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 2024-25 for Postgraduate Programme

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

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

(Applicable for the Students Admitted During the Academic Year 2024-25 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 /2024/9206 dated 24/5/2024).

Program Learning Outcomes (PLOs)

The successful completion of the M.Sc. Software System 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 System
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	4 X 3	12	12	1 - 4
II	Language-II	4	4 X 3	12	4 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 – 2, 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)	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		7 & 10
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	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	2	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	-	-	-	-	-	12	-	-	**-**	**12**
8	-	-	-	-	30	26	-	-	**30**	**26**
9	-	-	-	-	30	28	-	-	**30**	**28**
10	-	-	-	-	-	12	-	-	**-**	**12**
Total	**12**	**12**	**12**	**12**	**208**	**200**	**8**	**10**	**240**	**234**

Curriculum

M.Sc. Software System

Semester – 1									
Course Code	**Part**	**Course Category**	**Course Name**	**Hours/ Week**	**Examination**				**Credits**
					Duration in Hours	**Max Marks**			
						CIA	**ESE**	**Total**	
24TAM11L	I	Language – I	Tamil – I	3	3	25	75	100	3
24HIN11L			Hindi – I						
24MAL11L			Malayalam – I						
24FRE11L			French – I						
24ENG12L	II	English – I	English – I	3	3	25	75	100	3
24MSS13C	III	Core – I	C Programming	5	3	25	75	100	4
24MSS14P	III	Core Lab -I	**Lab:** C Programming	4	3	40	60	100	3
24MSS15C	III	Core – II	Digital Electronics and Microprocessor	5	3	25	75	100	4
24MSS16P	III	Core Lab-II	**Lab:** HTML	4	3	40	60	100	3
24MSS17A	III	Allied – I	Numerical Methods	4	3	25	75	100	3
24QUA1AE	IV	AECC - I	Quantitative Aptitude	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**	
24TAM21L	I	Language – II	Tamil – II	3	3	25	75	100	3
24HIN21L			Hindi – II						
24MAL21L			Malayalam – II						
24FRE21L			French – II						
24ENG22L	II	Language – II	English – II	3	3	25	75	100	3
24MSS23C	III	Core – III	C++ Programming	5	3	25	75	100	4
24MSS24P	III	Core Lab -III	**Lab:** C++ Programming	4	3	40	60	100	3
24MSS25C	III	Core - IV	Data Structures	5	3	25	75	100	4
24MSS26P	III	Core Lab-IV	**Lab:** Data Structures	4	3	40	60	100	3
24MSS27A	III	Allied - II	Applied Mathematics	4	3	25	75	100	3
24SOF2AE	IV	AECC - II	Soft Skills	2	2	-	50	50	2
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**	
24TAM31L	I	Language – I	Tamil – III	3	3	25	75	100	3
24HIN31L			Hindi – III						
24MAL31L			Malayalam – III						
24FRE31L			French – III						
24ENG32L	II	Language – II	English – III	3	3	25	75	100	3
24MSS33C	III	Core – V	Java Programming	6	3	25	75	100	4
24MSS34P	III	Core Lab - V	**Lab:** Java Programming	4	3	40	60	100	3
24MSS35C	III	Core - VI	Operating System and Linux	6	3	25	75	100	4
24MSS36P	III	Core Lab - VI	**Lab:** Linux Programming	4	3	40	60	100	3
24MSS37A	III	Allied - III	Discrete Structures	4	3	25	75	100	3
24BAT3FC /	IV	Foundation Course	Basic Tamil /	-	2	50	-	50	2
24ADT3FC/			Advanced Tamil /						
24IKS3FC			Indian Knowledge Systems*						
24MOO3AE	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**				
					Duration in Hours	**Max Marks**			**Credits**
						CIA	**ESE**	**Total**	
24TAM41L/	I	Language - I	Tamil-IV/	3	3	25	75	100	3
24HIN41L /			Hindi-IV/						
24MAL41L			Malayalam-IV/						
24FRE41L			French-IV						
24ENG42L	II	Language - II	English - IV	3	3	25	75	100	3
24MSS43C	III	Core - VII	Relational Database Management System	4	3	25	75	100	4
24MSS44P	III	Core Lab - VII	**Lab:** Relational Database Management System	4	3	40	60	100	3
24MSS45C	III	Core - VIII	Visual Programming	4	3	25	75	100	4
24MSS46P	III	Core Lab - VIII	**Lab:** Visual Programming Lab	4	3	40	60	100	3
24MSS47A	III	Allied - IV	Operations Research	4	3	25	75	100	3
24MSS48P	III	SEC Lab - I	**Lab:** Arduino Programming Essentials Lab	2	3	40	60	100	2
24IDT4AE	IV	AECC - IV	Innovation and Design Thinking	2	2	-	50	50	2
24IPR4AE			Intellectual Property Rights						
24END4AE			Entrepreneurship Development						
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**	
24MSS51C	III	Core – IX	Programming with Python	5	3	25	75	100	4
24MSS52P	III	Core Lab - IX	Programming with Python Lab	4	3	40	60	100	3
24MSS53C	III	Core - X	Web Designing and Applications	5	3	25	75	100	4
24MSS54P	III	Core Lab - X	Web Application Development and Hosting Lab	4	3	40	60	100	3
24MSS55C	III	Core - XI	Computer Networks	4	3	25	75	100	4
24MSS5AE/	III	Elective - I	Exploratory Data Analysis **(Data Science)**	5	3	25	75	100	4
24MSS5BE/			Blockchain Technology and Applications **(Cyber Security)**						
24MSS5CE			Data Preprocessing and Visualization **(Machine Learning)**						
24MSS56P	III	SEC Lab-II	Raspberry Pi Lab	2	3	40	60	100	2
24MSS57I	III	SEC	Internship	-	2	50	-	50	2
Total				**30**				**750**	**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 Using R	4	3	40	60	100	3
	III	Core - XIII	Graphics and Multimedia	4	3	25	75	100	4
	III	Core Lab-XII	Graphics and Multimedia Lab	4	3	40	60	100	3
	III	Core - XIV	Software Engineering	4	3	25	75	100	4
	III	Core - XV	Advanced Operating Systems	4	3	25	75	100	4
	III	Elective – II	Big Data Analytics **(Data Science)**	5	3	25	75	100	4
			Ethical Hacking **(Cyber Security)**						
			Neural Networks and Deep Learning **(Machine Learning)**						
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	-	-	80	120	200	12
Total				**-**	**-**			**200**	**12**

Semester – 8									
Course Code	**Part**	**Course Category**	**Course Name**	**Hours / Week**	**Examination**				
					Duration in Hours	**Max Marks**			**Credits**
						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	4	3	25	75	100	4
	III	Core Lab-XIV	Software Testing Lab	4	3	40	60	100	3
	III	Core - XVIII	Network Security and Cryptography	4	3	25	75	100	4
	III	Core - XIX	Data Science and Analytics	4	3	25	75	100	4
	III	Elective - III	Social Network Analysis **(Data Science)**	5	3	25	75	100	4
			Digital and Mobile Forensics **(Cyber Security)**						
			Generative AI and Prompt Engineering **(Machine Learning)**						
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 - III	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	12
Total				**-**	**-**	**80**	**120**	**200**	**12**
Grand Total				**240**				**6350**	**234**

Semester – 1

Part – I : Language I

(All the Undergraduate Programmes)

Course Code	Course Name	Category	Hours / Week	Credits
24TAM11L	Tamil - I	Part - I	3	3

Course Objectives

The course intends to cover

- இலக்கிய வளர்ச்சியை அறிந்துகொள்ளுதல்
- 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 அறிந்துகொள்ளுதல்.	K2, K3
CLO3	சிறந்த படைப்பாளர்களின் சிறுகதையில் வெளிப்படும் சமூகச்சிந்தனைகளை 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 பெறுதல்.	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 - கவிமணி 4. தேவதேவன் கவிதைகள் - தேவதேவன் • சாலையும் மரங்களும் செருப்பும் • புதிய வீடு 5. ஆலாபனை - கவிக்கோ அப்துல் ரகுமான் • போட்டி • பாதை 6. புத்தகச் சந்தை - கவிஞர் வாலி	14
II	**(சமூகம்)** 1. எட்டாவது சீர்..... - ஈரோடு தமிழன்பன் 2. தொலைந்து போனேன் - கவிஞர் தாமரை 3. திருநங்கைகள் காகிதப் பூக்கள் - நா. காமராசன் 4. மரங்களைப் பாடுவேன் - வைரமுத்து 5. புள்ளிப் பூக்கள் (ஹைக்கூ) - அமுத பாரதி 6. நாட்டுப்புறப் பாடல்கள் • தாலாட்டுப் பாடல், தெம்மாங்கு பாடல், உழவுத்தொழில்	14
III	**(சிறுகதை)** 1. அகல்யை - புதுமைப்பித்தன் 2. சுமைதாங்கி - ஜெயகாந்தன் 3. அம்மா ஒரு கொலை செய்தாள் - அம்பை 4. சோற்றுக் கணக்கு - ஜெயமோகன் 5. தூரத்து உறவு - வைரமுத்து	12

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

Reference Books	
1	பாரதி பாடல்கள் ஆய்வுப் பதிப்பு, பேரா. ம ரா போ குருசாமி,(2016) தமிழ்ப் பல்கலைக் கழகம், தஞ்சாவூர்
2	ஆலாபனை, அப்துல் ரகுமான்,(2000) கவிக்கோ பதிப்பகம்
3	தாமரை கவிதைகள், தாமரை, (2012) நியூ செஞ்சுரி புக் ஹவுஸ்
4	தமிழ் இலக்கிய வரலாறு, மு வரதராசனார், (2021) சாகித்திய அகாதெமி பதிப்பு
5	புதிய வெளிச்சத்தில் தமிழ் இலக்கிய வரலாறு, முனைவர் க பஞ்சாங்கம், (2017) அன்னம் வெளியீட்டு
6	தமிழ் இலக்கிய வரலாறு, முனைவர் கா கோ வேங்கடராமன்,(2008) கலையக வெளியீடு
7	நல்ல தமிழ் எழுத வேண்டுமா?, அ கி பரந்தாமனார் எம். ஏ., (2002)அல்லி நிலையம்
8	100 சிறந்த சிறுகதைகள் (தொகுதி 1 & 2) தொகுப்பு: எஸ் ராமகிருஷ்ணன் (2006) பதிப்பகம்: தேசாந்திரி பதிப்பகம்
9	தமிழ் இலக்கணம் எளிய அறிமுகம் , கோ குமரன் (2010) சந்தியா பதிப்பகம்
10	நாட்டுப்புற இயல் ஆய்வு, சு சக்திவேல்,(2012) மணிவாசகர் பதிப்பகம்

Part – II : Language II - English -I

(All the Undergraduate Programmes)

Course Code	Course Name	Category	Hours / Week	Credits
24ENG12L	**English - I**	**Part – II**	**4**	**3**

Course Objectives

The course intends to cover

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

Course Learning Outcomes

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

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

Part - II: English - I

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

Text Books

1.	Zama, M. (2004). Poetry Down the Ages. Orient Blackswan.
2.	Goldsmith, O. (1869). The Works of Oliver Goldsmith. J. Dicks
3.	Bacon, F., & Montagu, B. (1857). The Works of Francis Bacon (Vol. 1). Parry & McMillan.

Reference Books

1.	Kumar,V. T. Bhavani, Durga.K. Srinivas.YL. (2018). English in use - A textbook for College Students. (English, Paperback).
2.	Swan, M. (2005). Practical english usage (Vol. 7). Oxford: Oxford university press.

Web Resources (Swayam / NPTEL)

1.	https://nptel.ac.in/courses/109105205

Course Code	Course Name	Category	Hours / Week	Credits
24MSS13C	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 – Hierarchy of Programming Languages – Classifications of Programming Languages – Popular Programming Languages – Program development process – Characteristics of a Good Program – Program Development Process – Error in Programming.	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 Low Level Programming in C – Calling BIOS and DOS Interrupts – Port I/O Functions to Access CMOS – Keyboard and Speaker – Writing into Video Buffer.	15
	Total Hours	**75**
Text Books		
1.	Yeswanth Kanetkar (2022), Let us C, 19th Edition, BPB.	
2.	Yeswanth Kanetkar TSR through C, BPB.	
Reference Books		
1.	Balagurusamy.E (2019), Programming in ANSI C, 8th Edition, Tata McGraw Hill.	
2.	Ashok N.Kamthane (2006), Programming with ANSI and Turbo C, Pearson Education Asia.	
3.	Deitel & Deitel (2010), C How to Program, 6th Edition, PHI/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
24MSS14P	Lab: 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.	Yeswanth Kanetkar (2022), Let us C, 19th Edition, BPB.	
2.	Yeswanth Kanetkar TSR through C, BPB.	
Reference Books		
1.	Balagurusamy.E (2019), Programming in ANSI C, 8th Edition, Tata McGraw Hill.	
2.	Ashok N.Kamthane (2006), Programming with ANSI and Turbo C, Pearson Education Asia.	
3.	Deitel & Deitel (2010), C How to Program, 6th Edition, PHI/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
24MSS15C	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, Octal, Decimal, Hexadecimal Number - Binary Arithmetic, Subtraction, Multiplication - One's and Two's Complements Arithmetic. **Codes:** Grey Code, Error Detecting and Correcting Codes. **Logic Gates:** AND, OR, NOT, NAND, NOR, and Exclusive-OR operations, Boolean algebra, Basic Laws.	15
II	**Combinational Circuits:** Standard representation for logic functions, K-map representation and simplification of logic functions using K-map, minimization of logical functions- Don't care conditions. Half Adders – Full Adder- Half Subtractors - Full Subtractors – Parallel Binary Adder - 4 Bit Binary Adder/Subtractor - BCD Adder – Multiplexer and Demultiplexer - Priority Encoders and Decoders - Digital comparator.	15
III	**Sequential Circuits:** SR flip flop, Clocked SR Flip Flop – JK Flip Flop – D Flip Flops - T Flip Flop - Applications of Flip Flops. Shift Registers and Its Types - Applications of shift Registers. Ring Counter - Ripple (Asynchronous) counters - Synchronous Counters - Up down Counter – Mod – 3 and Mod - 5 Counter – Decade Counter - Applications of Counters.	15
IV	**8085 Microprocessors:** Pin Diagram – Architecture of 8085 - bus organization-registers- ALU- control section- instruction format- data format- addressing modes-Programming the 8085: Arithmetic and Logical Programs. Memory Read Machine Cycle – Memory Write Machine Cycle.	15
V	**I/O Interfacing:** I/O interfacing – Parallel communication interface (8255 PPI) - Serial communication interface (8251 USART) - Interrupts - Interrupt controller (8259) – DMA controller – Programming and applications Case studies: Time Delay Program – Traffic Light Control System – Water Level Controller–Stepper Motor Control – Interfacing DAC – Interfacing ADC – Temperature Measurement.	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
24MSS16P	Lab: HTML	Core Lab - II	4	3

S. No.	List of Programs	
1.	Develop a static web page using basic formatting tags.	
2.	Develop a web page using the concept of hyperlink.	
3.	Create a web page using various attributes of table tag.	
4.	Develop a HTML document to display Text ordered and unordered Lists.	
5.	Display images and texts using image tag and it's various attributes.	
6.	Develop a website using frames and frameset tag.	
7.	Design a webpage using form tag and it's elements.	
8.	Create a style sheet that defines the style with class method, id method.	
9.	Create an internal style sheet that defines style for positioning elements and setting the background color / image.	
10.	Perform basic arithmetic operations using JavaScript.	
11.	Create a JavaScript program to access various HTML elements.	
12.	Perform form fields validation using JavaScript.	
	Total Hours	**60**
Text Books		
1.	MG Martin (2018), HTML: Basic Fundamental Guide for Beginners.	
2.	Jon Duckett (2010), Beginning HTML, XHTML, CSS, and JavaScript, Wiley Publishing.	
Reference Books		
1.	C.Xavier (2007), World Wide Web Design with HTML, TMH.	
2.	Faithe Wempen (2012), HTML 5 Step by Step, Microsoft Press, PHI.	
3.	David Sawyer McFarland (2009), CSS – The Missing Manual, 2nd Edition, Pogue Press, O'Reilley Willey Publishing.	
Web Resources (Swayam/NPTEL)		
1.	https://onlinecourses.swayam2.ac.in/aic20_sp11/preview	

Course Code	Course Name	Category	Hours / Week	Credits
24MSS17A	Numerical Methods	Allied – I	4	3

Course Objectives

The Course intends to cover

The ability to use algorithms for approximation problems.

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	Determine the numerical solutions of simultaneous linear equations using different methods.	K2
CLO3	Compute the numerical solutions of differentiation of functions.	K2
CLO4	Evaluate the definite integrals using numerical methods.	K3
CLO5	Distinguish methods of Taylor series, Euler's, Modified Euler's and Runge Kutta methods to find solutions of differential equations.	K4
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze		

CLO – PLO Mapping

CLOs/PLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	2	2	2	1	2
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 Methods

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 - Convergence Criteria – Order of Convergence.	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 $1/3^{rd}$ and $3/8^{th}$ rules.	12
V	**Numerical Solution of 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. Gunavathy (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, 4^{th} Edition, Prentice Hall of India Pvt. Ltd.,

Web Resources (Swayam / NPTEL)

1.	https://archive.nptel.ac.in/courses/111/107/111107105/

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

Max Marks	Marks for		Components for CIA											
	CIA	ESE	CIA – I		CIA – II		Best of CIA-I & CIA-II	Model		Attendance	Active Engagement	Total
100	25	75	Actual	Weightage	Actual	Weightage	Weightage	Actual	Weightage	5	5	25
			50	5	50	5	5	75	10			

Question Paper Pattern

Component	Duration in Hrs.	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 – I &II	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 – I		Test - II		Model		Observation	Total
100	40	60	Actual	Weightage	Actual	Weightage	Actual	Weightage	5	40
			50	10	50	10	60	15		

Examination Pattern

Component	Duration in Hrs.	Marks			Weightage
		Practical	Record	Total Marks	
Test – I	2	50	-	50	10
Test – II	2	50	-	50	10
Model	3	60	-	60	15
ESE	3	50	10	60	-

Part – IV : Ability Enhancement Compulsory Courses

(All the Undergraduate Programmes)

Course Code	Course Name	Category	Hours/Week	Credits
24QUA1AE	Quantitative Aptitude	AECC - I	2	2

Course Objectives

The course intends to cover

- Basic concepts of numbers, time and work, interests, data representation and graphs
- Concepts of permutation, probability, discounts, percentage & profit loss.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Remember and Understand the concepts of numbers and average	K1, K2
CLO2	Understand about percentage and apply profit & loss related processing.	K2, K3
CLO3	To understand the concepts of time and work and interest calculations.	K2
CLO4	To understand about the concepts of permutation, combination and probability.	K2
CLO5	Understand , Apply and analyze the concept of problem solving involved in graphs and age.	K2,,K3,K4
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** -Analyze		

Ability Enhancement Compulsory Course - I: Quantitative Aptitude

Unit	Content	No. of Hours
I	Numbers - Simplification - BODMAS rule - Algebraic formulas - Decimal fractions - Square root and cube roots - Surds and indices - Divisibility rules - HCF and LCM - same remainder - different remainder - application problems – average – equation - mistaken value – replacement - including/excluding.	6
II	Percentage - increase/decrease – netchange – salary – election – marks – consumption - population / machine - profit and loss - profit and loss % - finding cp and sp - profit=loss - same product cp and sp with percentage – discount - ratio and proportion - divided into parts - based on numbers - increase/decrease/ income / expenditure – coins – partnership.	6
III	Time-and-work - individual/combined - alternative days - remaining work - efficiency based - amount split - chain rule - group of male and female or boys - pipes and cistern - finding time - efficiency based – alternative - remaining part - capacity of the tank - simple interest - finding principal - rate of interest – amount -time period - doubles or triples - compound interest - finding rate - finding time, principal - doubles or triples - difference between SI and CI.	6
IV	Permutation - finding value - vowels come together - vowel never comes together - some letters come together - no two vowels come together - vowels in odd/even places - based on repetition - circular permutation – application – combination - finding value and application – probability – coins - dice-cards - balls and miscellaneous problems - odd man out and number series.	6
V	Clock - finding angle - reflex angle - gain or loss – calendars - finding particularday - data interpretation - bar chart - line chart - pie chart – table – combined –ages ratio-twice or thrice - addition /subtraction - family based - problems on numbers - equations.	6
	Total Hours	**30**
Text Book		
1.	R.S. Aggarwal , Quantitative Aptitude, S.Chand & Company Ltd.,	
Reference Book		
1.	Ashish Arora, Quantitative Aptitude.	
Web Resources		
1.	https://www.javatpoint.com/aptitude/quantitative	
2.	https://www.indiabix.com/aptitude/questions-and-answers/	

Components for and Distribution of Marks for ESE (Theory)
Ability Enhancement Compulsory Course(AECC)

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**	
24TAM21L	I	Language – II	Tamil – II	3	3	25	75	100	3
24HIN21L			Hindi – II						
24MAL21L			Malayalam – II						
24FRE21L			French – II						
24ENG22L	II	Language – II	English – II	3	3	25	75	100	3
24MSS23C	III	Core – III	C++ Programming	5	3	25	75	100	4
24MSS24P	III	Core Lab -III	**Lab:** C++ Programming	4	3	40	60	100	3
24MSS25C	III	Core - IV	Data Structures	5	3	25	75	100	4
24MSS26P	III	Core Lab-IV	**Lab:** Data Structures	4	3	40	60	100	3
24MSS27A	III	Allied - II	Applied Mathematics	4	3	25	75	100	3
24SOF2AE	IV	AECC - II	Soft Skills	2	2	-	50	50	2
Total				**30**				**750**	**25**

Course Code	Course Name	Category	Hours /Week	Credits
24TAM21L	Tamil – II	Language - II	4	3

Course Objectives

The Course intends to cover

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

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	அற இலக்கியங்கள் வழி வாழ்வியல் ஒழுக்கங்களைக் கற்றுத் தருதல்.	K1, K2
CLO2	பக்தி இலக்கியங்கள் வழி பக்தி நெறிகளை உணர்த்துதல்.	K2
CLO3	தமிழில் உரைநடை இலக்கியப் படைப்பாளர்களின் சிந்தனைகளை எடுத்துரைத்தல்.	K3
CLO4	தமிழ் இலக்கிய வரலாற்றில் அற இலக்கியம் மற்றும் உரைநடையின் தாக்கம் குறித்து அறிதல்.	K1, K3
CLO5	பிழையின்றி எழுத இலக்கணங்களைக் கற்றுத் தருதல்.	K2, K3
K1 - Remember; **K2** - Understand; **K3** – Apply		

Part – I: Tamil – II

Unit	Content	No. of Hours
I	**(அறம்)** 1. திருக்குறள் • புகழ் • வினை செயல்வகை • நெஞ்சொடு கிளத்தல் 2. திரிகடுகம்(தேர்ந்தெடுக்கப்பட்ட 10 பாடல்கள்) 3. பழமொழி நானூறு(தேர்ந்தெடுக்கப்பட்ட 10 பாடல்கள்)	**14**
II	**(பக்தி)** 1. அபிராமி அந்தாதி(10 பாடல்கள்) - அபிராமி பட்டர் 2. உமர்கயாம் பாடல்கள் (தனிப்பாடல்கள்) - கவிமணி தேசிய விநாயகம் பிள்ளை 3. முத்துக்குமாரசாமி பிள்ளைத்தமிழ்(தாலப் பருவம்) – குமரகுருபரர் 4. இயேசுகாவியம் - மலைப்பொழிவு - கண்ணதாசன் 5. சித்தர் பாடல்கள் - சிவவாக்கியர் பாடல்	**14**
III	**(கலை மற்றும் பண்பாடு)** 1. அறம் எனப்படுவது - அமுதன் 2. ஏட்டில் எழுதா இலக்கியம் - ஔவை துரைச்சாமி 3. கீழடி - தொல்லியல் துறை, வெளியீடு 4. மனம் எனும் சொர்க்கவாசல் - டாக்டர் எம்.எஸ்.உதயமூர்த்தி 5. ஆளுமைத் திறன் - அறிவுக்கதிர் (அரசுப்பணி சிறப்பிதழ்)	**12**
IV	**(இலக்கிய வரலாறு)** 1. பதினெண் கீழ்க்கணக்கு நூல்கள் 2. உரைநடையின் தோற்றமும் வளர்ச்சியும்	**10**
V	**(இலக்கணம்)** 1. சொல்லின் வகைகள் 2. வேற்றுமைத் தொகைகள் 3. பயிற்சிக்குரியன:(விண்ணப்பங்கள், மடல்கள் எழுதச் செய்தல்)	**10**
	Total Hours	**60**

Reference Books	
1	முத்துக்குமாரசாமி பிள்ளைத்தமிழ்,(2021) கமலா முருகன், சாரதா பதிப்பகம்
2	இயேசு காவியம், கவிஞர் கண்ணதாசன்,(2006) கலைக்காவிரி பதிப்பகம்
3	உரைகளும் உரையாசிரியர்களும்,(2013) தி சு நடராசன் நியூ செஞ்சுரி புக் ஹவுஸ்
4	அபிராமி அந்தாதி, முனைவர் சி சேதுராமன்,(2010) நியூ செஞ்சுரி புக் ஹவுஸ்
5	புதிய வெளிச்சத்தில் தமிழ் இலக்கிய வரலாறு, முனைவர் க பஞ்சாங்கம், (2017) அன்னம் வெளியீட்டு
6	தமிழ் இலக்கிய வரலாறு, மு வரதராசனார்,(2021) சாகித்ய அகாடமி பதிப்பு
7	தமிழ் உரைநடை வரலாறு, வி செல்வநாயகம்,(2003) அடையாளம் பதிப்பகம்
8	தமிழ் இலக்கிய வரலாறு, முனைவர் கா கோ வேங்கடராமன்,(2010) கலையக வெளியீடு
9	எண்ணங்கள் - டாக்டர் எம் எஸ் உதயமூர்த்தி,(2016) வெளியீடு: கங்கை புத்தக நிலையம், சென்னை
10	அடோன் தமிழ் இலக்கணம், புலவர் பொன்மணிமாறன்,(2011) அருண் பப்ளிஷிங்

Part – II : Language-II-English - II

(All the Undergraduate Programmes)

Course Code	Course Name	Category	Hours/ Week	Credits
24ENG22L	English-II	Part - II	4	3

Course Objectives

The course intends to cover

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

Course Learning Outcomes

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

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

Part - II: English - II

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

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

Course Code	Course Name	Category	Hours / Week	Credits
24MSS23C	C++ Programming	Core - III	5	4

Course Objectives

The course intends to cover:

- C++ concepts from the basis of C Language.
- Object Oriented Programming concepts.
- Variables, type conversion, control flow, subroutines and inheritance.
- Objects, classes and methods.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Reminisce 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	Create the file pointers using I/O streams.	K6
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** – Analyze; **K6** - Create		

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	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 (1998), C++ The Complete Reference, 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
24MSS24P	Lab: C++ Programming	Core Lab - III	4	3

S. No.	List of Programs
1.	Program to get and print the string.
2.	Program demonstrating a stack implementation operation.
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, TRIANGE . 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.
	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 (1998), C++ The Complete Reference, 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
24MSS25C	Data Structures	Core - IV	5	4

Course Objectives

The course intends to cover:

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

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Recite the basics of algorithm and elementary data structures.	K1
CLO2	Understand the various types of linked lists and dynamic storage management.	K2
CLO3	Infer the concepts of trees and graphs in real world problems.	K3
CLO4	Analyze various sorting mechanisms of data.	K4
CLO5	Apply the file handling methods in file manipulations.	K3
K1 - Remember; K2 - Understand; K**3** - Apply; K**4** – 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: IV Data Structures

Unit	Content	No. of Hours
I	**Introduction:** Introduction of Algorithms, Analysing Algorithms. **Arrays**: Spare Matrices – Representation of Arrays. Stacks and Queues. Fundamentals – Evaluation of Expression Infix to Postfix Conversion – Multiple Stacks and Queues – Perform Analyse the Algorithms.	15
II	**Linked List:** Singly Linked List–Linked Stacks and Queues –Polynomial Addition – More on Linked Lists – Sparse Matrices–Doubly Linked List and Dynamic–Storage Management – Garbage Collection and Compaction.	15
III	**Trees:** Basic Terminology–Binary Trees–Binary Tree Representations–Binary Trees – Traversal–More on Binary Trees–Threaded Binary Trees–Binary Tree Representation of Trees–Council Binary Trees. Graphs: Terminology and Representations–Traversals, Connected Components and Spanning Trees.	15
IV	**Internal Sorting:** Insertion Sort–Quick Sort–2 Way Merge Sort–Heap Sort– Shell Sort–Sorting on Several Keys. External Sorting: Storage Devices–Sorting with Disks: Kway Merging –Sorting with Tapes– Perform Analyze the Algorithms.	15
V	**Symbol Tables:** Static Tree Tables –Dynamic Tree Tables – Hash Tables: Hashing Functions – Overflow Handling. Files: Files, Queries and Sequential organizations–Index Techniques –File Organizations. Case Study: Recursion– Towers of Hanoi–Pattern Matching in Strings.	15
	Total Hours	**75**

Text Books	
1.	Marcello La Rocca (2021), Advanced Algorithms and Data Structures.
2.	Narasimha Karumanchi (2016), Data Structures and Algorithms Made Easy, 5th Edition.
Reference Books	
1.	Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education Asia.
2.	Ellis Horowitz, Sartaj Sahani and Dinesh Mehta (2008), Fundamentals of Data Structures in C++, 2nd Edition, University Press.
Web Resources (Swayam / NPTEL)	
1.	https://onlinecourses.swayam2.ac.in/nou24_cs06/preview
2.	https://onlinecourses.swayam2.ac.in/cec19_cs04/preview
3.	https://onlinecourses.swayam2.ac.in/aic20_sp06/preview

Course Code	Course Name	Category	Hours / Week	Credits
24MSS26C	Lab: Data Structures	Core Lab - IV	4	3

S. No.	List of Programs
1	Implementation of matrix operations using arrays.
2	Implementation of sparse matrix.
3	Array implementation of Stack.
4	Array implementation of Queue, circular queue.
5	Implementation of infix to postfix conversion and evaluation of postfix expression.
6	Implementation of Singly Linked List, Doubly Linked List and Circular Linked List.
7	Implementation of AVL trees.
8	Implementation of Binary Tree and Binary tree traversal techniques.
9	Searching Techniques: Binary search using array, Linear search.
10	Sorting Techniques: Insertion Sort, Selection Sort, Bubble Sort, Quick Sort.
	Total Hours **60**
Text Books	
1.	Balaguruswamy E (2013), Object Oriented Programming Through C++,6th Edition.
2.	Varsha H. Patil, Data Structures using C++, Oxford.
Reference Books	
1.	Ellis Horowitz, Sartaj Sahani and Dinesh Mehta (2008), Fundamentals of Data Structures in C++, 2nd Edition, University Press.
2.	Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education Asia.
Web Resources (Swayam / NPTEL)	
1.	https://onlinecourses.swayam2.ac.in/nou24_cs06/preview
2.	https://onlinecourses.swayam2.ac.in/cec19_cs04/preview
3.	https://onlinecourses.swayam2.ac.in/aic20_sp06/preview

Course Code	Course Name	Category	Hours / Week	Credits
24MSS27A	Applied Mathematics	Allied - II	4	3

Course Objectives

The Course intends to cover

- The fundamental concepts of Mathematics by exploration

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Relate and apply binomial, exponential, logarithmic & summation series.	K1
CLO2	Recall the basic concepts of matrices in solving linear problems.	K1
CLO3	Remember the formulas and problems in differentiation.	K1
CLO4	Classify the different concepts of integration through simple formulas and problems.	K2
CLO5	Recognise measures of central tendency and dispersion in data analysis.	K1
K1 - Remember; **K2** - Understand		

Allied - II: Applied Mathematics

Unit	Content	No. of Hours
I	Binomial, Exponential and Logarithmic series (Statement only) – Applications to summation of series only.	12
II	Quadratic Equation – Matrices – Determinant of a matrix – Inverse of a matrix – Characteristic equation of a matrix – Eigen values – Solutions of simultaneous linear equations in three variables using matrix.	12
III	Differentiation of algebraic, Exponential, logarithmic and trigonometric functions – physical interpretations of derivatives with reference of velocity and acceleration – Application of differentiation of maxima and minima (simple problems).	12
IV	Partial differentiation (Simple problems) – Integration of simple algebraic, exponential and trigonometric functions – substitution method – Integration by parts.	12
V	Measures of central tendency – Mean, Median, Mode - Measure of dispersion – Range – Standard deviation - Mean deviation - Correlation – Karl pearson's coefficient of correlation – rank correlation.	12
	Total Hours	**60**

Text Books

1.	S. Narayanan., T.K. Manickavachagom Pillay.(2009), Algebra (Vol. I) , Viswanathan, S. Printers & Publishers Pvt Ltd. Unit I : Chapter 3 : Section 3.1 - 3.11 Chapter 4 : Section 4.1- 4.11 Chapter 5 : Section 5.1-5.7 Unit V: Chapter 7 : Section 7.177- 7.266 Chapter 8 : Section 8.268 - 8.328 Chapter 10 : Section 10.377- 10.389
2.	S. Narayanan., T.K. Manickavachagom Pillay (2009), Calculus (Vol. I &II), Viswanathan, S. Printers & Publishers Pvt Ltd. Unit II : Chapter 1 : Section 1.1- 17.1 Chapter 2: Section 2.1- 16.1 Unit III: Chapter 2 : Section 2.6- 3.3 Chapter 5 : Section 5.6- 5.6 Unit IV: Chapter 8 : Section 8.1-8.5
3.	S.P. Gupta (2001), Statistical Methods, Sultan Chand and Sons. Unit V: Chapter 7 : Section 7.177- 7.266 Chapter 8 : Section 8.268 - 8.328 Chapter 10 : Section 10.377- 10.389

Reference Book

1.	M.K. Venkataraman, Engineering Mathematics (Vol1,2), The National Publishing Co.

Web Resources (Swayam / NPTEL)

1.	https://onlinecourses.nptel.ac.in/noc19_ma34/preview

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

Max Marks	Marks for		Components for CIA										
	CIA	ESE	CIA – I		CIA – II		Best of CIA-I & CIA-II	Model		Attendance	Active Engagement	Total
100	25	75	Actual	Weightage	Actual	Weightage	Weightage	Actual	Weightage	5	5	25
			50	**5**	50	**5**	**5**	75	**10**			

Question Paper Pattern

Component	Duration in Hrs.	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 – I &II	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 – I		Test – II		Model		Observation	Total
100	40	60	Actual	Weightage	Actual	Weightage	Actual	Weightage	5	40
			50	**10**	50	**10**	60	**15**		

Examination Pattern

Component	Duration in Hrs.	Marks			Weightage
		Practical	Record	Total Marks	
Test – I	2	50	-	50	10
Test – II	2	50	-	50	10
Model	3	60	-	60	15
ESE	3	50	10	60	-

Part – IV : Ability Enhancement Compulsory Courses

(All the Undergraduate Programmes)

Course Code	Course Name	Category	Hours / week	Credits
24SOF2AE	Soft Skills	AECC – II	2	2

Course Objectives

The course intends to cover

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

Course Learning Outcomes

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

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

Ability Enhancement Compulsory Course - II : Soft Skills

Unit	Content	No. of Hours
I	**Presentation Skills : Getting to Know You:** Grammar: Introduction to Tenses; Listening: Fill in the blanks; Speaking: Self Introduction, Everyday English, Role-Play; Reading: Different ways of communication. **My Day:** Grammar: Present simple positive & negative / Adverbs of Frequency; Vocabulary & Speaking: Daily Activities; Listening: Observe and Answer / Telling the time; Reading & Writing: Describe where you live. **Your World:** Grammar: Possessive determiners; Vocabulary & Speaking: Talk about countries, nationalities; Listening: Positive & negative contractions; Reading & Writing: Personal profile. **The World Of Work:** Grammar: Yes/No & Wh Questions; Vocabulary & Speaking: Jobs; Listening: Recognize the schwa sound; Reading & Writing: Opening and closing an email. .**Places And Things:** Grammar: There is / there are, articles; Vocabulary & Speaking: Talk about rooms & furniture; Listening: Directions; Reading & Writing: Imperatives.**24 Hours:** Grammar: Likes & Dislikes; Vocabulary & Speaking: Speak about hobbies and interests; Listening: Observe & answer; Reading: Match the photos with descriptions; Writing: Write complete sentence using prompts;	6
II	**Confidence : Clothes and Shopping:** Grammar: Modal verbs / Adverbs of Frequency / Adjectives and Adverbs; Vocabulary & Speaking: Shopping; Listening: Observe and Answer; Reading & Writing: Product Review. **Travel & Transport:** Grammar: Past simple questions; Vocabulary & Speaking: Talk about holidays; Listening: At the train station; Reading & Writing: Email - A perfect holiday. **Health & Fitness:** Grammar: Past simple irregular verbs; Vocabulary & Speaking: Talk about a healthy lifestyle; Listening: Listen & Answer; Reading & Writing: Time sequencers. **Music:** Grammar: Present perfect simple; Vocabulary & Speaking: Survey about music; Listening: Listen two people talk about music; Reading: Use adjectives and create sentences. **Let's go shopping:** Grammar: Countable & Uncountable; Vocabulary & Speaking: Town Survey; Listening: Listen and answer; Reading & Writing: Read and match	6
III	**Creativity :Cooking & Eating:** Grammar: Some & Any, Quantifiers; Vocabulary & Speaking: Food & Drink; Listening: Kitchen conversation; Reading & Writing: Article reading & answering. **Survival:** Grammar: Comparison of adjectives; Vocabulary & Speaking: Describing people; Listening: Listen & Answer; Reading & Writing: Read and Answer. **Working Together:** Grammar: Verb + Noun phrases; Vocabulary & Speaking: Talk about technology; Listening: Listen & Answer; Reading & Writing: Notice. **Music:** Grammar: Present perfect simple; Vocabulary & Speaking: Survey about music; Listening: Listen two people talk about music; Reading: Use adjectives and create sentences. **Culture and Arts:** Grammar: Present perfect; Vocabulary & Speaking: Speak on the phone; Listening: Listen and answer; Reading & Writing: Review	6

Unit	Content	No. of Hours
IV	**Problem-Solving :Do's and Don'ts:** Grammar: Modal verbs; Vocabulary & Speaking: Role play; Listening: Holidays in January; Reading & Writing: Article reading & answering. **Body:** Grammar: First conditional; Vocabulary & Speaking: Personality & Appearance; Listening: Listen to conversations about personality; Reading & Writing: Read and Answer about your skills. **Speed:** Grammar: Present simple passive; Vocabulary & Speaking: Talk about relationships; Listening: Listen & Answer; Reading & Writing: Error spotting. **Work:** Grammar: Adverbs of manner; Vocabulary & Speaking: Talk about work advice; Listening: Observe & Answer; Reading: Read & check your ideas	6
V	**Critical Thinking : Influence:** Grammar: would / past habits; Listening: Sentence Correction; Speaking & Vocabulary: Your inspiration; Reading: Picture description; Writing: Rewrite the sentences. **Money:** Grammar: Second conditional; Listening: radio programme; Speaking & Vocabulary: Talk about games; Reading & Writing: Fill in the blanks. **Things that changed the world:** Grammar: articles; Speaking & Listening: Talk about chewing gum; Reading & Writing: Read and write a book review	6
	Total Hours	**30**

Components for and Distribution of Marks for ESE (Theory)

Ability Enhancement Compulsory Course (AECC)

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**	
24TAM31L	I	Language – I	Tamil – III	3	3	25	75	100	3
24HIN31L			Hindi – III						
24MAL31L			Malayalam – III						
24FRE31L			French – III						
24ENG32L	II	Language – II	English – III	3	3	25	75	100	3
24MSS33C	III	Core – V	Java Programming	6	3	25	75	100	4
24MSS34P	III	Core Lab - V	**Lab:** Java Programming	4	3	40	60	100	3
24MSS35C	III	Core - VI	Operating System and Linux	6	3	25	75	100	4
24MSS36P	III	Core Lab - VI	**Lab:** Linux Programming	4	3	40	60	100	3
24MSS37A	III	Allied - III	Discrete Structures	4	3	25	75	100	3
24BAT3FC /	IV	Foundation Course	Basic Tamil /	-	2	50	-	50	2
24ADT3FC/			Advanced Tamil /						
24IKS3FC			Indian Knowledge Systems *						
24MOO3AE	IV	AECC - III	Online Course MOOC	-	-	50	-	50	2
Total				**30**				**800**	**27**

Part –I – Language-I-Tamil III

(All the Undergraduate Programmes)

Course Code	Course Name	Category	Hours / Week	Credits
24TAM31L	Tamil – III	Language - I	4	3

Course Objectives

The course intends to cover

- தமிழரின் பிற துறை சார்ந்த சிந்தனைகளைக் கற்றுத் தேர்தல்
- 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 அறிதல்	K1, K2
CLO2	ஊடகம் மற்றும் உளவியல் தன்மை குறித்த சிந்தனைகளை வளர்த்தல்	K2
CLO3	சுற்றுலா - சுற்றுச்சூழலியல் தேவை மற்றும் மீட்டுருவாக்கம் குறித்து உணர்த்துதல்	K3
CLO4	மேலாண்மை பற்றி அறிதல் மற்றும் சுயக்கற்றல் திறனை வளர்த்தல்	K1, K3
CLO5	கொங்கு ஆளுமைகள் குறித்து அறியச் செய்தல்	K2, K3
K1 - Remember; **K2** - Understand; **K3** - Apply		

Part-I - Language – I: Tamil – III

பயன்பாட்டுத் தமிழ்

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

Reference Books

1	சுந்தரம்.இல, (2022) கணினித் தமிழ், விகடன் பிரசுரம்
2	மணியரசன்.துரை, (2019), இணையமும் இனியத் தமிழும், இசை பதிப்பகம்
3	பொன்னவைக்கோ.மு, (2015) இணையத் தமிழ் வரலாறு, பாரதிதாசன் பல்கலைக் கழகம்.
4	தங்கமணி இரா.ம, (2018) சுற்றுலாவியல், கொங்கு பதிப்பகம்
5	இலக்கியா க.வி, நந்தினி சா.சு,(2022), விடியல் பதிப்பகம்

Reference Books	
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

Course Code	Course Name	Category	Hours / Week	Credits
24HIN31L	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 will improve
- Understand the basics of Hindi literature and to understand Hindi literature properly
- Provide Knowledge of the elements of poetry and the knowledge of 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	May have knowledge of the contents of primitive poetry	K1, K2
CLO2	Learn about contemporary poetry and its techniques.	K2
CLO3	Interest in reading poetry and the ability to express social thoughts will improve	K3
CLO4	This will help you to understand the basics of Hindi literature and to understand Hindi literature properly	K1, K3
CLO5	Knowledge of the elements of poetry and the knowledge of subtle translation will improve.	K2, K3
K1 - Remember; **K2** - Understand; **K3** - Apply		

Language – I: Hindi – III

Unit	Content	No. of Hours
I	**Poetry: Kavya Lehar – By Dr. V. Baskhar Pracheen Kavitha** 1. Mahatma Kaber – Saki 2. Goswamy Tulasidas – Ram-Van-Aman 3. Mahatma Soordas – Baal – Leela 4. Kavivar Rahim – Dohe	14
II	**Poetry: Kavya Lehar – By Dr. V. Baskhar Aadhunik Kavitha** 1. Mythili Sharn Gupth – Vikaral Bijali 2. Sumithranandan Panth – Parivarthan 3. Suryakanth Thripati Nirala – Sandhayasundarai 4. Ramdhari Sing Dinkar – Bhagavan Ke Dakkiya 5. Harivansray Bachchan – Kota Sikka 6. Agyeya – Anubhav Paripakva 7. Naresh Mehtha – Ullangan 8. Dharmaveer Bharathi – Tum Mere Koun Ho	14
III	**History of Hindi Literature:** (Sahithyik Tippanian) 1. Ammer Kusro 2. Vidhyapathi 3. Chandbardhayi 4. Pruthiviraj Raso 5. Ramacharitha Manas 6. Vinaya Patrika	12
IV	**Alankar:** 1.Anupras 2. Yamak 3. Slesh 4.Vakrokthi 5.Upama, 6. Roopak 7. Virodhabas	10
V	**Translation**: **English - hindi only** Anuvadh abhyas – III (16-30 Lessons Only)	10
	Total Hours	**60**

Text Books	
1	Dr Baskhar V., (2006), Kavya lehar –Jawahar Pusthakalay, Sadar Bazaar,Mathura-U.P.281001.
2	Anuvadh abyas-III,Dakshin Bharath Hindi Prachar Sabha Chennai – 17.
Reference Books	
1	Rajnath sharma,(2010) Hindi sahithya ka saral ithihaas, Vinod Pustak Mandir, Agra-282
2	Kavya pradeep rambadri shukla,(2008) hindi bhavan, 36, tagore town, allahabad – 211 002.

Course code	Course Name	Category	Hours/Week	Credits
24MAL31L	Malayalam - 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 will improve
- Understand the 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-Analyse**		

Language – I: Malayalam – III

Unit	Content	No. of Hours
I	Poetry – Chinthavishtayaya Seetha	14
II	Poetry – Chinthavishtayaya Seetha	14
III	Poetry – Mrugasikshakan - (Murgasikshakan, Kausalya, Varavu, Vittupoku Ekalavyan, Mazha) 6 poetries	12
IV	Poetry – Mrugasikshakan - (Kayal, Karkkadakam, Bhagavatham, Vazhivakkile naikutty, Edavelayil oru nimisham, Verumoru kathu) 6 poetries	10
V	Poetry – Aayisha	10
	Total Hours	**60**
Text Books		
1	Kumaranasan, (2012), Chinthavishtayaya Seetha, Kerala Book Store Publishers.	
2	Vijayalakshmi, (2010), Mrugasikshakan, DC Books, Kottayam	
3	VayalarRamavarma,(2014), Aayisha, Kerala Book Store Publishers.	
Reference Books		
1	Dr.Leelavathi M, (2015) Kavitha SahithyaCharitram, Kerala Sahithya Academy, Trichur.	
2	Dr.Leelavathi M, (2015) Kavitha Dwani, D.C.Books, Kottayam.	
3	Dr.George K.M, (2014) Aadhunika Sahithyacharithram Prasthanangalilude, D.C.Books, Kottayam.	
4	Chummar T.M. (2009) Padya Sahithya Charithram, Kerala Sahithya Academy, Trichur.	

Course Code	Course Name	Category	Hours/Week	Credits
24FRE31L	French - III	Language - I	4	3

Course Objectives

The course intends

To interact in a simple way, ask and answer simple questions about themselves, where they live, people they know, and things they have, initiate and respond to simple statements in areas of immediate need or on very familiar topics, rather than relying purely on a very finite rehearsed, lexically-organized repertoire of situation-specific phrases.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Comprehend a repertoire of vocabulary	K1
CLO2	Understand tenses and intermediary level of grammar	K2
CLO3	Try to converse in unknown situation	K3
CLO4	Translate unknown texts on familiar topics	K4
K1 - Remember; **K2** - Understand; **K3** – Apply; **K4 - Analyse**		

Language – I: French – III

Unit	Content	No. of Hours
I	Etape 1 (Lecons 1 - 3)	14
II	Etape2 (Lecons 1 - 3)	14
III	Etape 3 - Leçons 1 – 2	12
IV	Etape 3 – Leçon 3	10
V	Etape 4 – Leçon 1	10
	Total Hours	**60**
Text Books		
1	Céline Himber, Corina Brillant, Sophie Erlich, (2014), Adomania2 – Methode Defrancais, Publisher : Hachette Fle	
Reference Books		
2	Yves Loiseau, Régine Merieux (2009), Latitudes 1, Publisher: French and European Publications Inc.	

Course Code	Course Name	Category	Hours / Week	Credits
24ENG32L	English-III	Language-II	4	3

Course Objectives

The course intends to cover

- Various genres of literature
- Inter personal skills essential at work environment

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	List out the connotations and denotations to pen poems.	K1
CLO2	Identify complex characters to navigate philosophical and intellectual learning and employ it in work place.	K2
CLO3	Interpret various prose styles to enhance creative writing	K3
CLO4	Compute vocabulary and grammatical proficiency in communication to enhance clarity in content creation.	K3
CLO5	Practice communication skills to be effective in lifelong learning.	K3
K1 – Remember; **K2**-Understand; **K3**- Apply		

Language-II: English-III

Unit	Content	No. of Hours
I	**Poetry** 1. Nothing Will Die – Alfred Lord Tennyson 2. Porphyria's Lover – Robert Browning 3. Obituary – A K Ramanujan	12
II	**Scenes from William Shakespeare's Plays** 1. Romeo and Juliet – The Balcony Scene 2. Merchant of Venice - Court Scene 3. Julius Caesar - Murder Scene	12
III	**Famous Speeches** 1. You've Got to Find What You Love-Steve Jobs 2. You Will Prevail -Sundar Pichai 3. I am Malala – Malala Yousafzai	12
IV	**Language Competency** 1. Identifying types of Sentences 2. Sentence Structure 3. Active Voice and Passive Voice 4. Direct and Indirect Speech	12
V	**English for Communication** **Listening and Speaking** Participating in a Group Discussion 1. Group discussion as a selection process 2. Different kinds of Group Discussion 3. Structure of Group Discussion 4. Successful Group Discussion Techniques 5. Group Discussion – Do's and Don'ts **Reading and Writing** 1. Reading diagrammatic information-interpretations maps, graphs and pie charts 2. Narrative writing– Two to three paragraphs 3. Dramatizing everyday situations/social issues through skits. (Writing scripts and performing)	12
	Total Hours	**60**
Reference Books		
1.	Wren, P.C. (1973). High school English grammar and composition.	
Web Resources (Swayam/NPTEL)		
1.	https://nptel.ac.in/courses/109106129	
2.	https://nptel.ac.in/courses/109104031	

Course Code	Course Name	Category	Hours / Week	Credits
24MSS33C	Java Programming	Core - V	6	4

Course Objectives

This course intends to cover

- Java basics and OOPs concepts.
- Packages, interface, JDBC connectivity, RMI and Swing.
- Exception handling and file operations.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Recall the basics of Java and OOPs concepts.	K1
CLO2	Understand and apply the control structures, class, objects and methods.	K2, K3
CLO3	Demonstrate the Interface, Packages and JDBC Connectivity.	K2
CLO4	Apply the Swing, GUI and Exception handlings.	K3
CLO5	Apply file operations and Stream classes.	K3
K1 - Remember; **K2** - Understand; **K3** - Apply		

CLO – PLO Mapping

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

Core – V : Java Programming

Unit	Content	No. of Hours
I	**Introduction:** Java Evolution - History – Features – How Java differs from C and C++ – Java and Internet – Java and WWW –Web Browsers. Overview of Java: simple Java program – Structure – Java Tokens – Statements – Java Virtual Machine - Constants, Variables, Data Types – Operators and Expressions.	18
II	**Branching and Looping:** Decision Making and Branching: if, if...else, nested if, switch, ? : Operator - Decision Making and Looping: while, do, for – Jumps in Loops - Labelled Loops – Classes, Objects and Methods.	19
III	**Interfaces and Packages:** Arrays, Strings and Vectors – Interfaces: Multiple Inheritance – Packages: Putting Classes together – Multithreaded Programming. Database Programming using JDBC: Introduction to JDBC, JDBC Drivers & Architecture – JDBC and Embedded SQL - RMI: How RMI works – RMI Process – Implementing RMI Services – Executing RMI Client and Server.	19
IV	**Exception Handling and Swing:** Fundamentals & Types of Exceptions - Try, Catch, Finally Keywords - Exception Handling Best Practices - Swing & GUI Development: Applet Programming – Graphics Programming - Fundamentals of Swing - Swing Characteristics - Swing Class Hierarchy - JavaFX GUI Programming Basics - GUI Components.	18
V	**File Operations:** 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.	16
	Total Hours	**90**

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	Herbert Schildt: Schildt, H. (2018), Java: A beginner's guide, 8th Edition,. McGraw-Hill Education.
2	Patrick Naughton & Hebert Schildt, (2001), 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
24MSS34P	Lab: Java Programming	Core Lab - V	4	3

S. No.	List of Programs
1	Sample Java programs.
2	Write a Java program to generate Harmonic Series.
3	Demonstrate a Java program to perform basic arithmetic operations with constructors.
4	Create a Java program for sorting a given list of names in ascending order.
5	Generate Java Program to implement the concept of multiple inheritance using Interfaces.
6	Write a Java program that connects to a database using JDBC and does add, deletes, modify and retrieve operations.
7	Generate a Java program to create an exception called ArrayStoreException.
8	Write a Java program that creates a list of months and adds an item listener to it. The program should allow the user to select their birthday month from the list and display the selected month in the console.
9	Develop a Java Program to create a Jframe with three text fields for name, Age and qualification and a text field for multiple lines for address.
10	Write a Java Program to create menu bars and pull down menus.
11	Develop a simple calculator using Swings.
12	Write a Java Program which opens an existing file and appends text to that file.
13	Write a Java program that displays the number of characters, lines and words in a text 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	Herbert Schildt: Schildt, H. (2018), Java: A beginner's guide, 8th Edition, McGraw-Hill Education.
2	Patrick Naughton & Hebert Schildt, (2001), 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
24MSS35C	Operating System and Linux	Core - VI	6	4

Course Objectives

The course intends to cover:

- Basic concepts of operating system.
- Process management, synchronization, memory management and file system.
- Linux commands, file management and shell scripts.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Understand the basic concepts of operating system.	K1, K2
CLO2	Comprehend the various process management and synchronization.	K2
CLO3	Analyze memory management and file system.	K4
CLO4	Understand the Linux basics and shell commands.	K1, K2
CLO5	Apply the shell scripts for real time application.	K3
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** – Analyze		

CLO-PLO Mapping

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

Core - VI: Operating System and Linux

Unit	Content	No. of Hours
I	**Introduction:** Definition of OS - Functionality of OS – OS design issues - Desktop Systems – Multiprocessor System – Distributed – Clustered – Real time systems – Operating System Structure – System Components – System Programs – System Design and Implementation – System Calls, System/Application Call Interface – Influence of Security, networking and multimedia.	17
II	**Process Management**: Process Scheduling – CPU Scheduling - Pre-emptive, non-pre-emptive – Multiprocessor scheduling. Process Synchronization: Problems of Synchronization - Deadlocks – Resource allocation and management – Deadlock handling mechanisms: prevention, avoidance, detection, recovery.	18
III	**Memory Management**: Memory allocation strategies – Virtual Memory – Hardware support for virtual memory – Paging – Segmentation – Demand Paging – Page Faults – Page Replacement Algorithm – Working sets. I/O and File Systems: File Concepts – File System Structure – Access Methods – Directory Structure – Protection – Directory Implementation – Allocation Methods – Free Space Management.	19
IV	**Linux Introduction:** History of Linux – Architecture of Linux – Features of Linux – Introduction to vi editor – Linux commands. Introduction to Shells: Linux session – Standard streams – Redirection – Tee Command. Filters: Filters and Pipes – Sorting – Count characters, words or lines. Securing Files in Linux: File access permission – Viewing file access permission – Changing file access permission.	18
V	**File Management:** File structures – System calls for File Management – File commands - Comparing files - Concatenating files - Display beginning and end of files - Directory commands. Shell Scripts: Conditional execution in shell script – Managing repetitive tasks using shell script.	18
	Total Hours	**90**
Text Books		
1	Abraham Silberschatz, Peter B, Galvin, Greg Gagne, (2018), Operating System Concepts, 10th Edition, Wiley, United States.	
2	Silberschatz and Galvin, (2004), Operating System Concepts, 6th Edition, John Wiley & Sons, Inc.	
3	Joachim Puls and Michael Wegner, (2010), The operating system Linux and programming languages An introduction, 1st Edition.	
4	James K.L. (2011), Linux Learning the Essentials. PHI.	
Reference Books		
1	Andrew S. Tanenbaum, (2016), Modern Operating Systems, 4th Edition, Pearson, United Kingdom.	
2	Richard Petersen, (2008), Linux: The Complete Reference, 6th Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi.	
Web Resources (Swayam / NPTEL)		
1	https://onlinecourses.swayam2.ac.in/cec20_cs06/preview	
2	https://onlinecourses.nptel.ac.in/noc24_cs108/preview	
3	https://onlinecourses.swayam2.ac.in/aic20_sp24/preview	

Course Code	Course Name	Category	Hours / Week	Credits
24MSS36P	Lab: Linux Programming	Core Lab - VI	4	3

S. No.	List of Programs
1	Sample Linux shell scripts.
2	Create, read and append data to a file using commands like cat, echo, and touch.
3	Write a script to accept user input and display it using the read command.
4	Perform basic arithmetic operations like addition, subtraction, multiplication, and division using the expr or $(( )) syntax.
5	Generate a Linux script for redirection and tee commands.
6	Write a Linux shell script to implement the filter commands.
7	Modify file access permissions using chmod and check permissions using ls -l.
8	Write a shell script to create files and directories, display a list of all files in the current directory, and remove all files and current directory.
9	Write a script to check if a string is a palindrome or not.
10	Create a Linux script for compare two file content.
11	Use if-else statements to check if a number is odd or even.
12	Create a script that prints numbers from 1 to 10 using for, while or until loops.
	Total Hours **60**

Text Books

1	Joachim Puls and Michael Wegner, (2010), The operating system Linux and programming languages An introduction, 1st Edition.
2	Keir Thomas, Andy Channelle and Jaime Sicam, (2009), Beginning Ubuntu Linux: From novice to professional, 4th Edition, A press.
3	Behrouz A. Forouzan, Richard F. Gilberg. Thomson, (2003), Unix and Shell Programming.

Reference Books

1	James K.L. (2011), Linux Learning the Essentials. PHI.
2	Richard Petersen, (2008), Linux: The Complete Reference, 6th Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi.

Web Resources (Swayam/NPTEL)

1	https://onlinecourses.swayam2.ac.in/cec20_cs06/preview
2	https://onlinecourses.nptel.ac.in/noc24_cs108/preview
3	https://onlinecourses.swayam2.ac.in/aic20_sp24/preview

Course Code	Course Name	Category	Hours / Week	Credits
24MSS37A	Discrete Structures	Allied – III	4	3

Course Objectives

The course intends to cover:

- Discrete structure fundamentals and their applications in computer science.

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	Describe the concepts of graph theory in technical representation.	K2
CLO3	Apply the concepts of connectives and tautological implications in data analysis.	K3
CLO4	Apply the properties of algebraic structures such as groups, rings, and fields	K3
CLO5	Construct regular expressions, grammars, and finite state automata to represent and analyze formal languages.	K3
K1 - Remember; **K2** - Understand; **K3** - Apply		

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.	12
	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(2002), R. Manohar,"Discrete Mathematics Structures with Applications to Computer Science", McGraw Hill International Edition.	
2	M. K. Venkataraman(2004), N. Sridharan. & N. Chandarasekaran, "Discrete Mathematics", National Publishing Company, Chennai.	
Web Resources (Swayam / NPTEL)		
1	https://onlinecourses.nptel.ac.in/noc22_cs49/preview	

Part – IV – Foundation Course

Course Code	Course Name	Course Category	Hours/Week	Credits
24IKS3FC	Indian Knowledge Systems(IKS)	FC-III	-	2

Unit	Content
1	**Indian Knowledge System (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(IKS)-** 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.
6	**Indigenous Agriculture and 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 - Methodology - Traditional Water Management Systems - Northern Region - North Western Region - North Eastern Region - Central Indian Region - Southern Indian Region.

Unit	Content
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			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**

***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

Semester 4

Semester – 4									
Course Code	**Part**	**Course Category**	**Course Name**	**Hours/ Week**	**Examination**				
					Duration in Hours	**Max Marks**			**Credits**
						CIA	**ESE**	**Total**	
24TAM41L/	I	Language - I	Tamil-IV/	3	3	25	75	100	3
24HIN41L /			Hindi-IV/						
24MAL41L			Malayalam-IV/						
24FRE41L			French-IV						
24ENG42L	II	Language - II	English – IV	3	3	25	75	100	3
24MSS43C	III	Core - VII	Relational Database Management Systems	4	3	25	75	100	4
24MSS44P	III	Core Lab - VII	**Lab:** Relational Database Management Systems	4	3	40	60	100	3
24MSS45C	III	Core - VIII	Visual Programming	4	3	25	75	100	4
24MSS46P	III	Core Lab - VIII	**Lab:** Visual Programming Lab	4	3	40	60	100	3
24MSS47A	III	Allied - IV	Operations Research	4	3	25	75	100	3
24MSS48P	III	SEC Lab - I	**Lab:** Arduino Programming Essentials Lab	2	3	40	60	100	2
24IDT4AE	IV	AECC - IV	Innovation and Design Thinking	2	2	-	50	50	2
24IPR4AE			Intellectual Property Rights						
24END4AE			Entrepreneurship Development						
Total				**30**				**850**	**27**

Part – I: Language – I

தமிழ் – IV

(All the UG Programmes)

Course Code	Course Name	Category	Hours / Week	Credits
24TAM41L	Tamil - IV	Language - I	3	3

Course Objectives

The Course intends to cover

- தமிழ் இலக்கிய வளர்ச்சிப் போக்குகள் மற்றும் நுட்பங்களை அறியச்செய்தல்.
- தமிழ்நாடு அரசுப் பணியாளர் தேர்வாணையம் நடத்தும் போட்டித்தேர்வுகளை எதிர்கொண்டு வேலைவாய்ப்பினைப் பெறும் வகையில் மாணவர்களைத் தயார்படுத்துதல்.
- கேட்டல், பேசுதல், படித்தல் மற்றும் எழுதுதல் முதலான திறன்களை(LSRW Skills) அறியச்செய்தல்.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	இலக்கியங்கள் மூலம் பண்டைய தமிழக மக்களின் வாழ்க்கை முறை, சமூக மதிப்பீடுகள், கலை, கலாச்சாரம் போன்றவற்றை ஆழமாகப் புரிந்துகொள்ளுதல்.	K1- K3
CLO2	தமிழறிஞர்களின் தமிழ்த்தொண்டை அறிவதன் மூலம் தமிழ் மொழியின் செழுமை, அதன் இலக்கிய வளம் மற்றும் பண்பாட்டு அடையாளம் ஆகியவற்றை அறிந்துகொள்ளுதல்.	K1- K3
CLO3	பிழையின்றி பேசுவதற்கும் எழுதுவதற்கும் இலக்கணத்தை பயன்படுத்துதல்.	K1 - K3
CLO4	தமிழ்நாடு அரசு நடத்தும் அனைத்து தேர்வுகளுக்கும் கல்வி மற்றும் மொழி வளர்ச்சிக்கும் கலைச்சொற்கள் ஒரு முக்கியத் தேவையாக உள்ளன என்பதனை உணர்தல்.	K1- K3
CLO5	உரைநடை பத்தியை வாசித்து கேட்கப்படும் வினாக்களுக்கு ஏற்ற பதில்களைத் தேடுவதன் மூலம் ஆழமான புரிதல் ஏற்படும் என்பதை உணர்தல்.	K2, K3
K1 - Remember; **K2** - Understand; **K3** – Apply		

Unit	Content	No. of Hours
I	(இலக்கிய வரலாறு) • திருக்குறள் • நாலடியார் • நான்மணிக்கடிகை • பழமொழி நானூறு • முதுமொழிக்காஞ்சி • திரிகடுகம் • இன்னா நாற்பது • சிறுபஞ்சமூலம் • ஏலாதி • ஔவையார் பாடல்கள்	11
II	**(தமிழ் அறிஞர்களும், தமிழ்த்தொண்டும்)** **திராவிட மொழிகள் தொடர்பான செய்திகள்:** • உ.வே.சாமிநாத ஐயர் • தெ.பொ.மீனாட்சி சுந்தரம் • சி.இலக்குவனார். **தமிழ்ப்பணி தொடர்பான செய்திகள்:** • தேவநேய பாவாணர் • பெருஞ்சித்திரனார் • ஜி.யு.போப் • வீரமாமுனிவர். **தமிழ்த்தொண்டு மற்றும் சான்றோர் தொடர்பான செய்திகள்:** • பாவேந்தர் • டி.கே.சிதம்பரனாதர் • தவத்திரு குன்றக்குடி அடிகளார் • கண்ணதாசன் • வேலுநாச்சியார் • முடியரசன் • தமிழ் ஒளி • கி.வா.ஜகந்நாதர் • நாமக்கல் கவிஞர்	11

Unit	Content	No. of Hours
III	**(இலக்கணம்)** • குறில், நெடில் வேறுபாடு • லகர, ளகர, ழகர வேறுபாடு • னகர, ணகர வேறுபாடு • ரகர, றகர வேறுபாடு • சுட்டெழுத்துக்கள் • வினா எழுத்துக்கள் • இனவெழுத்துக்கள் • ஒருமைப் பன்மை அறிதல் • எழுத்துப்பிழை, ஒற்றுப்பிழை அறிதல் • ஓரெழுத்து ஒருமொழி • ஒருபொருள் பன்மொழி • இருபொருள் குறிக்கும் சொற்கள்	9
IV	**(எழுத்துத்திறன் மற்றும் கலைச்சொற்கள்)** • சொற்றொடர் அமைத்தல் • தொடர் வகைகள் • செய்வினை, செயப்பாட்டு வினை • தன்வினை, பிறவினை. **திணைமரபு:** • உயர்திணை, • அஃறிணை. **பால் மரபு:** • ஆண்பால், • பெண்பால், • பலர்பால். • வினைமரபு • தொகை மரபு • நிறுத்தல் குறியீடுகள். **பல்துறை சார்ந்த கலைச்சொல்லுக்கு நேரான தமிழ்ச்சொல் அறிதல்:** • அறிவியல், கல்வி, மருத்துவம், மேலாண்மை, சட்டம், புவியியல், தொழில்நுட்பம், ஊடகம், தகவல் தொழில்நுட்பம்.	7

Unit	Content	No. of Hours
V	**வாசித்தல், புரிந்து கொள்ளும் திறன் மற்றும் எளிய மொழி பெயர்ப்பு வாசித்தல் :** கொடுக்கப்பட்ட பத்தியை வாசித்து கேட்கப்பட்ட வினாக்களுக்கு சரியான விடையைத் தேர்ந்தெடுத்தல். **புரிந்துகொள்ளும் திறன்:** உவமைத் தொடரின் பொருளறிதல், மரபுத்தொடரின் பொருளறிதல், பழமொழிகள் பொருளறிதல். **எளிய மொழி பெயர்ப்பு:** ஆங்கிலம் மற்றும் பிறமொழிச் சொற்களுக்கு இணையான தமிழ்ச் சொற்கள் அறிதல், பயன்பாட்டில் உள்ள ஆங்கிலச் சொற்களை மொழிபெயர்த்தல்.	7
	Total Hours	**45**

Reference Books

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

Part – I: Language – I
Hindi – IV

Course Code	Course Name	Category	Hours / Week	Credits
24HIN41L	Hindi – IV	Language - I	3	3

Course Objectives

The Course intends to cover

- Knowledge of contemporary drama contents of Hindi literature.
- Novels and its techniques. The ability to read novels and express criticism about it and the ability to express social thoughts will improve.
- Litigation messages in Hindi and news on speech techniques.
- The Ability to write articles on their own and improve their sophisticated translation skills.

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.	K2
CLO3	Develop an interest in the appreciation of short stories.	K3
CLO4	Comprehend the grammatical structures and sentence making.	K4
CLO5	Understand the language and developing English to Hindi translation skill.	K4
K1 - Remember; **K2** - Understand; **K3** – Apply; **K4**-Analyse.		

Unit	Contents	No. of Hours
I	Drama: Dhuvasaminy By Jayashankar Prasad	9
II	Novel - Nirmala – Premchand	9
III	Lokkothi & Muhavare - Naveen Hindi Vyakaran (Selected Lokkokthi -10 & Muhavare-10)	9
IV	General Essay :Aadarsh Nibandh	9
V	Translation : Hindi-English Only Anuvadh Abhyas – III (16-30 Lessons Only)	9
	Total Hours	**45**

Text Books

1.	Jayashankar Prasad (2015), Dhuvasaminy, Drama, , Publisher : Dakshin Bharath Hindi Prachar Sabha, Chennai-17.
2	Premchand(2015),Nirmala,Novel , Rajkamal Prakashan,1B Nethaji Subash Marg,New Delhi

Reference Books

1.	Rajnath Sharma , Hindi Sahithya Ka Saral Ithihaas, , Vinod Pustak Mandir,Agra-282
2.	Kavya Pradeep Rambadri Shukla, Hindi Bhavan, 36, Tagore Town, Allahabad – 211 002.

Part – I: Language – I
Malayalam – IV

Course Code	Course Name	Category	Hours / Week	Credits
24MAL41L	Malayalam - IV	Language - I	3	3

Course Objectives

The Course intends to cover

- Knowledge of contemporary drama contents of Malayalam literature.
- Screen play and its techniques. The ability to read drama and express criticism about it and the ability to express social thoughts will improve.
- Litigation messages in Malayalam and news on speech techniques.
- Ability to write articles on their own and improve their creative skills.

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 drama	K1
CLO2	Can read and critique Screenplay	K1
CLO3	Create interest in art literature courses	K2
CLO4	The hope of writing a Drama or a Screen Play.	K3
CLO5	The idea of creating new works and critique knowledge will improve.	K4
K1 - Remember; **K2** - Understand; **K3** – Apply; **K4**-Analyse.		

Unit	Content	No. of Hours
I	Screen Play – Perumthachan	9
II	Screenplay – Perumthachan	9
III	Drama – Saketham	9
IV	Drama – Saketham	9
V	Drama – Saaketham	9
	Total Hours	**45**

Text Books

1. Perumthachan – M.T.Vasudevan Nair, DC Books
2. Saketham – C.N.Sreekandan Nair, DC Books.

Reference Books

1. Malayala Nataka Sahithya Charithram. G Sankara Pillai (Kerala SahithyaAkademi, Trissur)
2. Malayala NatakaSahithya Charithram, Vayala Vasudevan Pillai (Kerala SahithyaAkademi Thrissur).
3. Natakam- Oru Patanam (C.J. SmarakaPrasanga Samithi, Koothattukulam)
4. Natakaroopacharcha, Kattumadam Narayanan (NBS, Kottayam)
5. Chalachithra sameeksha – Vijayakrishanan.
6. Cinemayude Paadangal Visakalanavum Veekshanavum – Jose-K.Manual

Part – I: Language – I
French – IV

Course Code	Course Name	Category	Hours / Week	Credits
24FRE41L	French – IV	Language - I	3	3

Course Objective

The Course intends

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

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Comprehend the grammatical structures in various genres.	K1
CLO2	Understand the text styles and poetical elements.	K2
CLO3	Develop an interest in the appreciation of literature.	K3
CLO4	Discuss and respond to content of a reading passage.	K4
K1 - Remember; **K2** - Understand; **K3** – Apply; **K4 –** Analyse		

Unit	Contents	No. of Hours
I	Etape 5 (Lecons 1 - 3)	9
II	Etape 6 (Lecons 1 - 3)	9
III	Etape 7 - Leçons 1 – 2	9
IV	Etape 7 – Leçon 3, Etape 8 – Leçon 1	9
V	Etape 8 – Leçons 2 – 3	9
Etapes 5 to 8, Pages 63 to 114		
	Total Hours	**45**
Text Book		
1	Adomania 2 , Methode de francais , Céline Himber, Corina Brillant, Sophie Erlich Publisher: HACHETTE FLE, Goyal Publishers and Distributors Pvt Ltd, New Delhi (9810322459)	
Reference Book		
1	Latitudes 1 , Yves Loiseau, Régine Merieux Publisher: French and European Publications Inc, Goyal publishers and distributors Pvt Ltd, New Delhi (9810322459).	

Part – II: Language-II-English –IV

(All the Undergraduate Programmes)

English for Competitive Examinations

Course Code	Course Name	Category	Hours / Week	Credits
24ENG42L	English-IV	Language-II	3	3

Course Objectives

The course intends to cover

- Essential Language Skills for Competitive Exams.
- Grammatical Mastery and Writing Skills for confident formal communication.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Identify grammatical errors with precision and write with clarity and accuracy.	K1
CLO2	Identify, comprehend and use a wide range of vocabulary to enhance verbal expression.	K2, K3
CLO3	Construct structured essays, reports, and formal letters with clarity and coherence.	K3
CLO4	Interpret diverse texts using strategic reading techniques to analyze content and answer comprehension questions effectively	K3
CLO5	Understand and employ the technical and administrative terms to excel in the career.	K2, K3
K1 - Remember; **K2** - Understand; **K3** – Apply		

Part-II: English-IV

Unit	Content	No. of Hours
I	**Grammar** Parts of Speech, Concord, Tenses, Active Voice and Passive Voice, Types of Sentences – Statement, Interrogative, Imperative, Exclamatory, Transformation of Statements into imperatives, Interrogatives into Statements, Assertive into Negatives, Exclamatory Sentences into Statements, Imperatives into Inquisitive Interrogatives, Imperatives into Appreciative Statements, Verbs, Main Verbs and Auxiliary Verbs, Regular and Irregular Verbs	9
II	**Grammar** Infinitives, Gerunds, Participles, Question Tags, Sentence Patterns, Types of Sentences – Simple, Compound and Complex, Phrases and Clauses, Degrees of Comparison – Positive, Comparative & Superlative, Direct into Indirect and Indirect to Direct, Synthesis of Sentences, Punctuations,	9
III	**Vocabulary and Writing Skills** Synonyms, Antonyms, Homonyms, Homophones, Collocations, Idioms & Phrases, Phrasal verbs, Spelling of words, Correct usage of words, One word substitution, Word Creation, Singular and plural (including Zero plural), Derivatives, Abbreviations, British and American English, Compound words and Figures of speech. Letter writing (formal and informal) – Types of Letters, Precis Writing, Jumbled sentences, Finding out the right order of sentences, Making queries, Inferences, Blanks, Substitutions.	9
IV	**Reading Comprehension** Types of Passages (Narrative, Argumentative, Factual, Descriptive),Unseen passages (News Paper, Headlines, Editorials, Government related News), Question Types - Strong question, Weak question, Match the following, Sentence Completion, Ascertainment of facts	9
V	**Administrative Vocabulary & Translation** Marketing and Sales, Human Resource, Finance and Operation, Organization and Management, Office Procedures and Document Word Translation, Sentence Translation, Tense related translation tasks, Tense / Voice related tasks. (**Simple words - Basic Level**)	9
	Total Hours	**45**

Reference Books	
1.	Bhatnagar, R. P., & Bhargava, R. (2017). English for Competitive Examinations (3rd ed.). New Delhi: Laxmi Publications.
2.	Wren, P. C., & Martin, H. (2007). High School English Grammar & Composition (11th ed.). New Delhi: S. Chand & Company
3.	Gupta, S. C. (2014). English Grammar & Composition (2nd ed.). Meerut: Arihant Publications
4.	Aggarwal, R. S., & Aggarwal, V. (2022). Quick Learning Objective General English (Revised ed.) New Delhi, S. Chand Publishing.
Web Resources (Swayam/NPTEL)	
1.	https://onlinecourses.nptel.ac.in/noc24_hs73/preview

Course Code	Course Name	Category	Hours / Week	Credits
24MSS43C	Relational Database Management System	Core - VII	4	4

Course Objectives

This course intends to

- Understand data modelling using the entity-relationship and database designs.
- Learn the concepts of relational models, structured query language and transaction management.
- Enhance the concepts of normalization, database security and distributed database.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Learn the fundamentals of a database system.	K1
CLO2	Understand the relational models and formulate relational algebra queries.	K2
CLO3	Understand the SQL queries and transaction management.	K2
CLO4	Apply various normal forms in schema and database security.	K3
CLO5	Apply parallel and distributed database concepts.	K3
K1 – Remember; **K2** - Understand; **K3** - Apply		

CLO – PLO Mapping

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

Core VII: Relational Database Management System

Unit	Content	No. of Hours
I	**Overview of database systems**: Data Models, Schemas, Instances, the three schema architectures and data independence, Database Languages and interfaces, Database System environment, Centralized and Client / Server Architecture for DBMS, Classifications of Database Management Systems. ER diagrams – Entities, Attributes, and Entity Sets – Relationships and Relationship Sets - Additional feature of the ER model - conceptual Database design with the ER model.	12
II	**Relational Model:** Integrity constraints over relations – Enforcing integrity constraints – Querying relational data. **Logical Database Design**: ER to Relational –Introduction to Views – Destroying / Altering Tables and Views. **Relational Algebra**: Relational Algebra – unary and set operations, Relational Algebra Queries. **Calculus**: Tuple relational calculus, Domain relational Calculus, calculus vs algebra, computational capabilities.	12
III	**SQL - Queries, Constraints, Triggers**: The form of a basic SQL Query – UNION, INTERSECT and EXCEPT – Nested Queries – Aggregate operators – Null values – Complex integrity constraints in SQL - Triggers & Active Databases. **Transaction Management Overview**: The ACID Properties - Transactions & Schedules – Concurrent execution of Transactions – Lock-based concurrency control – Performance of Locking –Transaction support in SQL. PL/SQL Concepts PL/SQL Block, Stored Procedures, Functions and Packages.	12
IV	**Schema and Security**: Introduction to Schema refinement – Functional dependencies – Reasoning about functional dependencies – Normal forms, Boyce Code Normal form, Third normal form –Properties of Decompositions – Normalization, Decomposition of BCNF, Decomposition into 3NF– Schema Refinement in Database design – other kinds of dependencies. **Security**: Introduction to Database security -Access control – Discretionary Access control – Mandatory Access control – Additional issues to security.	11
V	**Parallel and Distributed database:** Introduction – Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems. **Parallel Databases**: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Design of Parallel Systems- Distributed Database Concepts – Distributed Data Storage – Distributed Transactions – Commit Protocols – Distributed Query Processing - Database design for ORDBMS – OODBMS – Comparing RDBMS, OODBMS and ORDBMS.	13
	Total Hours	**60**

Text Books	
1.	Raghu Ramakrishnan and Johannes Gehrke (2007), Database Management Systems, 2nd Edition, McGraw-Hill.
2.	Archana Varma (2025), Database Management Systems, 2nd Edition, Kindle Edition.
Reference Books	
1.	Avi Silberschatz Henry F. Korth S. Sudarshan (2019), Database System Concepts, 7th Edition, McGraw-Hill.
2.	S K Singh (2009), Database Systems: Concepts, Design and Applications, Pearson Education.
Web Resources (Swayam/NPTEL)	
1.	https://onlinecourses.nptel.ac.in/noc22_cs91/preview
2.	https://onlinecourses.swayam2.ac.in/cec25_ma16/preview

Course Code	Course Name	Category	Hours / Week	Credits
24MSS44P	Relational Database Management System Lab	Core Lab - VII	4	3

S. No.	List of Programs
1	Create a table for Employee details with Employee Number as primary key and following fields: Name, Designation, Gender, Age, Date of Joining and Salary. Insert at least ten rows and perform update, delete, select operations, Altering, viewing records based on conditions.
2	Create tables for library management system which demonstrate the use of primary key and foreign key. Master table should have the following fields: Accno, Title, Author and Rate. Transaction table should have the following fields: User id, Accno, Date of Issue and Date of Return.
3	Create a table for railway ticket reservation with necessary fields and use GRANT, REVOKE, ROLLBACK, SAVEPOINT and COMMIT commands.
4	Create a table for book store and queries using Aggregate functions, Group By, Having Clause and Order Clause.
5	Create a master-order table and implement Simple Join, Self Join, Outer Join, Inner Join, Left and Right Join.
6	Write a PL/SQL to split the student table into two tables based on result (One table for ―Pass and another for ―Fail). Use cursor for handling records of student table. Assume necessary fields and create a student details table.
7	Formulate a table for electricity bill calculation using cursor.
8	Create a database trigger to implement on master and transaction tables which are based on inventory management system for checking data validity. Assume the necessary fields for both tables.
9	Build a view that will display department names and the sum of all employee income by department.
10	Write a PL/SQL to update the rate field by 20% more than the current rate in inventory table which has the following fields: Prono, ProName and Rate. After updating the table add a new field (Alter) called Number of items and place for values for the new field without using PL/SQL block
11	Write a PL/SQL to raise the following Exception in Bank Account Management table when deposit amount is zero.
12	Develop a PL/SQL stored procedure for retail company to manage customer orders.
	Total Hours **60**

Text Books	
1.	Raghu Ramakrishnan and Johannes Gehrke (2007), Database Management Systems, 2nd Edition, McGraw-Hill.
2.	Archana Varma (2025), Database Management Systems, 2nd Edition, Kindle Edition.
Reference Books	
1.	S K Singh, (2009), Database Systems: Concepts, Design and Applications, Pearson Education
2.	Avi Silberschatz Henry F. Korth S. Sudarshan, (2019), Database System Concepts, 7th Edition, McGraw-Hill.
Web Resources (Swayam/NPTEL)	
1.	https://onlinecourses.nptel.ac.in/noc22_cs91/preview
2.	https://onlinecourses.swayam2.ac.in/cec25_ma16/preview

Course Code	Course Name	Category	Hours / Week	Credits
24MSS45C	Visual Programming	Core - VIII	4	4

Course Objectives

This course intends to

- Understand the basics of Visual Programming.
- Learn the working concepts of VB.NET, C# and designing web page using ASP.NET.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Learn the basics of .NET and its framework.	K1
CLO2	Understand the basics of VB.NET statements and functions.	K2
CLO3	Infer the basic concept of classes and objects, control structures in C#.	K3
CLO4	Apply the concept of web based applications using ASP.NET.	K3
CLO5	Analyze the web forms and HTML Controls using ASP.NET.	K4
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze		

CLO – PLO Mapping

CLOs/PLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	1	1	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 VIII: Visual Programming

Unit	Content	No. of Hours
I	**Introduction to .NET:** .NET Framework - Requirements of .NET - .NET Built on –Overview of the .NET Framework – Common Language Runtime –Types of Compilation in .NET– Managed and unmanaged code – Common Type System – Meta Data Concepts – Cross- Language Interoperability – Application Domains - .NET Framework Class Library Overview – Basic Structural Diagram of .NET Framework – Versions of .NET Framework.	13
II	**VB.NET Controls:** Arrays – Menus – Working with other controls of toolbox: Date Time Picker, List Box, Combo Box, Picture Box, Rich Text Box, Progress Bar, Link Label, Checked List – Box Built-in Dialog Boxes – Dialog classes – File Processing – Directory class.	11
III	**Overview of C#:** History and evolution of C# – Writing and running C# programs – Variables, data types, and operators- Control structures if-else, switch, loops– Classes and objects – File I/O and Serialization.	12
IV	**Introduction to ASP.NET:** Features of ASP.NET – Developing a Web Application - ASP.NET pages – provider model – coding model – code sharing – Compilation in ASP.NET Applications and State: Structure of an application – The global .asax Application File – using states – HTTP handlers.	12
V	**Web and HTML Controls:** Web Forms - The control class – The web control class – creating buttons – Enabling and Disabling controls – Hyperlinks – The Tree view model – Menu control – Site map path control – wizard control – validation controls – Login controls – HTML controls – Developing web sites.	12
	Total Hours	**60**

Text Books

1.	Christian Nagel (2022), Professional C# and .NET,2nd Edition, Wrox, Wiley Brand.
2.	Kameron Hussain, Frahaan Hussain (2023), Mastering VB.NET: A Comprehensive Guide to Visual Basic .NET Programming, 2nd Edition, Sonar Publishing.

Reference Books

1.	Pankaj Agarwal, (2022), Principles of .NET Framework, 5th Edition, Vayu Education of India,
2.	Daniel Arsenovski, (2021), Professional Refactoring in Visual Basic (Programmer to Programmer), 2nd Edition, Wrox Press.
3.	Matthew MacDonald , (2018), Beginning ASP.NET 4.5 in C#, 3rd Edition, Paperback Publication.
4.	Serhan Yamacli (2019), Beginner's Guide to Visual Basic .NET Programming: A Practical Approach, 4th Edition, Atlantic Books.

Web Resources (Swayam/NPTEL)

1.	https://onlinecourses.swayam2.ac.in/ntr25_ed128/preview
2.	https://onlinecourses.swayam2.ac.in/ntr25_ed123/preview

Course Code	Course Name	Category	Hours / Week	Credits
24MSS46P	Visual Programming Lab	Core Lab - VIII	4	3

S. No.	List of Programs
1.	Basic programs in .NET using different controls and message box.
2.	Develop a program in .NET for Font Applications.
3.	Develop a .NET Notepad Application using menu strip control.
4.	Develop an Arithmetic Calculator.
5.	Write a .NET program for Employee details of an organization which includes basic information, designation and salary details.
6.	Develop a VB.NET program for Students Information assuming roll no, name, and marks in five subjects and display the total and result.
7.	Develop a VB.NET program for Adding data into a text file.
8.	Write a C# program to check whether a given number is Armstrong number or not.
9.	Write a C# program to find the sum of digits of a number.
10.	Develop a college website using ASP.NET.
11.	Develop an ASP.NET program to conduct online examination system with login page, MCQ questions and display the result.
12.	Develop a program in ASP.NET for Online Mobile Phone Shop.
13.	Develop a program in ASP.NET for Online Registration form.
14.	Develop an ASP.NET program for Digital library.
15.	Develop a project for College Management System using backend as Oracle and front end as VB.NET.
	Total Hours **60**
Text Books	
1.	Kameron Hussain, Frahaan Hussain (2023), Mastering VB.NET: A Comprehensive Guide to Visual Basic .NET Programming, 2nd Edition, Sonar Publishing.
2.	Christian Nagel (2022), Professional C# and .NET,2nd Edition, Wrox, Wiley Brand.
Reference Books	
1.	Valerio De Sanctis (2024), ASP.NET Core 8 and Angular, 6th Edition, Expert Insight.
2.	Herbert Schildt, (2021), C# The Complete Reference, 2nd Edition, Paperback.
3.	Serhan Yamacli (2019), Beginner's Guide to Visual Basic .NET Programming: A Practical Approach, Atlantic Books.
Web Resources (Swayam / NPTEL)	
1.	https://onlinecourses.swayam2.ac.in/ntr25_ed128/preview
2.	https://onlinecourses.swayam2.ac.in/nou25_cs17/preview

Course Code	Course Name	Category	Hours / Week	Credits
24MSS47A	Operations Research	Allied-IV	4	3

Course Objectives

The course intends to cover

- The methodology of OR problem solving and formulate linear programming problem.
- The Development of formulation skills in transportation models and finding solutions
- The basics in the field of game theory and assignment problems
- How project management techniques help in planning and scheduling a project

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Recognize the importance and value of Operations Research and linear programming in solving practical problems in industry.	K1
CLO2	Interpret the transportation models' solutions and infer solutions to the real-world problems.	K2
CLO3	Understand about game theory and assignment problems.	K2
CLO4	Apply project networks for quantitative analysis	K3
CLO5	Apply the models of queuing theory and Replacement in the real-world applications	K3
K1 – Remember **K2** - Understand; **K3** - Apply		

CLO – PLO Mapping

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

Allied-IV: Operations Research

Unit	Content	No. of Hours
I	**Linear Programming Problem**: Introduction of operations research, mathematical formulation of the problem, graphical method- simplex method (only) –duality- dual simplex method	12
II	**Transportation Problem**: Introduction to the problem, linear programming formulation of a transportation problem. Basic feasible solution by north-west corner method, Vogel's approximation method, least cost method. Finding optimal solution by modified distribution method, degeneracy, unbalanced transportation problem and Maximization in transportation model. **Assignment Problem**: One to one assignment problem, optimal solutions, unbalanced assignment matrix, maximization in assignment problem - travelling sales man problem,	12
III	**Theory of Games**: Introduction, rectangular two person zero sum games, solution of rectangular games in terms of mixed strategies, solution of 2x2 games without saddle point, concept of dominance to reduce the given matrix, graphical method for 2xn and nx2 games. **Replacement Model:** Replacement policy when value of money does not change with time &when value of money changes with time.	12
IV	**Queuing Theory:** Introduction – queuing System- elements of queuing system- operating characteristics of queuing system- classification of queuing models- model - (M/M/1):(∞/FIFO) - (M/M/1):(∞ / SIRO) -(M/M/C):(N/FIFO) –(M/M/C): ∞/ FIFO)	12
V	**Network Scheduling**: Introduction, basic components techniques, logical sequencing, rules of network constructions - concurrent activities- critical path method and probability considerations in project evaluation and review technique.	12
	Total Hours	**60**
Text Books		
1.	Manmohan, P.K. Gupta, Kanthiswarup (2015), "Operations Research", S. Chand & Sons. Unit I: Chapter 1: Sections: 1.1-1.11 Chapter 2: Sections: 2.1-2.4 Chapter 3: Sections: 3.1-3.4 Chapter 4: Sections: 4.1-4.3 Chapter 5: Sections: 5.1-5.7&5.9 Unit II: Chapter 10: Sections:10.1-10.13&10.15 Chapter 11 : Sections: 11.1 -11.4 & 11.7 Unit III: Chapter 17: Sections: 17.1-17.7 Chapter 18 : Sections: 18.1 – 18.2.2 Unit IV: Chapter 21 : Section 21.1 – 21.9. Unit V: Chapter 25: Sections: 25.1-25.7.	
Reference Books		
1.	Hamdy A Taha (2002), "Operations Research" Pearson Education, 7th edition.	
2.	P.K. Gupta, D.S. Hira, "Problems in Operations Research", S. Chand Publishers.	
Web Resources (Swayam / NPTEL)		
1.	https://nptel.ac.in/courses/110106062	

Course Code	Course Name	Category	Hours / Week	Credits
24MSS48P	Arduino Programming Essentials Lab	SEC Lab - I	2	2

S. No.	List of Programs
1.	Write an Arduino program to calculate the sum, average, and standard deviation of a given set of numbers and display the results on the Serial Monitor.
2.	Develop an Arduino program to generate and display the first 'n' prime numbers on the Serial Monitor.
3.	Generate an Arduino program to interface a Push Button and turn ON/OFF an LED.
4.	Create an Arduino program to interface a Buzzer and make it sound when a button is pressed.
5.	Write an Arduino program to read temperature data from a DHT11 sensor and plot real-time temperature variations using the Serial Plotter.
6.	Develop an Arduino program to measure distance using an Ultrasonic sensor (HC-SR04) and display distance readings on the Serial Monitor.
7.	Create an Arduino program to read light intensity using an LDR sensor and display the light level values on the Serial Monitor.
8.	Generate an Arduino program to read soil moisture sensor data and display the moisture percentage on the Serial Monitor.
9.	Develop an Arduino program to read heart rate data from a Pulse Sensor and display BPM on the Serial Monitor.
10.	Write an Arduino program to detect motion using PIR Sensor and display motion alert on the Serial Monitor.
	Total Hours **30**
Text Books	
1.	Massimo Banzi and Michael Shiloh, (2014), Getting Started with Arduino, 4th Edition, Maker Media.
Reference Books	
1.	Jeremy Blum, (2019), Exploring Arduino: Tools and Techniques for Engineering Wizardry, 2nd Edition, Wiley.
2.	Michael Margolis, (2011), Arduino Cookbook, 2nd Edition, O'Reilly Media.
3.	Jonathan Oxer and Hugh Blemings, (2010), Practical Arduino: Cool Projects for Open Source Hardware, A Press.
Web Resources (Swayam / NPTEL)	
1.	https://onlinecourses.swayam2.ac.in/aic20_sp04/preview
2.	https://onlinecourses.nptel.ac.in/noc22_cs53/preview

Course Code	Course Name	Category	Hours / Week	Credits
24IDT4AE	Innovation & Design Thinking	AECC - IV	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)-IV : Innovation & Design Thinking

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

Course Code	Course Name	Category	Hours/Week	Credits
24IPR4AE	Intellectual Property Rights	AECC - IV	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		

Course Code	Course Name	Category	Hours / Week	Credits
24END4AE	Entrepreneurship Development	AECC – IV	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 – IV : 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	

Ability Enhancement Compulsory Courses(AECC)-IV : 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	

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				
	CIA	ESE	CIA		Model		Total
			Actual	Weightage	Actual	Weightage	
50	50	-	50	**25**	50	**25**	**50**

Question Paper Pattern

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

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

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

Semester 5

Semester – 5									
Course Code	**Part**	**Course Category**	**Course Name**	**Hours / Week**	**Examination**				
					Duration in Hours	**Max Marks**			**Credits**
						CIA	**ESE**	**Total**	
24MSS51C	III	Core – IX	Programming with Python	5	3	25	75	100	4
24MSS52P	III	Core Lab - IX	Programming with Python Lab	4	3	40	60	100	3
24MSS53C	III	Core - X	Web Designing and Applications	5	3	25	75	100	4
24MSS54P	III	Core Lab - X	Web Application Development and Hosting Lab	4	3	40	60	100	3
24MSS55C	III	Core - XI	Computer Networks	4	3	25	75	100	4
24MSS5AE/	III	Elective - I	Exploratory Data Analysis **(Data Science)**	5	3	25	75	100	4
24MSS5BE/			Blockchain Technology and Applications **(Cyber Security)**						
24MSS5CE			Data Preprocessing and Visualization **(Machine Learning)**						
24MSS56P	III	SEC Lab-II	Raspberry Pi Lab	2	3	40	60	100	2
24MSS57I	III	SEC	Internship	-	2	50	-	50	2
Total				**30**				**750**	**26**

Course Code	Course Name	Category	Hours / Week	Credits
24MSS51C	Programming with Python	Core - IX	5	4

Course Objectives

The course intends to cover

- The concepts of Python programming.
- Different data structures of Python and OOPs concept.
- Python libraries and frameworks for application development.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Understand the basic concepts of Python programming.	K1, K2
CLO2	Apply the code structures to develop simple Python programs.	K3
CLO3	Building scalable and maintainable applications using modules, packages and object-oriented skills.	K3
CLO4	Apply database concepts and develop web applications.	K3
CLO5	Analyze system concurrency and network concepts in Python.	K4
K1 – Remember; **K2** - Understand; K**3** - Apply; **K4** – Analyze;		

CLO-PLO Mapping

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

Core IX: Programming with Python

Unit	Content	No. of Hours
I	**Python**: Introduction – Numbers – Strings – Variables – Lists – Tuples – Dictionaries – Sets - Comparison - Make Bigger Data Structures.	13
II	**Code Structures**: if, elseif, and else – The if/else Ternary Expression - Repeat with while – Iterate with for – Iteration Protocol - Manual Iteration – Other Build-in types of Iterators – Comprehensions – Functions – Generators – Decorators – Namespaces and Scope – Handle Errors with try and except – User Exceptions.	15
III	**Modules, Packages, and Programs**: Standalone Programs – Command-Line Arguments – Modules and the import Statement – Packages - The Python Standard Library. **Objects and Classes**: Define a Class with Class – Inheritance – Override a Method – Add a Method – Get Help from Parent with Super – In self Defense – Get and Set Attribute Values with Properties – Name Mangling for Privacy – Method Types – Duck Typing – Special Methods –Composition.	15
IV	**Data Types**: Text Strings – Binary Data. **Storing and Retrieving Data**: File Input/Output – Structured Text Files – Structured Binary Files - Relational Databases – Connecting to a Database using Python - Sending DML and DDL queries - NoSQL Data Stores. **Web**: Web Clients – Web Servers – Web Services and Automation. **Libraries for Data Science**: NumPy - Pandas. Machine Learning with Python.	17
V	**Systems**: Files – Directories – Programs and Processes – Calendars and Clocks. **Concurrency**: Queues – Processes – Threads – Green Threads and Gevent – Twisted – Redis. **Networks**: Patterns – The Publish-Subscribe Model – TCP/IP – Sockets – ZeroMQ – Internet Services – Web Services and APIs – Remote Processing – Big Fat Data and MapReduce – Working in the Clouds. **Frameworks**: Types of Frameworks - Build Simple Web Application using Flask – Testing with PyTest Framework.	15
	Total Hours	**75**

Text Books

1.	Bill Lubanovic, (2025), Introducing Python, 3rd Edition, Second Release, O'Reilly.
2.	Mark Lutz, (2025), Learning Python, 6th Edition, O'Reilly.
3.	Jameer Basha A, Lokesh S and Kiruba (2024), Python Programming, 3rd Impression, Pearson Publications.
4.	Malhar Lathkar, (2021), Building Web Apps with Python and Flask, 2021 Edition,BPB Publications.

Reference Books

1.	David M. Beazley, (2017), Python Essential Reference, 4th Edition, Developer's Library.
2.	Sheetal Taneja, Naveen Kumar, (2017), Python Programming-A Modular Approach, Pearson Publications.
3.	Alex Martelli, Anna Ravenscroft, Steve Holden (2017), Python in Nutshell, 3rd Edition, O'Reilly Media Publisher.
4.	Shalabh Aggarwal (2019), Flask Framework cookbook, 2nd Edition, Packt Publications.

Web Resources (Swayam / NPTEL / Others)

1.	https://onlinecourses.swayam2.ac.in/e-learning/preview/aic20_sp33
2.	https://onlinecourses.nptel.ac.in/noc24_cs54/preview
3.	https://onlinecourses.swayam2.ac.in/e-learning/preview/cec22_cs20
4.	https://www.geeksforgeeks.org/machine-learning/machine-learning-with-python/

Course Code	Course Name	Category	Hours / Week	Credits
24MSS52P	Programming with Python Lab	Core Lab - IX	4	3

S. No.	List of Programs	
1.	Programs using elementary data items, lists, dictionaries and tuples	
2.	Programs using conditional branches and loops.	
3.	Programs using functions	
4.	Programs using exception handling.	
5.	Programs using inheritance.	
6.	Programs using polymorphism	
7.	Programs to implement file operations.	
8.	Programs using modules.	
9.	Implement database connectivity, execute DDL and DML queries.	
10.	Programs using NumPy library	
11.	Program for Client-Server communication.	
12.	Programs for creating dynamic and interactive web pages using forms.	
	Total Hours	60
Text Books		
1.	Bill Lubanovic, (2025), Introducing Python, 3rd Edition, Second Release, O'Reilly.	
2.	Mark Lutz, (2025), Learning Python, 6th Edition, O'Reilly.	
3.	Jameer Basha A, Lokesh S and Kiruba (2024), Python Programming, 3rd Impression, Pearson Publications.	
4.	Malhar Lathkar, (2021), Building Web Apps with Python and Flask, 2021 Edition, BPB Publications.	
Reference Books		
1.	David M. Beazley, (2017), Python Essential Reference, 4th Edition, Developer's Library.	
2.	Sheetal Taneja, Naveen Kumar, (2017), Python Programming-A Modular Approach, Pearson Publications.	
3.	Alex Martelli, Anna Ravenscroft, Steve Holden (2017), Python in Nutshell, 3rd Edition, O'Reilly Media Publisher.	
4.	Shalabh Aggarwal (2019), Flask Framework cookbook, 2nd Edition, Packt Publications.	
Web Resources (Swayam/NPTEL)		
1.	https://onlinecourses.swayam2.ac.in/e-learning/preview/aic20_sp33	
2.	https://onlinecourses.nptel.ac.in/noc24_cs54/preview	
3.	https://onlinecourses.swayam2.ac.in/e-learning/preview/cec22_cs20	

Course Code	Course Name	Category	Hours / Week	Credits
24MSS53C	Web Designing and Applications	Core - X	5	4

Course Objectives

This course intends to cover

- Fundamental of web technologies, development of web pages using HTML tags and Cascading Style Sheets.
- Client-side and Server-side scripting.
- Interactive and dynamic web applications using JavaScript, PHP and database connectivity with MySQL.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Understand and remember the basic concepts of web technologies and create web pages using HTML tags.	K1, K2
CLO2	Understand the styling and layout techniques using Cascading Style Sheets to design interactive web pages.	K2
CLO3	Apply Java script in client-side scripting to develop interactive web pages using Javascript.	K3
CLO4	Analyze server-side scripting techniques.	K4
CLO5	Evaluate web frameworks and tools for developing web applications.	K5
K1 – Remember; **K2** - Understand; **K3** - Apply; **K4**- Analyze; **K5** - Evaluate;		

CLO – PLO Mapping

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

Core X: Web Designing and Applications

Unit	Details	No. of Hours
I	**Fundamentals of Web Designing:** Introduction to Internet and World Wide Web - Web Browsers and Web Servers - Client–Server Architecture of the Web - Website Structure and Navigation Concepts - Introduction to HTML - HTML Document Structure - Basic HTML Tags and Attributes - Text Formatting Tags - Lists, Hyperlinks, and Images in HTML – Frames and Frameset - Tables and Forms in HTML.	15
II	**Web Page Styling and Layout Design:** Introduction to Cascading Style Sheets - CSS Syntax and Structure - Types of CSS - Inline, Internal, and External Style Sheets - CSS Selectors and Properties - Styling Text, Fonts, Colors, and Backgrounds - CSS Box Model - Page Layout and Positioning Techniques - Designing Navigation Menus - Responsive Web Design Concepts - Introduction to User Interface Design and User Experience Design Principles in Web Design.	15
III	**Client-Side Scripting:** Introduction to JavaScript - Features and Advantages of JavaScript in Web Development - JavaScript Syntax and Program Structure – Data Types, Variables and Operators. **Control Structures:** Conditional Statements and Loops - Functions and Arrays in JavaScript - Event Handling in JavaScript - Document Object Model (DOM) Concepts - Manipulating Web Page Elements using JavaScript - Form Validation using JavaScript.	15
IV	**Server-Side Scripting:** Introduction to Server-Side Scripting - Overview of PHP - PHP Syntax and Program Structure - Variables, Data Types, and Operators in PHP - Control Structures and Functions in PHP - Handling HTML Forms using PHP - Sessions and Cookies - Basic File Handling. **Database Connectivity:** Overview of MySQL - Connecting PHP with Database - Creating and Accessing Databases. **Basic SQL Operations:** Insert, Update, Delete, and Select - Developing Simple Database-Driven Web Applications - Basic Web Security Concepts.	16
V	**Introduction to Angular:** Introduction to AngularJS – MVC Architecture – Understanding Attributes – Expressions and Data Binding – Conditional Directives – Style Directives – Controllers – Filters – Forms – Routers – Modules – Services. **Web Application Frameworks and Tools:** Firebase – Docker – Node JS – React – Django – UI &UX. AI Chatbots for Websites.	14
	Total Hours	75

Text Books

1.	C Xavier, (2022), Web Technology and Design, 2nd Edition, New Age International (P) Ltd., Publisher.
2.	Robin Nixon (2021), Learning PHP, MySQL & JavaScript, 6th Edition, O'Reilly Media.
3.	Jon Duckett (2022), PHP & MySQL: Server-Side Web Development, Wiley.
4.	Jon Duckett (2014), JavaScript and JQuery: Interactive Front-End Web Development, Wiley Publications.
5.	Doguhan Uluca (2018), Angular 6 for Enterprise-Ready Web Applications, 1st Edition, Packt Publishing.

Reference Books

1.	Paul Deitel, Harvey Deitel, and Abbey Deitel (2018), Internet and World Wide Web: How to Program, 5th Edition, Pearson Education.
2.	Shyam Seshadri (2018), Angular: Up and Running: Learning Angular, Step by Step, 1st Edition, O′Reilly.

Web Resource (Swayam, NPTEL / Others)

1.	https://onlinecourses.swayam2.ac.in/ntr26_ed74/preview
2.	https://onlinecourses.swayam2.ac.in/e-learning/preview/nou24_cs09
3.	https://www.text.com/blog/best-ai-chatbots-for-websites/

Course Code	Course Name	Category	Hours / Week	Credits
24MSS54P	Web Application Development and Hosting Lab	Core Lab - X	4	3

S. No.	List of Programs
1.	Develop a website for your college using advanced tags of HTML.
2.	Write names of several countries in a paragraph and store it as an HTML document, world.html. Each country name must be a hot text. When you click India (for example), it must open india.html and it should provide a brief introduction about India.
3.	Develop a HTML document to i) display Text with Bullets / Numbers - Using Lists ii) to display the Table Format Data.
4.	Develop a Complete Web Page using Frames and Framesets which gives the Information about a Hospital using HTML.
5.	HTML document to print your Bio-Data in a neat format using several components.
6.	Develop a HTML document to display a Registration Form for an inter-collegiate function.
7.	Develop web pages using HTML and various elements of CSS.
8.	Design a web page with a navigation menu using CSS.
9.	Write a JavaScript program to perform a simple calculator using user input from a web page.
10.	Develop an online reservation form system using JavaScript.
11.	Write a JavaScript to develop a To-Do list application with local storage.
12.	Using HTML form accept Customer details and validate the data and display appropriate messages for violations using PHP (Eg. Name is Mandatory field; Pincode must be 6 digits, etc.).
13.	Write a program to accept two numbers n1and n2 using HTML form and display the prime numbers between n1 and n2 using PHP.
14.	Develop a database-driven web application that stores and retrieves data from MySQL using PHP.
15.	Create a basic AngularJS application to demonstrate data binding.
16.	Build a simple frontend application using React and hosting.
	Total Hours **60**

Text Books

1.	C Xavier, (2022), Web Technology and Design, New Age International (P) Ltd., Publisher.
2.	Robin Nixon (2021), Learning PHP, MySQL & JavaScript, 6th Edition, O'Reilly Media.
3.	Jon Duckett (2022), PHP & MySQL: Server-Side Web Development, Wiley.
4.	Jon Duckett (2014), JavaScript and JQuery: Interactive Front-End Web Development, Wiley Publications.
5.	Doguhan Uluca, Angular 6 for Enterprise-Ready Web Applications, 1st Edition, Packt Publishing.

Reference Books

1.	Paul Deitel, Harvey Deitel, and Abbey Deitel (2012), Internet and World Wide Web: How to Program, 5th Edition, Pearson Education.
2.	Shyam Seshadri, Angular: Up and Running: Learning Angular, Step by Step, 1st Edition, O'Reilly.

Web Resources (Swayam, NPTEL)

1.	https://onlinecourses.swayam2.ac.in/ntr26_ed74/preview
2.	https://onlinecourses.swayam2.ac.in/e-learning/preview/nou24_cs09

Course Code	Course Name	Category	Hours / Week
24MSS55C	Computer Networks	Core - XI	5

Course Objectives

This course intends to cover

- Fundamentals of computer networks and reference models.
- Different layers and 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	Understand the fundamental concepts of computer networks and reference models.	K1, K2
CLO2	Understand the concepts of physical layer for data communication and telephone System.	K2
CLO3	Apply the concepts of the data link layer for error detection and correction.	K3
CLO4	Apply the routing and congestion control algorithms, UDP and TCP in the network and transport layer for efficient data transmission and prevent data overload.	K3
CLO5	Analyze the session layer, presentation layer and application layer to manage connection, secure data and provide interface in application.	K4
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 XI: Computer Networks

Unit	Content	No. of Hours
I	**Introduction**: Use of Computer Networks – Network Hardware – Network software. **Reference Models:** OSI and TCP/IP. **Networks**: Internet, ATM, Ethernet and Wireless LANs. AI in Networks.	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 – Modern Communication Systems (4G and 5G).	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 on the Internet. **Transport layer**: The Transport Service – Elements of Transport Protocol – A Simple Transport Protocol. **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, (2022), Data Communications and Networking, 6th 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 / Others)	
1.	https://onlinecourses.nptel.ac.in/noc22_cs19/preview
2.	https://onlinecourses.swayam2.ac.in/cec21_cs04/preview
3.	https://www.ericsson.com/en/ai/ai-in-networks

Course Code	Course Name	Category	Hours / Week	Credits
24MSS5AE	Exploratory Data Analysis	Elective - I	5	4

Course Objectives

The course intends to cover

- Methods for data preparation and data understanding.
- Techniques such as correlation analysis, time series and dimensionality reductions.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Understand missing data in the real-world data sets by choosing appropriate methods.	K1, K2
CLO2	Apply the data transformation techniques for clean, normalized and usable format for analysis.	K3
CLO3	Analyze the correlation and time series to determine how the current values relate to past values.	K4
CLO4	Apply the clustering algorithms for grouping unknown data.	K3
CLO5	Evaluate dimensionality reduction and model development for reducing feature count, noise reduction and removing redundancy.	K5
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** – Analyze; **K5**-Evaluate		

CLO-PLO Mapping

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

Elective - I : Exploratory Data Analysis

Unit	Content	No. of Hours
I	**Introduction to Exploratory Data Analysis:** Understanding Data Science - Data Preprocessing - Significance of EDA - Steps in EDA - Data Types, Numerical Data – Discrete Data, Continuous Data – Categorical Data. **Measurement Scales:** Nominal, Ordinal, Interval, Ratio – Comparing EDA with Classical and Bayesian Analysis – Software Tools for EDA - Visual Aids for EDA.	15
II	**Data Transformation:** Transformation Techniques - Performing Data Deduplication - Replacing Values – Discretization and Binning. **Introduction to Missing Data:** Handling Missing Data - Traditional Methods - Maximum Likelihood Estimation - Descriptive Statistics - Grouping Data Sets.	14
III	**Correlation Analysis and Time Series Analysis:** Types of Analysis - Univariate Analysis - Bivariate Analysis - Multivariate Analysis. **Time Series Analysis (TSA):** Fundamentals of TSA - Characteristics of TSA –Time Based Indexing - Visualizing Time Series – Grouping Time Series Data - Resampling Time Series Data - Hypothesis Testing and Regression.	15
IV	**Clustering Algorithms:** Finding Clusters - Hierarchical Methods - Optimization Methods - Evaluating the Clusters - Introduction to Spectral clustering - Document Clustering – Minimum Spanning Tree Clustering - Overview of Model-Based Clustering – Expectation-Maximization Algorithm – Hierarchical Agglomerative Model-Based Clustering - Outlier Detection using Clustering.	15
V	**Dimensionality Reduction:** Linear Methods - Principal Component Analysis (PCA) – Singular Value Decomposition – Factor Analysis - Intrinsic Dimensionality. **Non-Linear Methods:** Multidimensional Scaling – Manifold Learning – Self-Organizing Maps. **Model Development and Evaluation:** Constructing Linear Regression Model – Evaluation – Computing Accuracy – Understanding Accuracy. **Understanding Reinforcement Learning:** Difference between Supervised and Reinforcement Learning – Applications of Reinforcement Learning. An Exploratory Data Analysis (EDA) to Integrate Artificial Intelligence in Education.	16
	Total Hours	**75**

Text Books	
1.	Suresh Kumar Mukhiya, Usman Ahmed, (2020), Hands-On Exploratory Data Analysis with Python, 1st Edition, Packt Publishing.
2.	Martinez, W, Martinez A & J.L. Solka, (2017), Exploratory Data Analysis with MATLAB,3rd Edition, CRC Press, A Chapman & Hall Book.
Reference Books	
1.	Charu C. Aggarwal, (2015), Data Mining the Textbook, Springer.
2.	Craig K. Enders (2022), Applied Missing Data Analysis, 2nd Edition, The Guilford Press.
3.	Catherine Mars, Jane Elliott, (2009), Exploring Data: An Introduction to Data Analysis for Social Scientists, 2nd Edition, Wiley Publications.
Web Resources (Swayam/ NPTEL / Others)	
1.	https://nptel.ac.in/courses/109107190
2.	https://medium.com/@100006278/an-exploratory-data-analysis-eda-to-integrate-artificial-intelligence-in-education-39f97b635317

Course Code	Course Name	Category	Hours / Week	Credits
24MSS5BE	Blockchain Technology and Applications	Elective -I	5	4

Course Objectives

This course intends to cover

- Fundamentals of blockchain and crypto currency.
- Blockchain security features and its significance.
- Opportunities, challenges and applications in blockchain.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Understand and remember blockchain technology and crypto currency.	K1, K2
CLO2	Understand the mining mechanism in blockchain.	K2
CLO3	Apply the crypto currency and trust model.	K3
CLO4	Understand the crypto economics and crypto currency regulations.	K2
CLO5	Analyze the challenges, opportunities and applications in blockchain.	K4
K1 - Remember; **K2** - Understand; K**3** – Apply; **K4** – Analyze;		

CLO-PLO Mapping

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

Elective-I: Blockchain Technology and Applications

Unit	Content	No. of Hours
I	**Introduction to Blockchain:** History, Characteristics of the Blockchain - Architecture - The Big Picture of the Industry – Size, Growth, Structure, Players - Bit Coin versus Crypto Currencies versus Blockchain - Distributed Ledger Technology (DLT) - Strategic Analysis of the Space – Blockchain Platforms, Regulators, Application Providers. **The Major Application:** Currency, Identity, Chain of Custody.	15
II	**Network and Security**: Advantage Over Conventional Distributed Database – Blockchain Network - Mining Mechanism - Distributed Consensus - Blockchain 1.0, 2.0 and 3.0 – Transition, Advancements and Features - Privacy, Security Issues in Blockchain - Block Chain Components.	15
III	**Cryptocurrency:** History, Distributed Ledger, Bitcoin Protocols - Symmetric-Key Cryptography - Public-Key Cryptography - Digital Signatures - Zero Knowledge Proofs and Privacy Preserving - High and Low Trust Societies. **Types of Trust Model:** Peer-To-Peer, Leviathan and Intermediary - Application of Cryptography to Blockchain.	15
IV	**Cryptocurrency Regulation:** - Stakeholders, Roots Bit Coin, Legal Views - Exchange of Cryptocurrency – Black Market – Global Economy. **Cyrpto Economics**: Assets, Supply and Demand - Inflation and Deflation – Regulation - Smart Contracts.	15
V	**Challenges in Blockchain:** Opportunities - Challenges in Blockchain. **Application of Blockchain:** Industry 4.0 – Machine to Machine Communication – Data Management Industry 4.0 – Future Chain in Health 4.0 – Blockchain Properties - Healthcare Costs - Healthcare Quality - Healthcare Value - Challenges for using Blockchain for Healthcare Data - Decentralized Applications - Block Chain and Allied Technologies. Use Cases for Blockchain and AI.	15
	Total Hours	**75**

Text Books	
1.	Imran Bashir, (2023), Mastering Blockchain, 4th Edition, Packt Publication.
2.	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder (2016), Bitcoin and Crypto Currency Technologies: A Comprehensive Introduction, Princeton University Press.
3.	Antonopoulos (2014), Mastering Bitcoin: Unlocking Digital Crypto Currencies, O'Reilly Media.
Reference Book	
1.	Kumar Saurabh, Ashutosh Saxena, (2020), Blockchain Technology: Concepts and Application, 1st Edition, Wiley.
Web Resources (Swayam / NPTEL / Others)	
1.	https://onlinecourses.swayam2.ac.in/aic21_ge01/preview
2.	https://onlinecourses.nptel.ac.in/noc24_cs15/sannouncements?force=true
3.	https://nptel.ac.in/courses/106105184
4.	https://www.ibm.com/think/topics/blockchain-ai

Course Code	Course Name	Category	Hours / Week	Credits
24MSS5CE	Data Preprocessing and Visualization	Elective -I	5	4

Course Objectives

The course intends to cover

- Data objects, attributes and different types of databases.
- Data cleaning levels for data preprocessing.
- Data visualization using Python with 2D and 3D plotting.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Understand and remember the concepts of data object and types of databases.	K1, K2
CLO2	Understand various levels of data cleaning in data preprocessing.	K2
CLO3	Apply data integration and data reduction.	K3
CLO4	Apply data transformation and visualization skills using Python.	K3
CLO5	Analyze advanced plotting techniques using matplotlib library in Python.	K4
K1 - Remember; **K2** - Understand; K**3 -** Apply; **K4** – Analyze;		

CLO-PLO Mapping

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

Elective-I: Data Preprocessing and Visualization

Unit	Content	No. of Hours
I	**Data Introduction**: Data, Information, Knowledge and Wisdom (DIKW) Pyramid – DIKW for Data Analytics – Data Preprocessing for Data Analytics Versus Machine Learning – Data Objects – Data Attributes – Types of Data Values – Information Versus Pattern - Databases – Types of Databases – Connecting to, and Pulling Data from Databases.	15
II	**Data Preprocessing**: Purpose of Data Analytics – Tools for Data Analytics - Levels of Data Cleaning –Mapping the Purposes and Tools of Analytics to the Levels of Data Cleaning – Cleaning Up the Table – Unpacking Columns and Reformulating the Table – Restructuring the Table – Missing Values – Outliers – Errors. Data Preprocessing in Machine Learning.	14
III	**Data Fusion and Data Integration**: Data Fusion Versus Data Integration – Directions of Data Integration – Entity Identification – Unwise Data Collection – Index Mismatched Formatting – Aggregation Mismatch – Duplicate Data Objects – Data Redundancy. **Data Reduction:** Objectives of Data Reduction – Distinction Between Data Reduction and Data Redundancy – Random Sampling – Stratified Sampling – Random Over/Under Sampling – Performing Dimensionality Data Reduction.	16
IV	**Data Transformation and Massaging**: Normalization and Standardization – Binary Coding, Ranking Transformation and Discretization – Attribute Construction – Feature Extraction – Log Transformation – Smoothing, Aggregation and Binning. **Data Visualization:** Data Visualization in Python – Matplotlib for Data Visualization –Matplotlib Figure with Two Subplots – Saving Plots to File – Customize Plot – Changing Line and Marker Styles – Adding Annotations and Text – Creating Subplots – Adjusting Axis Limits and Tick Marks – Using Color Maps.	15
V	**Advanced Plotting Techniques 2D:** Bar Plot – Histogram – Box Plot – Violin Plot – Area Plot – Stacked Area Plot –Polar Plot – Pie Chart – Heatmap – Contour Plot – Hexbin Plot – Stream Plot. **Advanced Plotting Techniques 3D:** Surface Terrain Plot – Quiver Plot – Tri-Surface Plot – Wireframe Plot – Ribbon Plot – Delaunay Triangulation Plot – 3D Polar Plot – 3D Scatter Plot – 3D Vector Plot – Animated Plot.	15
	Total Hours	**75**

Text Books

1.	Roy Jafari (2022), Hands-on Data Preprocessing in Python, Packt Publishing Ltd.
2.	Dr. Abhinav (2023), Data Visualization using Python Programming, Shashwat Publication.

Reference Books

1.	Reis, Joe, Housley, Matt (2022), Fundamentals of Data Engineering, O'Reilly Media.
2.	Ihab F. Ilyas, Xu Chu (2019), Data Cleaning, Association for Computing Machinery.

Web Resources (Swayam / NPTEL / Others)

1.	https://onlinecourses.nptel.ac.in/noc22_cs32/preview
2.	https://onlinecourses.nptel.ac.in/noc21_cs45/preview
3.	https://lakefs.io/blog/data-preprocessing-in-machine-learning/

Course Code	Course Name	Category	Hours / Week	Credits
24MSS56P	Raspberry Pi Lab	SEC Lab - II	2	2

S. No.	List of Programs (Any 10 Practical's)
1.	File Integrity Verification using Cryptographic Hashing.
2.	Simulation of Shortest Job First (SJF) CPU Scheduling.
3.	Text Compression Analysis using Entropy Concepts.
4.	TF-IDF Based Keyword Extraction from Local Documents.
5.	Local Search Engine using Text Scoring.
6.	Parallel Text Analytics using Multiprocessing.
7.	Student Performance Analytics using SQLite.
8.	RSA-Based Public Key Encryption Demonstration.
9.	Linear Regression using Gradient Descent.
10.	K-Means Clustering using Euclidean Distance.
11.	Password Strength Checker using Python
12.	Log File Analyzer using Python
13.	Email Parsing using Python
14.	Palindrome Checker using Python
15.	Random Password Generator using Python
	Total Hours **30**

Text Books

1.	Eric Matthes, (2023), Python Crash Course, 3rd Edition, No Starch Press.
2.	Aditya Y. Bhargava, (2024), Grokking Algorithms, 2nd Edition, Manning.

Reference Books

1.	Daniel J. Barrett, (2024), Linux Pocket Guide: Essential Commands, 4th Edition, O'Reilly.
2.	Wes McKinney, (2022), Python for Data Analysis, 3rd Edition, O'Reilly.

Web Resources (Swayam / NPTEL / Others)

1.	https://onlinecourses.nptel.ac.in/noc22_cs53/preview

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			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
	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

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**