Total**	
25TAM31L	I	Language – I	Tamil – III	3	3	25	75	100	3
25HIN31L			Hindi – III						
25MAL31L			Malayalam – III						
25FRE31L			French – III						
25ENG32L	II	Language – II	English – III	3	3	25	75	100	3
25MSS33C	III	Core – V	Object Oriented Programming with Java	6	3	25	75	100	4
25MSS34P	III	Core Lab - V	Java Programming Lab	4	3	40	60	100	3
25MSS35C	III	Core - VI	Data Structures and Applications	6	3	25	75	100	4
25MSS36P	III	Core Lab -VI	Data Warehousing and Data Pipeline Engineering Lab	4	3	40	60	100	3
25MSS37A	III	Allied - III	Discrete Structures	4	3	25	75	100	3
25BAT3FC/	IV	Foundation Course	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**	**27**

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	9
II	**ஊடகம் மற்றும் உளவியல் தமிழ்** ஊடகத்தின் இன்றியமையாமை - நிகழ்வுகளைச் செய்திகளாக வடிவமைத்தல் - ஊடகத் துறையில் மொழியின் பங்கு - உளவியல் வரையறை - உளவியல் பிரிவுகள் - வகுப்பறை உளவியல் (ஆசிரியர், மாணவர்)	9
III	**சுற்றுச்சூழலியல் மற்றும் சுற்றுலாவியல்** தமிழரின் சூழலியல் அறிவு - சுற்றுச்சூழல் மாசுபாடு - சுற்றுச்சூழல் பாதுகாப்பு - சுற்றுலா வகைகள் - உலகப் புகழ்பெற்ற சுற்றுலாத் தலங்கள் - சுற்றுலா வளர்ச்சி மற்றும் பயன்கள்	9
IV	**மேலாண்மைத் தமிழ் மற்றும் மொழிப்பயிற்சி** மேலாண்மையும் அணுகுமுறைகளும் - மேலாண்மை செயல்பாடுகள் மற்றும் வகைகள் - வகுப்பறை மேலாண்மை – நேர்காணல் - நூல் திறனாய்வு மற்றும் மதிப்பீடு - படிவங்கள் பூர்த்தி செய்தல் மற்றும் விண்ணப்பங்கள்	9
V	**பன்முக ஆளுமைகள்** ஜி.டி.நாயுடு(அறிவியல்) – பத்மஸ்ரீ டாக்டர் பக்தவத்சலம்(மருத்துவம்) - நா மகாலிங்கம்(தொழில்) - மயில்சாமி அண்ணாதுரை(விஞ்ஞானம்) - என் ஜி ராமசாமி(சமூகம்) - நம்மாழ்வார்(விவசாயம்)	9
	Total Hours	**45**

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)	9
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	9
III	**History of Hindi Literature :(Tippaniyan)** 1. Bhakthi kal ka samanya parichaya (Kabeer, Jaysi, Soor, Thulsi, Meera, Raskhan, Rahim)	9
IV	**Ras Chad & Alankar:** 1. Srungar & veer Ras 2. Anupras & Upama 3. Dhoha & Rola	9
V	**Translation : English-Hindi only** 1. Anuvadh Abhyas – III (16-30 Lessons Only)	9
	Total Hours	**45**
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	9
II	Poetry – Sishyanum makanum - Vallaththol Narayana Menon	9
III	Poetry - Rafeeque Ahammed (Selected poetries Thoramazha, Madhuranarangakal, Athrayum,Umma,Pakaram)	9
IV	Poetry-RafeequeAhammed(Selectedpoetries-Ammathottil,Vidhyalayam,	9
V	Thottakutty,Sivakami,Ithanu prarthana)	9
	Total Hours	**45**

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)	9
II	Communication(pg 93-97). Grammaire: pg(161-162)	9
III	Tout Le Monde s'amuse(pg 98-100). Grammaire: pg(163)	9
IV	Mots Et Expressions(pg 101-107). Grammaire: pg(164-167)	9
V	Communication(pg 108-120). Grammaire: pg(168-171)	9
Semester III Portions from Textbook « Nouvelle Génération A1» : UNITÉ 5, UNITÉ 6(Pg 82-120) Cahier d'exercices (Pg156-171)		
	Total Hours	**45**

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	9
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	9
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	9
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.	9
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.	9
	Total Hours	**45**

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
25MSS33C	Object Oriented Programming with Java	Core - V	6	4

Course Objectives

The course intends to cover

- OOPs and fundamentals of Java programming.
- Decision making with branching and looping.
- Multithreading, GUI concepts and memory management and file handling.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Remember OOPs concepts and overview of Java.	K1
CLO2	Understand the Java fundamentals, decision making, class & objects and string handling.	K2
CLO3	Apply arrays, inheritance, packages and multithreading concepts for structured, efficient and scalable programming.	K3
CLO4	Apply exception handling, swing and applets concepts in graphics programming.	K3
CLO5	Apply file stream for data and memory allocation to manage space used by streams and objects.	K3
K1 – Remember; **K2 -** Understand; **K3** – Apply;		

CLO – PLO Mapping

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

Core - V: Object Oriented Programming with Java

Unit	Content	No. of Hours
I	**Fundamentals of Object-Oriented Programming:** Object-Oriented Paradigm – Basic concepts of Object-Oriented Programming – Benefits of Object-Oriented Programming – Application of Object-Oriented Programming. **Java Evolution**: History – Features – How Java Differs from C and C++ – Java Buzzwords - Java and Internet – Java and WWW –Web Browsers. **Overview of Java**: Simple Java Program – Structure – Java Tokens – Statements – JVM Architecture - Java Virtual Machine - Java Runtime Environment - Java Development Kit - Command Line Arguments.	16
II	**Branching and Looping:** Constants, Variables, Data Types - Operators and Expressions. **Decision Making and Branching**: if, if...else, nested if, switch, ? : Operator. **Decision Making and Looping**: while, do, for – Jumps in Loops - Labeled Loops – Classes, Objects and Methods. **String Handling**: String Buffer Classes - String Builder - String Class Methods - String Tokenization.	17
III	**Arrays and Interfaces:** Arrays, Strings and Vectors – Interfaces - Types of Inheritance - Multiple Inheritance - Member AccessRules - Usage of this and Super Keyword - Method Overloading - Method Overriding. **Packages**: Putting Classes Together – Access Protection - Importing Packages - Multithreaded Programming.	19
IV	**Error Handling:** Managing Errors and Exceptions – Fundamentals & Types of Exceptions - Try, Catch, Finally Keywords - Built-in Exceptions - Creating Own Exception Classes - Applet Programming – Graphics Programming - **Event Handling**: Event - Event Sources - Handling Mouse and Keyboard Events. **Swing**: Fundamentals of Swing - Swing Characteristics - Swing Class Hierarchy - JavaFX GUI Programming Basics – JavaFX Event Handling.	19
V	**Managing Input/Output Files in Java:** Concepts of Streams - Stream Classes – Byte Stream Classes – Character Stream Classes – Using Streams – I/O Classes – File Class – I/O Exceptions – Creation of Files – Reading/Writing Characters, Byte-Handling Primitive Data Types – Random Access Files - Serialization and Deserialization. **Memory Allocation and Object Life Cycle**: Object Creation - Memory allocation in heap - Object Life Cycle - Finalization. Unlocking Generative AI for Java Developers.	19
	Total Hours	**90**
Text Books		
1.	Balagurusamy E, (2024), Programming with Java, 7th Edition, McGraw-Hill Education.	
2.	Schildt H, (2024), Java: The complete reference, 13th Edition, McGraw-Hill Education.	
Reference Books		
1.	John R.Hubbard, (2020), Programming with Java, 2nd Edition, TMH.	
2.	Patrick Naughton & Hebert Schildt, (2018), The Complete Reference Java 2, 3rd Edition, TMH.	
Web Resources (Swayam / NPTEL / Others)		
1.	https://onlinecourses.nptel.ac.in/noc19_cs84/preview	
2.	https://onlinecourses.nptel.ac.in/noc20_cs84/preview	
3.	https://medium.com/@swasbits/unlocking-generative-ai-for-java-developers-a-practical-rag-guide-1b7a8647db4d	

Course Code	Course Name	Category	Hours / Week	Credits
25MSS34P	Java Programming Lab	Core Lab – V	4	3

S. No.	List of Programs
1.	Program for Factorial of a number using command-line arguments.
2.	Create a switch statement to print the day according to their equivalent number.
3.	Sort the array integer elements in descending order.
4.	Program to implement method overloading.
5.	Program to implement method overriding.
6.	Implement Abstract class with an abstract method.
7.	Count the Characters, Digits and Special Characters from the given String.
8.	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.	Program to implement Vector Operations.
10.	Implement the concept of Multiple Inheritance using Interfaces.
11.	Program to implement an Arithmetic and ArrayIndexOutOfBound Exception.
12.	Create a user-defined Exception called PayOutOfBound and throw the Exception.
13.	Program to implement the concept of Multithreading with the use of any three multiplication tables and assign three different priorities to them.
14.	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.	Applet Program to draw several shapes using Paint method.
16.	Program to draw circle, square, ellipse and rectangle at the mouse click positions.
17.	Program which opens an existing file and appends text to that file.
	Total Hours **60**
Text Books	
1.	Balagurusamy E (2023), Programming with Java, 7th Edition, McGraw-Hill Education.
2.	Schildt H (2024), Java: The complete reference, 13th Edition, McGraw-Hill Education.
Reference Books	
1.	John R. Hubbard (2020), Programming with Java, 2nd Edition, TMH.
2.	Patrick Naughton & Hebert Schildt (2018), The Complete Reference Java 2, 3rd Edition, TMH.
Web Resources (Swayam / NPTEL)	
1	https://onlinecourses.nptel.ac.in/noc19_cs84/preview
2	https://onlinecourses.nptel.ac.in/noc20_cs84/preview

Course Code	Course Name	Category	Hours / Week	Credits
25MSS35C	Data Structures and Applications	Core - VI	6	4

Course Objectives

The course intends to cover

- Elementary data structures and various algorithms.
- Data representation techniques such as Stack, Queue, List, Trees, Graphs.
- Sorting and searching methods.
- Symbol table, Hash table, Dynamic hashing and Min-Max Heap.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Recite fundamentals of algorithms and elementary data structures.	K1
CLO2	Understand various types of linked lists and dynamic storage management.	K2
CLO3	Apply the concepts of trees and graphs in real world problems.	K3
CLO4	Analyze symbol and hash tables, dynamic hashing and Min-Max heap concepts to retrieve and manage the data effectively.	K4
CLO5	Apply various sorting mechanisms to rearrange data in specific order.	K3
K1 – Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze;		

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 - VI: Data Structures and Applications

Unit	Content	No. of Hours
I	**Introduction**: Introduction of Algorithms - Analyzing Algorithms. **Arrays**: Sparse Matrices – Representation of Arrays - Stacks and Queues Fundamentals – Evaluation of Expression - Infix to Postfix Conversion – Multiple Stacks and Queues. 1. C program to implement matrix operations using arrays. 2. Implementation of sparse matrix using C. 3. Array implementation of Stack and Queue using C. 4. Implement infix to postfix conversion and evaluation of postfix expression using C.	18
II	**Linked List**: Singly Linked List – Linked Stacks and Queues –Polynomial Addition – More on Linked Lists – Doubly Linked List and Dynamic Storage Management – Garbage Collection and Compaction. 1. Implementation of Linked List, Doubly Linked List and Circular Linked List using C. 2. Implement Linked Stack and Linked Queue using C.	18
III	**Trees**: Basic Terminology – Binary Trees – Binary Tree Representations –Binary Trees – Traversal – More on Binary Trees – Binary Tree Representation of Trees–Council Binary Trees. **Binary Search Tree**: Introduction – Searching a BST – Inserting into BST – Delete from BST. Decision Tree in Machine Learning. **Graphs**: Terminology and Representations – Traversals - Shortest Paths - Connected Components and Spanning Trees. 1. Implement Binary Tree and Binary Tree traversal techniques using C. 2. Implement the BFS and DFS traversals using C.	18
IV	**Symbol Tables**: Static Tree Tables – Dynamic Tree Tables. **Hash Tables**: Hashing Functions – Overflow Handling – Distributed Hash Tables. **Dynamic Hashing**: Dynamic Hashing using Directories – Analysis of Directory Dynamic Hashing – Directory Less Dynamic Hashing. **Min-Max Heap**: Definition – Insertion into a Min-Max Heap. 1. Program to insert elements into a static tree (array representation) using C. 2. Implement a hash table using division (mod) hashing method using C. 3. Implement insertion in a Min-Max Heap using C.	18
V	**Internal Sorting**: Insertion Sort – Quick Sort – 2 Way Merge Sort – Heap Sort – Bubble Sort - Shell Sort – Sorting on Several Keys. **Searching**: Linear Search – Binary Search. 1. Implement the sorting techniques: insertion sort, selection sort, bubble sort and quick sort using C. 2. Implement searching techniques: Binary search using array, Linear search using C.	18
	Total Hours	**90**

Text Books	
1.	Ellis Horowitz, Sartaj Sahni, (2018), Fundamentals of Data Structures, 2nd Edition, Computer Science Press.
2.	Ellis Horowitz, Sartaj Sahni, Susan Anderson, (1993), Fundamentals of Data Structures in C, 2nd Edition, Computer Science Press.
3.	Narasimha Karumanchi, (2016), Data Structures and Algorithms Made Easy, 5th Edition, CareerMonk Publications.
Reference Books	
1.	Mark Allen Weiss, (2020), Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education Asia.
2.	Marcello La Rocca (2021), Advanced Algorithms and Data Structures, Manning Publications.
Web Resources (Swayam / NPTEL / Others)	
1.	https://onlinecourses.swayam2.ac.in/e-learning/preview/nou24_cs06
2.	https://onlinecourses.swayam2.ac.in/e-learning/preview/cec19_cs04
3.	https://onlinecourses.swayam2.ac.in/e-learning/preview/aic20_sp06
4.	https://www.geeksforgeeks.org/machine-learning/decision-tree-introduction-example/

Course Code	Course Name	Category	Hours / Week	Credits
25MSS36P	Data Warehousing and Data Pipeline Engineering Lab	Core Lab – VI	4	3

Unit	Content	No. of Hours
I	**Data Warehousing & Dimensional Modeling:** Data Warehousing Concepts – OLTP vs OLAP – Data Warehouse Architecture (Three-Tier Architecture) – Fact Tables and Dimension Tables – Star Schema – Snowflake Schema – Slowly Changing Dimensions (Type 1, Type 2) – Data Marts – Data Lake vs Data Warehouse vs Lakehouse 1. Program to design a simple Star Schema for Sales Data. 2. How to implement Fact and Dimension tables using SQL. 3. How to perform OLAP queries using GROUP BY and Aggregation Functions.	12
II	**ETL & Data Integration:** ETL vs ELT Concepts – Data Extraction from CSV Files – Data Extraction from Databases – Data Cleaning using Python (Pandas) – Handling Missing Values – Data Transformation Techniques – Loading Data into MySQL/PostgreSQL – Introduction to Workflow Scheduling – Basics of Apache Airflow – Building Simple Automated Data Pipelines 1. Program to build a simple ETL pipeline using Python. 2. Program to clean and transform real-world datasets. 3. Program to load transformed data into a database.	12
III	**Real-Time Data Processing:** Batch Processing vs Stream Processing – Introduction to Apache Kafka – Kafka Architecture (Producer, Broker, Consumer, Topic) – Creating Kafka Topics – Sending Data using Producer – Receiving Data using Consumer – Introduction to Spark Structured Streaming – Window Operations – Real-Time Aggregations – Handling Streaming Data 1. Program to simulate real-time data using Kafka. 2. Program to consume streaming data using Spark. 3. Program to perform window-based aggregation.	12
IV	**Open-Source Data Engineering Tools & Storage:** Local Storage Concepts – File Systems in Data Engineering – Structured vs Semi-Structured Data – Data Storage Formats (CSV, JSON, Parquet, ORC) – Columnar vs Row-Based Storage – Introduction to Data Lakes (Concept Only) – Working with Parquet using PySpark – SQLite/PostgreSQL as Analytical Storage – Introduction to Docker (Basic Container Concept) – Version Control using Git – Data Backup and Local Archiving Strategies 1. Program to convert CSV files into Parquet format using PySpark. 2. Program to compare file size and performance between CSV and Parquet. 3. How to use Docker to run a database container locally.	12

Unit	Content	No. of Hours
V	**Data Pipeline Optimization and Governance:** Data Pipeline Architecture – Query Optimization Techniques – Indexing and Partitioning – Performance Tuning – Data Security Concepts – Data Encryption Basics – Data Governance Principles – Metadata Management – Monitoring and Logging in Data Pipelines – End-to-End Mini Data Engineering Project 1. SQL Query optimization using indexing. 2. How to monitor and log ETL pipelines.	12
	Total Hours	**60**
Text Book		
1.	Ralph Kimball & Margy Ross, Wiley, (2013), The Data Warehouse Toolkit, 3rd Edition, John Wiley & Sons, Inc.	
Reference Books		
1.	Martin Kleppmann, (2017), Designing Data-Intensive Applications, 2nd Edition, O'Reilly.	
2.	Paul Crickard, (2020), Data Engineering with Python, Packt Publishing.	
3.	Tyler Akidau, Slava Chernyak & Reuven Lax, (2018), Streaming Systems, O'Reilly.	
Web Resources (Swayam / NPTEL)		
1.	https://onlinecourses.nptel.ac.in/noc20_cs92/preview	
2.	https://nptel.ac.in/courses/106106179	

Course Code	Course Name	Category	Hours / Week	Credits
25MSS37A	Discrete Structures	Allied-III	4	3

Course Objectives

The course intends to cover

- The foundations in set theory, graph theory, logic, boolean algebra and lattices.
- The structures for computational applications such as trees, graphs, and automata.
- The applications of formal languages and its representation in regular expressions with finite state machine

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Recall the basic terminology of sets.	K1
CLO2	Understand the concepts of graph theory through technical representation.	K2
CLO3	Apply the concepts of logical connectives and tautological implications in data analysis.	K3
CLO4	Apply the fundamentals of boolean algebra and lattice theory in problem representation.	K3
CLO5	Apply regular expressions, grammars, and finite-state automata to represent and analyze formal languages.	K3,K4
K1 - Remember; **K2** – Understand; **K3** – Apply; **K4**-Analyze		

CLO – PLO Mapping

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

Allied - III: Discrete Structures

Unit	Content	No. of Hours
I	**Set Theory:** Set & its Elements-Set Description-Types of Sets-Venn- Euler Diagrams- Set Operations & Laws of Set Theory-Fundamental Products-Partitions of Sets-Minsets- Algebra of Sets and Duality-Inclusion and Exclusion Principle.	12
II	**Graph Theory:** Basic Terminology – Paths, Cycle & 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 - Rule-based AI chatbots for pattern matching in Expressions.	12
	(Problems- 80% & Theory - 20%)Total Hours	**60**
Text Book		
1.	J.K. Sharma, (2022),Discrete Mathematics,2nd Edition, Macmillan India Ltd. Unit I : Chapter 1 : Section 1.1 – 1.7, 1.9,1.10,1.12,1.14 Unit II: Chapter 9 : Section 9.1 – 9.5, 9.8, Chapter10 : Section 10.1 -10.3, 10.6, 10.8 Unit III: Chapter12 : 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: Chapter15 : Section 15.3 – 15.7	
Reference Books		
1.	J. P. Tremblay(2016), R. Manohar, Discrete Mathematics Structures with Applications to Computer Science, McGraw Hill International Edition.	
2.	M. K. Venkataraman(2007), N. Sridharan. & N. Chandarasekaran, Discrete Mathematics, National Publishing Company, Chennai.	
Web Resources (Swayam / NPTEL/Others)		
1.	https://archive.nptel.ac.in/courses/111/106/111106086/	
2.	https://www.researchgate.net/publication/391531842_Automata_theory_and_formal_language_in_artificial_intelligence	

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**