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 Undergraduate Programme

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

Programme: Bachelor of Computer Applications (BCA)
Programme Code: BCA

(Applicable for the Students Admitted During the Academic Year 2024 - 25 onwards)

Eligibility

The Student should have passed Higher Secondary Examination and wherever the students have not studied mathematics knowledge be imparted through Residential/Bridge Course (As per the eligibility condition given Ref. BU/R/B3-B4/Eligibility Condition/2024/9206 dated 24/05/2024)

Program Learning Outcomes (PLOs)
The successful completion of the BCA programme shall enable the students to:

PLO1	Understanding the computing processes and algorithmic principles to design software applications with varying complexity to address the society's requirements.
PLO2	Develop the business-relatedsoftware automation solution with appropriate provisions for data security, user comfort, environmental considerations and promote sustainable solutions.
PLO3	Develop the ability to adapt with the changing technology landscape and apply suitable CASE tools to a wide range of software development projects.
PLO4	Demonstrate active involvement in collaborative missions either as a team member as a leader or by multidisciplinary teams to accomplish results of higher order.
PLO5	Practice the Software Engineering Code of Ethics and Professional Practice

BCA

Distribution of Credits and Hours for all the Semesters

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

Consolidated Semester wise and Component wise Hours and Credits Distribution

Semester	Part I		Part II		Part III		Part IV		Part V		Total	
	Hrs.	Credits	Hrs.	Credits	Hrs.	Credits	Hrs.	Credits	Hrs.	Credits	Hrs.	Credits
1	4	3	4	3	18	13	4	4	-	-	30	23
2	4	3	4	3	18	13	4	4	-	-	30	23
3	4	3	4	3	22	15	-	4	-	-	30	25
4	4	3	4	3	20	15	2	2	-	2	30	25
5	-	-	-	-	30	23	-	-	-	-	30	23
6	-	-	-	-	30	21	-	-	-	-	30	21
Total	**16**	**12**	**16**	**12**	**138**	**100**	**10**	**14**	**-**	**2**	**180**	**140**

BCA

Curriculum

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	4	3	25	75	100	3
24HIN11L	I		Hindi – I						
24MAL11L	I		Malayalam – I						
24FRE11L	I		French – I						
24ENG12L	II	Language - II	English – I	4	3	25	75	100	3
24BCA13C	III	Core - I	Python Programming	5	3	25	75	100	4
24BCA14P	III	Core Lab - I	**Lab :** Python Programming	4	3	40	60	100	2
24BCA15C	III	Core - II	Digital Fundamental Architecture & Microprocessor	5	3	25	75	100	4
24BCA16A	III	Allied - I	Numerical Methods	4	3	25	75	100	3
24ENV1FC	IV	FC- I	Environmental Studies	2	2	50	-	50	2
24QUA1AE	IV	AECC- I	Quantitative Aptitude	2	2	-	50	50	2
Total				**30**				**700**	**23**

Semester – 2									
Course Code	**Part**	**Course category**	**Course Name**	**Hours /Week**	**Examination**				**Credits**
					Duration in Hours	**Max Marks**			
						CIA	**ESE**	**Total**	
24TAM21L	I	Language - I	Tamil – II	4	3	25	75	100	3
24HIN21L	I		Hindi – II						
24MAL21L	I		Malayalam – II						
24FRE21L	I		French – II						
24ENG22L	II	Language - II	English – II	4	3	25	75	100	3
24BCA23C	III	Core – III	Java Programming	5	3	25	75	100	4
24BCA24P	III	Core Lab - II	**Lab:** Java Programming	4	3	40	60	100	2
24BCA25C	III	Core – IV	Operating Systems	5	3	25	75	100	4
24BCA26A	III	Allied – II	Discrete Mathematics	4	3	25	75	100	3
24HUM2FC	IV	FC – II	Human Rights	2	2	50	-	50	2
24SOF2AE	IV	AECC - II	Soft Skills	2	2	-	50	50	2
Total				**30**				**700**	**23**

Semester – 3									
Course Code	**Part**	**Course Category**	**Course Name**	**Hours/ Week**	**Examination**				**Credits**
					Duration in Hours	**Max Marks**			
						CIA	**ESE**	**Total**	
24TAM31L	I	Language - I	Tamil – III	4	3	25	75	100	3
24HIN31L	I		Hindi – III						
24MAL31L	I		Malayalam – III						
24FRE31L	I		French – III						
24ENG32L	II	Language – II	English – III	4	3	25	75	100	3
24BCA33C	III	Core – V	Data Structures & Algorithms	6	3	25	75	100	4
24BCA34P	III	Core Lab – III	**Lab:** Data Structures & Algorithms	4	3	40	60	100	2
24BCA35C	III	Core – VI	Introduction to Data Science	6	3	25	75	100	4
24BCA36A	III	Allied - III	Operations Research	4	3	25	75	100	3
24BCA37P	III	SEC – I	**Lab:** Desktop Publishing with InDesign	2	3	40	60	100	2
24BAT3FC/	IV	FC – III	Basic Tamil /	-	2	50	-	50	2
24ADT3FC/			Advanced Tamil/						
24IKS3FC			Indian Knowledge Systems(IKS)*						
24MOO3AE	IV	AECC - III	Online Course – MOOC	-	-	50	-	50	2
Total				**30**				**800**	**25**

Semester – 4									
Course Code	Part	Course category	Course Name	Hours/ Week	Examination				Credits
					Duration in Hours	Max Marks			
						CIA	ESE	Total	
24TAM41L	I	Language – I	Tamil –IV	4	3	25	75	100	3
24HIN41L	I		Hindi –IV						
24MAL41L	I		Malayalam –IV						
24FRE41L	I		French –IV						
24ENG42L	II	Language – II	English –IV	4	3	25	75	100	3
24BCA43C	III	Core – VII	Database Management System	5	3	25	75	100	4
24BCA44P	III	Core Lab – IV	**Lab :**Database Management System	4	3	40	60	100	2
24BCA45C	III	Core – VIII	Software Engineering	5	3	25	75	100	4
24BCA46A	III	Allied – IV	Digital Marketing	4	3	25	75	100	3
24BCA47P	III	SEC – II	**Lab:** Product Mockups & Brand Visualization	2	3	40	60	100	2
24IDT4AE/	IV	AECC - IV	Innovation & Design Thinking /	2	2	-	50	50	2
24IPR4AE/			Intellectual Property Rights /						
24END4AE			Entrepreneurship Development						
24EXC4LA	V	Extra - Curricular and Co-curricular	Liberal Arts	-	-	50	-	50	2
			Total	**30**				**800**	**25**

Semester - 5									
Course Code	**Part**	**Course Category**	**Course Name**	**Hours/ Week**	**Examination**				**Credits**
					Duration in Hours	**Max Marks**			
						CIA	**ESE**	**Total**	
24BCA51C	III	Core - IX	Full Stack Development	5	3	25	75	100	4
24BCA52P	III	Core Lab - V	**Lab:** Full Stack Development	5	3	40	60	100	3
24BCA53C	III	Core - X	Linux and Shell Programming	5	3	25	75	100	4
24BCA54P	III	Core Lab - VI	**Lab:** Linux and Shell Programming	5	3	40	60	100	3
24BCA55C	III	Core - XI	Visual Basic	5	3	25	75	100	4
24BCA5AE/	III	Elective – I	Machine Learning **(Artificial Intelligence)**	5	3	25	75	100	3
24BCA5BE/			Cryptography & Network Security **(Cyber Security)**						
24BCA5CE			Data Mining **(Data Mining)**						
24BCA56I	III	SEC	Internship	-	2	50	-	50	2
Total				**30**				**650**	**23**

Semester – 6									
Course Code	**Part**	**Course Category**	**Course Name**	**Hours / Week**	**Examination**				**Credits**
					Duration in Hours	**Max Marks**			
						CIA	**ESE**	**Total**	
24BCA61C	III	Core – XII	Graphics and Multimedia	6	3	25	75	100	4
24BCA62P	III	Core Lab – VII	**Lab :** Graphics and Multimedia	5	3	40	60	100	3
24BCA63C	III	Core - XIII	Data Visualisation	6	3	25	75	100	4
24BCA6AE/	III	Elective - II	Natural Language Processing **(Artificial Intelligence)**	5	3	25	75	100	3
24BCA6BE/			Cyber Security and Cyber Law **(Cyber Security)**						
24BCA6CE			Big Data Processing and Analytics **(Data Mining)**						
24BCA64P	III	SEC Lab - III	**Lab:** Data Visualisation	2	3	40	60	100	2
24BCA6PR	III	Project	**Core :** Project Work	6	3	40	60	100	5
			Total	**30**				**600**	**21**
			Grand Total	**180**				**4250**	**140**

Semester 1

Semester – 1									
Course Code	**Part**	**Course Category**	**Course Name**	**Hours/ Week**	**Examination**				**Credits**
					Duration in Hours	**Max Marks**			
						CIA	**ESE**	**Total**	
24TAM11L	I	Language - I	Tamil – I	4	3	25	75	100	3
24HIN11L	I		Hindi – I						
24MAL11L	I		Malayalam – I						
24FRE11L	I		French – I						
24ENG12L	II	Language - II	English – I	4	3	25	75	100	3
24BCA13C	III	Core - I	Python Programming	5	3	25	75	100	4
24BCA14P	III	Core Lab - I	**Lab :** Python Programming	4	3	40	60	100	2
24BCA15C	III	Core - II	Digital Fundamental Architecture & Microprocessor	5	3	25	75	100	4
24BCA16A	III	Allied - I	Numerical Methods	4	3	25	75	100	3
24ENV1FC	IV	FC- I	Environmental Studies	2	2	50	-	50	2
24QUA1AE	IV	AECC- I	Quantitative Aptitude	2	2	-	50	50	2
Total				**30**				**700**	**23**

Part – I : Language I-Tamil-I

(All the Undergraduate Programmes)

Course Code	Course Name	Category	Hours / Week	Credits
24TAM11L	Tamil - I	Language- I	4	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	Language-II	4	3

Course Objectives

The course intends to cover

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

Course Learning Outcomes

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

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

Part - II: English - I

Unit	Content	No. of Hours
I	**Poetry** : Nature 1. I Wandered Lonely as a Cloud - William Wordsworth 2. The Sparrow - Paul Laurence Dunbar 3. Stopping by woods on a snowy Evening – Robert Frost	12
II	**Prose** : Friendship 1. The Man in Black - Oliver Goldsmith 2. Of Friendship - Francis Bacon 3. The Blessing of Friends - Sir John Lubbock	12
III	**Short Stories:** Morality 1. The Necklace – Guy de Maupassant 2. The Lottery - Shirley Jackson 3. The Monkey's Paw - W. W. Jacobs	12
IV	**Language Competency:** 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
24BCA13C	Python Programming	Core - I	5	4

Course Objectives

This Course intends to cover

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

Course Learning Outcomes

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

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

CLO – PLO Mapping

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

Core - I: Python Programming

Unit	Content	No. of Hours
I	**Introduction:** The essence of computational problem solving – Limits of computational problem solving-Computer algorithms-Computer Hardware-Computer Software-The process of computational problem solving-Python programming language - Literals - Variables and Identifiers - Operators - Expressions and Data types, Input / Output.	15
II	**Control Structures:** Boolean Expressions - Selection Control - If Statement-Indentation in Python- Multi-Way Selection - Iterative Control- While Statement- Infinite loops- Definite vs. Indefinite Loops- Boolean Flag. String, List, Tuple and Dictionary, Manipulations Building blocks of python programs, Understanding and using ranges.	15
III	**Functions:** Program Routines- Defining Functions- More on Functions: Calling Value - Returning Functions - Calling Non-Value - Returning Functions- Parameter Passing - Keyword Arguments in Python - Default Arguments in Python-Variable Scope. Recursion: Recursive Functions.	15
IV	**Objects and their use:** Software Objects - Turtle Graphics – Turtle attributes-Modular Design: Modules - Top-Down Design - Python Modules - Text Files: Opening, reading and writing text files – Database Programming: Connecting to a database, Creating Tables, INSERT, UPDATE, DELETE and READ operations, Transaction Control, Disconnecting from a database, String Processing - Exception Handling	15
V	**Dictionaries and Sets:** Dictionary type in Python - Set Data type. Object Oriented Programming using Python: Encapsulation - Inheritance – Polymorphism. Python packages: Simple programs using the built-in functions of packages matplotlib, numpy, pandas etc.	15
	Total Hours	**75**
Text Books		
1.	Charles Dierbach (2022), Introduction to Computer Science using Python - A computational Problem solving Focus, Wiley India Edition.	
2.	Wesley J. Chun (2016), Core Python Applications Programming, 3rd Edition , Pearson Education.	
Reference Books		
1.	Mark Lutz (2018), Learning Python Powerful Object-Oriented Programming, O'reilly Media, 5th Edition.	
2.	Timothy A. Budd (2011), Exploring Python, Tata MCGraw Hill Education Private Limited, 1st Edition.	
3.	John Zelle (2013), Python Programming: An Introduction to Computer Science, 2nd Edition, Course Technology Cengage Learning Publications, ISBN 978- 1590282410	
Web Resources (Swayam / NPTEL)		
1.	https://onlinecourses.swayam2.ac.in/cec24_cs01/course	
2.	https://onlinecourses.nptel.ac.in/noc24_cs57/preview	

Course Code	Course Name	Category	Hours / Week	Credits
24BCA14P	Lab : Python Programming	Core Lab - I	4	2

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

S. No.	List of Programs	
15	Devise a Python program to implement the Hangman Game.	
16	Program to create student database and calculate total marks, percentage and grade of a student. Marks obtained in each of the five subjects are to be input by user. Assign grades according to the following criteria: Grade A: Percentage >=80 Grade B: Percentage >=70 and 80 Grade C: Percentage >=60 and <70 Grade D: Percentage >=40 and <60 Grade E: Percentage < 40	
	Total Hours	**60**
Text Books		
1.	Charles Dierbach (2022), Introduction to Computer Science using Python - A computational Problem-solving Focus, Wiley India Edition.	
2.	Wesley J. Chun (2016), Core Python Applications Programming, 3rd Edition, Pearson Education.	
Reference Books		
1.	Mark Lutz (2018), Learning Python Powerful Object-Oriented Programming, O‟reilly Media, 5th Edition.	
2.	Timothy A. Budd (2011), Exploring Python, Tata MCGraw Hill Education Private Limited, 1st Edition.	
3.	John Zelle (2013), Python Programming: An Introduction to Computer Science, 2nd Edition, Course Technology Cengage Learning Publications, ISBN 978- 1590282410.	
Web Resources (Swayam/NPTEL)		
1.	https://onlinecourses.swayam2.ac.in/cec24_cs01/course	
2.	https://onlinecourses.nptel.ac.in/noc24_cs57/preview	

Course Code	Course Name	Category	Hours / Week	Credits
24BCA15C	Digital Fundamental Architecture & Microprocessor	Core - II	5	4

Course Objectives

This Course intends to cover:

- Different Number System, Digital Arithmetic and Logic Circuits.
- Various types of Microprocessor Architecture.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Understand the basics of digital systems and computing.	K1, K2
CLO2	Apply the basics in digital circuits.	K3
CLO3	Develop the various electronic circuits.	K3
CLO4	Understand the architecture and functionalities of Integrated Circuits.	K2
CLO5	Demonstrate an application or a working environment with Integrated Circuits and its Peripherals.	K2
K1 - Remember; **K2** - Understand; **K3** - Apply		

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	3	2	2	2	1
CLO5	3	2	3	3	2
3 – Substantial (High)		**2** – Moderate (Medium)		**1** – Slight (Low)	

Core - II : Digital Fundamental Architecture and Microprocessor

Unit	Content	No. of Hours
I	**Number Systems 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 Microprocessor:** Introduction – Block Diagram - Pin Diagram - 8085 Architecture, bus organization. Instruction Format – Instruction Set – Addressing Modes. Programming the 8085: Arithmetic and Logical Programs.	15
V	**Parallel and Serial Interfacing:** 8255A Programmable Peripheral Interfacing: Block Diagram, Pin Diagram, Modes of Operation: I/O and BSR. 8085 Interrupts - Architecture of Programmable Interrupt Controller 8259 — Architecture of 8254 Programmable Interval Timer / Counter. Direct Memory Access – 8237 DMA Controller. ADC Interfacing – DAC Interfacing.	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 Courses)		
1.	https://onlinecourses.swayam2.ac.in/cec24_cs09/preview	
2.	https://onlinecourses.nptel.ac.in/noc24_ee46/preview	

Part – III : Allied Courses

(B.Sc. Computer Science / BCA / B.Sc. Information Technology / B.Sc. Computer Technology)

Course Code	Course Name	Category	Hours / Week	Credits
24BCS16A / 24BCA16A / 24BIT16A / 24BCT16A	**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 (4th ed.), 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 : Foundation Course

(All the Undergraduate Programmes)

Course Code	Course Name	Category	Hours / Week	Credits
24ENV1FC	Environmental Studies	FC- I	2	2

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

Unit	Content
IV	**Biodiversity and its Conservation** - Introduction-Definition: genetic, species and ecosystem diversity. - Bio geographical classification of India. - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. - Biodiversity at global, National and local levels. - India as a mega-diversity nation. - Hot-spots of biodiversity. - Threats to biodiversity: habital loss, poaching of wildlife, man-wildlife conflicts. - Endangered and endemic species of India. - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
V	**Environmental Pollution Definition** - Causes, effects and control measures of: - a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards - Solid waste Management: Causes, effects and control measures of urban and industrial wastes. - Role of an individual in prevention of pollution. - Pollution case studies. - Disaster management: floods, earthquake, cyclone and landslides.
VI	**Social Issues and the Environment** - From Unsustainable to Sustainable development. - Urban problems related to energy. - Water conservation, rain water harvesting, watershed management. - Resettlement and rehabilitation of people; its problems and concerns. Case studies. - Environmental ethics: Issues and possible solutions. - Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. - Wasteland reclamation. - Consumerism and waste products. - Environment Protection Act. - Air (Prevention and Control of Pollution) Act. - Water (Prevention and Control of Pollution) Act. - Wildlife Protection Act. - Forest Conservation Act. - Issues involved in enforcement of environmental legislation. - Public awareness.

Unit	Content
VII	**Human Population and the Environment** - Population growth, variation among nations. - Population explosion-Family welfare Programme. - Environment and human health. - Human Rights. - Value Education. - HIV/AIDS. - Women and Child Welfare. - Role of information Technology in Environment and human health. - Case Studies.
VIII	**Field Work (Practical).** - Visit to a local area to document environmental assets-river/forest/grassland/ hill/mountain. - Visit to a local polluted site-Urban/Rural/Industrial/Agricultural. - Study of common plants, insects, birds. - Study of simple ecosystems-pond, river, hill slopes, etc.
	Total Hours **30**

Web Resources	
1.	https://www.ugc.gov.in/oldpdf/modelcurriculum/env.pdf

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

Max Marks	Marks for		Components for CIA							
	CIA	ESE	CIA – I		CIA – II		Best of CIA-I & CIA-II	Model		Total (Best + Model)
50	50	-	Actual	Weightage	Actual	Weightage	Weightage	Actual	Weightage	**50**
			50	**25**	50	**25**	**25**	50	**25**	

Question Paper Pattern

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

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 Hrs.	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 - I	Tamil – II	4	3	25	75	100	3
24HIN21L	I		Hindi – II						
24MAL21L	I		Malayalam – II						
24FRE21L	I		French – II						
24ENG22L	II	Language - II	English – II	4	3	25	75	100	3
24BCA23C	III	Core – III	Java Programming	5	3	25	75	100	4
24BCA24P	III	Core Lab - II	**Lab:** Java Programming	4	3	40	60	100	2
24BCA25C	III	Core – IV	Operating Systems	5	3	25	75	100	4
24BCA26A	III	Allied – II	Discrete Mathematics	4	3	25	75	100	3
24HUM2FC	IV	FC – II	Human Rights	2	2	50	-	50	2
24SOF2AE	IV	AECC - II	Soft Skills	2	2	-	50	50	2
Total				**30**				**700**	**23**

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

Course Objectives

The Course intends to cover

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

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	அற இலக்கியங்கள் வழி வாழ்வியல் 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	Langauge - 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
24BCA23C	Java Programming	Core - III	5	4

Course Objectives

This Course intends to cover:

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

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Remember object-oriented features to build simple applications	K1
CLO2	Understand the concept of Inheritance, Packages, Interfaces and Exception Handling	K2
CLO3	Apply multithreaded programming and File Handling Concepts	K3
CLO4	Understand the fundamental concept of AWT Controls, Layouts and events to demonstrate User Driven Interactive Applications	K2, K3
CLO5	Develop GUI Applications using Swing in Java, Develop simple Application using Spring Boot	K3
K1 – Remember; **K2** - Understand; **K3** – Apply		

CLO – PLO Mapping

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

Core - III : Java Programming

Unit	Content	No. of Hours
I	**Introduction:** Review of Object-Oriented concepts–History of Java - Java buzzwords - JVM architecture – Data types – Variables - Scope and lifetime of variables – arrays – operators – control statements – type conversion and casting – Simple Java program – constructors – methods – Static Block - Static Data – Static Method String and String Buffer Classes.	15
II	**Inheritance:** Basic concepts - Types of inheritance - Member access rules – Usage of this and Super keyword - Method Overloading - Method overriding – Abstract classes - Dynamic method dispatch – Usage of final keyword. Packages: Definition - Access Protection-Importing Packages – Interfaces – Definition – Implementation – Extending. Exception Handling**:** try-catch - throw - throws – finally – Built-in exceptions - Creating own Exception classes.	15
III	**Multithreaded Programming:** Thread Class - Runnable interface - Synchronization – Using synchronized methods – Using synchronized statement – Inter thread Communication – Deadlock. I/O Streams: Concepts of streams - Stream classes - Byte and Character stream - Reading console Input and Writing Console output – File Handling.	15
IV	**AWT Controls:** The AWT class hierarchy - user interface components - Labels - Button - Text Components - Check Box - Check Box Group - Choice - List Box - Panels – Scroll Pane - Menu - Scroll Bar. Working with Frame class - Color - Fonts and layout managers - Event Handling - Events – Event sources - Event Listeners - Event Delegation Model (EDM) – Handling Mouse and Keyboard Events - Adapter classes - Inner classes.	15
V	**Swing**: Introduction to Swing - Hierarchy of swing components. Containers - Top level containers - JFrame - JWindow - JDialog - JPanel - JButton – JToggleButton - JCheckBox - JRadioButton - JLabel, JTextField - JTextArea - JList - JComboBox - JScrollPane. Spring Boot: Fundamentals of Spring Boot- Spring vs Spring Boot - Spring Boot Architecture - Develop Spring Boot Application step by step - Run Spring Boot Application - Creating first Spring Boot application	15
	Total Hours	**75**
Text Books		
1.	Herbert Schildt (2017), The Complete Reference, Tata McGraw Hill, New Delhi,9th Edition.	
2.	E.Balagurusamy (2023), Programming with Java, Tata McGraw Hill, New Delhi,7th Edition.	
3.	Ashish Sarin, J. Sharma (2017), Getting Started with Spring Framework, Create Space Independent Publishing Platform.	
Reference Books		
1.	Y. Daniel Liang (2018), Introduction to Java Programming, Pearson Education, India, 10th Edition.	
2.	Kathy Sierra, Bert Bates, Trisha Gee (2022), HeadFirst Java. O.Reilly Publications, 3rd Edition	
Web Resources (Swayam / NPTEL)		
1.	https://onlinecourses.nptel.ac.in/noc22_cs47/preview	
2.	https://onlinecourses.nptel.ac.in/noc20_cs84/preview	

Course Code	Course Name	Category	Hours/ Week	Credits
24BCA24P	Lab : Java Programming	Core Lab - II	4	2

S. No.	List of Programs
1	Basic Java programs.
2	Java program that prompts the user for an integer and then prints out all the prime numbers up to that Integer.
3	Java program to multiply two given matrices.
4	Java program that displays the number of characters, lines, and words in a text.
5	Generate random numbers between two given limits using Random class and print messages according to the range of the value generated.
6	Java program to do String Manipulation using CharacterArray and perform the following string operations: a) Stringlength b) Finding a character at a particular position c) Concatenating two strings.
7	Java program to perform the following string operations using String class: a) String Concatenation b) Search a substring c) To extract substring from the given string.
8	Java program to perform string operations using the StringBuffer class: a) Length of a string b) Reverse a string c) Delete a substring from the given string.
9	Java program that implements a multi-thread application that has three threads. The first thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.
10	Java threading program that uses the same method asynchronously to print the numbers 1 to10 using Thread1 and to print 90 to100 using Thread2.
11	Java program to demonstrate the use of the following exceptions. a) ArithmeticException b) NumberFormatException c) ArrayIndexOutofBoundsException d) NegativeArraySizeException
12	Java program that reads on filename from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file, and the length of the file in bytes

S. No.	List of Programs
13	Java program to accept a text and change its size and font. Include bold italic options. Use frames and controls.
14	Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired.(Use adapter classes).
15	Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +,-,*, and % operations. Add a textfield to display the result. Handle any possible exceptions like divide by zero.
16	Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "stop" or "ready" or "go" should appear above the buttons in a selected color. Initially there is no message shown.
	Total Hours **60**
Text Books	
1.	Herbert Schildt (2017), The Complete Reference, Tata McGraw Hill, New Delhi,9th Edition.
2.	E. Balagurusamy (2023), Programming with Java, Tata McGraw Hill, New Delhi, 7th Edition.
Reference Books	
1.	Cay S. Horstmann (2007), Gary Cornell, Core Java, Volume I– Fundamentals, Prentice Hall, 8th Edition.
2.	Kathy Sierra, Bert Bates, Trisha Gee (2022), "Head First Java",(Grayscale Indian Edition) ,O'Reilly Publications, 3rd Edition.
Web Resources (Swayam/NPTEL)	
1.	https://onlinecourses.nptel.ac.in/noc20_cs58/preview
2.	https://onlinecourses.nptel.ac.in/noc24_cs40/preview

Course Code	Course Name	Category	Hours / Week	Credits
24BCA25C	Operating Systems	Core – IV	5	4

Course Objectives

This Course intends to cover:

- Basic Operating System concepts.
- Process concepts, Deadlock and Memory management.
- Scheduling algorithms, devices and information management.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Define the process concepts and its lifecycle in operating system.	K1
CLO2	Understand the Asynchronous concurrent process and algorithms.	K2
CLO3	Understand the deadlock detection, prevention and recovery using algorithms.	K2
CLO4	Apply the knowledge of job Scheduling Algorithms to make the effective utilization of CPU.	K3
CLO5	Apply memory management strategies to enhance system efficiency.	K3
K1 - Remember; **K2** - Understand; **K3** - Apply		

CLO – PLO Mapping

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

Core - IV : Operating Systems

Unit	Content	No. of Hours
I	**Introduction:** Operating system, history (1990s to 2000 and beyond), distributed computing, parallel computation - Process concepts - Definition of process, process states - Life cycle of a process, process management- process state transitions, Process Control Block (PCB), process operations, suspend and resume, context switching, Interrupts - Interrupt processing, interrupt classes, inter-process communication - signals, message passing.	15
II	**Asynchronous concurrent processes:** Mutual exclusion - critical section, mutual exclusion primitives, implementing mutual exclusion primitives, Peterson's algorithm - software solutions to the mutual Exclusion Problem - n-thread mutual exclusion - Lamport Bakery Algorithm - Semaphores – Mutual exclusion with Semaphores, thread synchronization with semaphores - counting semaphores - implementing semaphores - Concurrent programming - Monitors, message passing.	15
III	**Deadlock and indefinite postponement:** Resource concepts, four necessary conditions for deadlock - deadlock prevention - deadlock avoidance and Dijkstra's Banker's algorithm - deadlock detection - deadlock recovery.	15
IV	**Job and processor scheduling:** Scheduling levels - scheduling objectives - scheduling criteria - preemptive vs non-preemptive scheduling - interval timer or interrupting clock – priorities - scheduling algorithms - FIFO scheduling - RR scheduling - quantum size - SJF scheduling - SRT scheduling - HRN scheduling - multi-level feedback queues - Fair share scheduling.	15
V	**Real Memory organization and Management:** Memory organization - Memory management - Memory hierarchy - Memory management strategies - contiguous vs non - contiguous memory allocation - single user contiguous memory allocation - fixed partition multiprogramming - variable partition multiprogramming - Memory swapping - Virtual Memory organization - virtual memory basic concepts, multilevel storage organization - block mapping – paging basic concepts - segmentation – paging - segmentation systems - Virtual Memory Management - Demand Paging – Page replacement strategies.	15
	Total Hours	**75**
Text Books		
1.	H.M.Deitel (2011), Operating Systems, 7th Edition, Pearson Education Asia.	
2.	Andrew Tanenbaum (2010), Modern Operating Systems, Pearson Education.	
Reference Books		
1.	William Stallings (2012), Operating System: Internals and Design Principles, 7th Edition, Prentice-Hall of India.	
2.	A.Silberschatz and P.B. Galvin (2012), Operating Systems Concepts, 9th Edition, John Wiley &Sons (ASIA) Private Ltd.	
Web Resources (Swayam/ NPTEL)		
1.	https://onlinecourses.nptel.ac.in/noc21_cs88/preview	
2.	https://onlinecourses.nptel.ac.in/noc21_cs72/preview	

Part – III : Allied Courses

(B.Sc. Computer Science / BCA / B.Sc. Information Technology / B.Sc. Computer Technology)

Course Code	Course Name	Category	Hours / Week	Credits
24BCS26A / 24BCA26A 24BIT26A 24BCT26A	**Discrete Mathematics**	**Allied – II**	**4**	**3**

Course Objectives

The course intends to cover

- The fundamental concepts and tools in discrete mathematics with emphasis on their applications to computer science.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Formulate the basic terminology of sets.	K1
CLO2	Design the operations with relations.	K2
CLO3	Apply FSA to find a solution for a computer based system.	K3
CLO4	Apply the concepts of Connectives and tautological implications in data analysis.	K3
CLO5	Evaluate the basic terminology of graph theory.	K3
K1 - Remember; **K2** - Understand; **K3** - Apply		

CLO – PLO Mapping

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

Allied – II : Discrete Mathematics

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	**Relations:** Binary Relations – Set operation on relations-Types of Relations – Partial order relation – Equivalence relation – Composition of relations.	12
III	**Languages:** Operations on languages – Regular Expressions and regular languages – Grammar – Types of grammars – Finite state machine – Finite – State automata.	12
IV	**Mathematical Logic:** Propositional calculus –Basic logical operations-Tautologies-Contradiction-Argument-Method of proof- Predicate calculus.	12
V	**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
	Total Hours	**60**
Text Book		
1.	J.K. Sharma, (2022). Discrete Mathematics(Ed.2), Macmillan India Ltd. Unit I : Chapter 1 : Section 1.1 – 1.7, 1.9,1.10,1.12,1.14 Unit II : Chapter 3 : Section 3.3 – 3.7, 3.9, 3.11 Unit III: Chapter 15 : Section 15.3 – 15.7 Unit IV: Chapter 12 : Section 12.1 – 12.3, 12.8 – 12.12, 12.14 Unit V: Chapter 9 : Section 9.1 – 9.5, 9.8 Chapter 10 : Section 10.1 -10.3, 10.6, 10.8	
Reference Books		
1.	J.P. Tremblay, R. Manohar, (2002). Discrete Mathematics Structures with Applications to Computer Science,, McGraw Hill International Edition.	
2.	M.K. Venkataraman., N. Sridharan. & N. Chandarasekaran, (2004). Discrete Mathematics, National Publishing Company, Chennai.	
Web Resources (Swayam / NPTEL)		
1.	https://archive.nptel.ac.in/courses/111/106/111106086/	

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 : Foundation Courses

(All the Undergraduate Programmes)

Course Code	Course Name	Category	Hours / Week	Credits
24HUM2FC	Human Rights	FC - II	2	2

Unit	Content
I	**Concept of Human Values, Value Education Towards Personal Development** Aim of Education and Value Education; Evolution of Value Oriented Education; Concept of Human Values; Types of Values; Components of Value Education. **Personal Development:** Self-analysis and Introspection; Sensitization towards Gender Equality, Physically Challenged, Intellectually Challenged. Respect to - Age, Experience, Maturity, Family Members, Neighbors, Co-workers. Character Formation towards Positive Personality: Truthfulness, Constructively, Sacrifice, Sincerity, Self-Control, Altruism, Tolerance, Scientific Vision.
II	**Value Education Towards National and Global Development** **National and International Values:** Constitutional or National Values - Democracy, Socialism, Secularism, Equality, Justice, Liberty, Freedom, and Fraternity. Social Values - Pity and Probity, Self-Control, Universal Brotherhood. Professional Values - Knowledge Thirst, Sincerity in Profession, Regularity, Punctuality, and Faith. Religious Values - Tolerance, Wisdom, Character. Aesthetic Values - Love and Appreciation of Literature and Fine Arts and Respect for the Same. National Integration and International Understanding.
III	**Impact of Global Development on Ethics and Values** Conflict of Cross-Cultural Influences, Mass Media, Cross-Border Education, Materialistic Values, Professional Challenges, and Compromise. Modern Challenges of Adolescent Emotions and Behavior; Sex and Spirituality: Comparison and Competition; Positive and Negative Thoughts. Adolescent Emotions, Arrogance, Anger, Sexual Instability, Selfishness, Defiance
IV	**Therapeutic Measures** Control of the Mind through a. Simplified Physical Exercise b. Meditation – Objectives, Types, Effect on Body, Mind and Soul c. Yoga – Objectives, Types, Asanas d. Activities: (i) Moralisation of Desires (ii) Neutralisation of Anger (iii) Eradication of Worries (iv) Benefits of Blessings

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

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

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

Max Marks	Marks for		Components for CIA							
	CIA	ESE	CIA – I		CIA – II		Best of CIA-I & CIA-II	Model		Total (Best + Model)
50	50	-	Actual	Weightage	Actual	Weightage	Weightage	Actual	Weightage	**50**
			50	**25**	50	**25**	**25**	50	**25**	

Question Paper Pattern

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

Part – IV : Ability Enhancement Compulsory Course

(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	Details	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 Hrs.	Mode of Exam	Type of Questions	No. of Questions	Marks
2	Online	MCQ	50	50x1=50

Semester 3

BCA

Curriculum

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	4	3	25	75	100	3
24HIN31L	I		Hindi – III						
24MAL31L	I		Malayalam – III						
24FRE31L	I		French – III						
24ENG32L	II	Language – II	English – III	4	3	25	75	100	3
24BCA33C	III	Core – V	Data Structures & Algorithms	6	3	25	75	100	4
24BCA34P	III	Core Lab – III	**Lab:** Data Structures & Algorithms	4	3	40	60	100	2
24BCA35C	III	Core – VI	Introduction to Data Science	6	3	25	75	100	4
24BCA36A	III	Allied - III	Operations Research	4	3	25	75	100	3
24BCA37P	III	SEC – I	**Lab:** Desktop Publishing with InDesign	2	3	40	60	100	2
24BAT3FC/	IV	FC – III	Basic Tamil /	-	2	50	-	50	2
24ADT3FC/			Advanced Tamil/						
24IKS3FC			Indian Knowledge Systems(IKS) *						
24MOO3AE	IV	AECC - III	Online Course – MOOC	-	-	50	-	50	2
Total				**30**				**800**	**25**

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

- 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) – பத்மஸ்ரீ 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
6	சின்னத்தம்பி முருகேசன்.பொன்(2016) சுற்றுச் சூழலியல்(உலகம் தழுவிய வரலாறு), எதிர் வெளியீடு

Reference Books	
7	இறையன்பு.வெ (2018) இலக்கியத்தில் மேலாண்மை, நியூ செஞ்சுரி புக் ஹவுஸ்
8	ஸ்ரீனிவாசன்.வி, (2009), திருக்குறளில் மேலாண்மை, விகடன் பிரசுரம்
9	பட்டனத்தி மைந்தன், (2018), ஜி.டி நாயுடு, ராமையா பதிப்பகம்
10	டாக்டர் பக்தவத்சலம்.ஜி (2009) இதயம் ஒரு கோவில், விஜயா பதிப்பகம்

Question Pattern	
காலம் : 3 மணி நேரம்	மொத்த மதிப்பெண்கள் : 75
பிரிவு – அ 10x1=10 • சரியான விடையைத் தேர்ந்தெடுத்து எழுதுக.	
பிரிவு – ஆ 5x5=25 • வணிகம் மற்றும் கணினித் தமிழ் - 1 வினா • ஊடகம் மற்றும் உளவியல் தமிழ் - 1 வினா • சுற்றுலாவியல் மற்றும் சுற்றுச்சூழலியல் - 1 வினா • மேலாண்மைத் தமிழ் மற்றும் மொழிப்பயிற்சி- 1 வினா • கொங்கு ஆளுமைகள் - 1 வினா	
பிரிவு – இ 5x8=40 • வணிகம் மற்றும் கணினித் தமிழ் - 1 வினா • ஊடகம் மற்றும் உளவியல் தமிழ் - 1 வினா • சுற்றுலாவியல் மற்றும் சுற்றுச்சூழலியல் - 1 வினா • மேலாண்மைத் தமிழ் மற்றும் மொழிப்பயிற்சி- 1 வினா • கொங்கு ஆளுமைகள் - 1 வினா	

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

Course Code	Course Name	Category	Hours / Week	Credits
24HIN31L	Hindi - III	Language - I	4	3

Course Objectives

- May 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
- This will help you to understand the basics of Hindi literature and to understand Hindi literature properly
- 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		

Part – 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		

Part – 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 Objective

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		

Part – 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 Book	
1.	Céline Himber, Corina Brillant, Sophie Erlich, (2014), Adomania2 – Methode Defrancais, Publisher : Hachette Fle
Reference Book	
1.	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		

Part-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 Book		
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
24BCA33C	Data Structures & Algorithms	Core - V	6	4

Course Objectives

The course intends to cover

- Basic Concepts of Data Structures and Applications
- Algorithm Analysis and Design Techniques

Course Learning Outcomes

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

CLO	Content	Knowledge Level
CLO1	Learn the basic concepts of Stack and Queues Data Structures and its application	K1
CLO2	Understand the representation of Linked List and its implementation	K2
CLO3	Organize and manage hierarchical datas with non-linear Data structures	K2
CLO4	Understand various Sorting Algorithms and to manage the data efficiently	K3
CLO5	Apply algorithmic design paradigms like Dynamic Programming, Backtracking, Divide and Conquer	K3
K1- Remember; **K2** - Understand; **K3** – Apply		

CLO – PLO Mapping

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

Core - V: Data Structures &Algorithms

Unit	Content	No. of Hours
I	**Basic Concepts:** Overview: System Life Cycle-Algorithm Specification: Introduction- Performance Analysis: Space Complexity-Time Complexity-Asymptotic Notation - **Arrays:** The Abstract Data type – Sparse Matrics – The Abstract Data type-Sparse Matrix Representation – Transposing a Matrix.The Representation of Multidimensional Arrays -**Stacks and Queues:** Stacks – Queues-Evaluation of Expression – Multiple Stacks and Queues	18
II	**Linked List:** Singly Linked Lists and Chains – Linked Stacks and Queues-Polynomials-Polynomial Representation-Adding Polynomial – Circular List Representation of Polynomial-Sparse Matrices-Sparse Matrix Representation-Doubly Linked List	18
III	**Trees: Terminology –** Representation of Trees – Binary Trees: The Abstract Data type – Properties of Binary Tree – Binary Tree Traversal. Binary Search Tree-Searching, Inserting and Deleting in Binary Search Tree.- Introduction: Threaded Binary Trees. - **Graphs** The Graph Abstract Data type – Elementary Graph Operations: Depth First Search- Breadth First Search -Minimum Cost Spanning Tree – Kruskal's Algorithm – Shortest Path and Transitive Closure	18
IV	**Searching:** Sequential Search - Binary Search - **Sorting:** Definitions - Insertion sort – Quick sort - Merge sort – Heap sort –**Hashing:** The Symbol Table, Abstract Data Type - Static Hashing - Dynamic Hashing using Directories	18
V	**Algorithm Analysis Techniques**: Efficiency of Algorithms – Analysis of Recursive Programs – **Algorithm Design Techniques** : Divide and Conquer Algorithms - Dynamic Programming – 0/1 Knapsack Problem - Matrix Chain Multiplication - Greedy Algorithms - Case study on Job Sequencing Algorithm – Huffman Coding - K- Job Sequencing with Deadlines	18
	Total Hours	**90**

Text Books	
1.	Ellis Horowitz, SartajSahni, Susan Anderson Freed, Second Edition (2014), "Fundamentals of Data in C", Universities Press
2.	V. Aho, John E. Hopcroft, Jeffrey D. Ullman, (2008), "Data Structures and Algorithms", 3rd Edition, Pearson Education Alfred Asia
Reference Books	
1.	Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education Asia.
2.	Ellis Horowitz, SartajSahani and Dinesh Mehta (2008), Fundamentals of Data Structures in C++, 2nd Edition, University Press.
Web Resources (Swayam / NPTEL)	
1.	https://onlinecourses.nptel.ac.in/noc23_cs85/preview
2.	https://onlinecourses.nptel.ac.in/noc24_cs78/preview

Core Lab – III : Data Structures & Algorithms

Course Code	Course Name	Category	Hours /Week	Credits
24BCA34P	Lab: Data Structures & Algorithms	Core Lab - III	4	2

S.No	List of Programs
1	Simple Programs, Implementation of Array Operations
2	Implementation of Stack using Arrays
3	Implementation of Queue using Arrays
4	Conversion of Infix to Postfix Expression
5	Evaluation of Postfix Expression
6	Implementation of Singly Linked List
7	Implementation of Tree Traversal
8	Implementation of Depth First Search
9	Implementation of Breadth First Search
10	Implementation of Linear Search
11	Implementation of Binary Search
12	Implementation of Quick Sort
13	Implementation of Merge Sort
14	Greedy Algorithms - Activity Selection Problem
15	0-1 Knapsack Problem
	Total Hours **60**

Text Books

1. Ellis Horowitz, SartajSahni, Susan Anderson Freed, Second Edition, "Fundamentals of Data in C", Universities Press
2. V. Aho, John E. Hopcroft, Jeffrey D. Ullman, (2008), "Data Structures and Algorithms", 3rd Edition, Pearson Education Alfred Asia

Reference Books

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education Asia.
2. Ellis Horowitz, SartajSahani and Dinesh Mehta (2008), Fundamentals of Data Structures in C++, 2nd Edition, University Press.

Web Resources (Swayam / NPTEL)

1. https://onlinecourses.nptel.ac.in/noc23_cs85/preview
2. https://onlinecourses.nptel.ac.in/noc24_cs78/preview

Core – VI : Introduction to Data Science

Course Code	Course Name	Category	Hours / Week	Credits
24BCA35C	Introduction to Data Science	Core - VI	6	4

Course Objectives

The course intends to cover

- To introduce the concepts, techniques, and tools in Data Science.
- To understand the various facets of data science practice, including data collection and integration, exploratory data analysis, predictive modelling, descriptive modelling and effective communication.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	To understand the basics in Data Science and Big Data	K1
CLO2	To understand the overview and building process in Data Science	K2
CLO3	To incorporate basic Data Pre-Processing procedures.	K3
CLO4	To understand various algorithms in Data Science	K3
CLO5	To understand Data Science in different domains.	K3
K1 - Remember; **K2** - Understand; **K3** - Apply		

CLO – PLO Mapping

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

Core - VI : Introduction to Data Science

Unit	Content	No. of Hours
I	**Introduction to Data Science** – Evolution of Data Science – Data Science Roles – Benefits and uses – Facets of Data – Data Science Process – Big Data ecosystem and Data Science.	18
II	**Overview of the Data Science Process** – Research Goals – Retrieving Data – Data Integration and Transformation – Exploratory Data Analysis – Data Reduction – Model Building.	18
III	**Data Preprocessing-Feature Engineering:** Creating New Features – Feature Selection Techniques – Automating Data Preparation with Scikit.	18
IV	**Machine Learning algorithms** – Modeling Process and Types - Predictive models – Classification –SVM - Supervised – Unsupervised - Semi-supervised.	18
V	**Data Science in different domains:** Healthcare, Retail, Finance and Social Media – Introduction to Hadoop – Spark – Text Analytics and NLP – Introduction to Tableau and Power BI.	18
	Total Hours	**90**

Text Books	
1.	Davy Cielen(2016), Arno D. B. Meysman, Mohamed Ali, "Introducing Data Science", manning publications
2.	Davy Cielen(2016), Arno D.B. Meysman, Mohamed Ali,"Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools", Dreamtech Press
3.	Tom White, "Hadoop: The definitive Guide"
Reference Books	
1.	DipanjanSarkar, " Text Analytics with Python: A Practitioner's guide to NLP"
2.	Cathy O'Neil, Rachel Schutt, "Doing Data Science Straight Talk from the Frontline", O'Reilly Media 2013
Web Resources (Swayam / NPTEL)	
1.	https://nptel.ac.in/courses/10610617

Course Code	Course Name	Category	Hours / Week	Credits
24BCS36A/ 24BCA36A/ 24BAI36A	Operations Research	Allied III	4	3

Course Objectives

The Course intends to cover

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

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Recall the concepts of linear programming, including mathematical formulation, graphical method, and simplex method.	K1
CLO2	Explain Transportation and Assignment Problems, feasible solutions and the Traveling Salesman Problem.	K2
CLO3	Solve Two-Person Zero-Sum Games using the Maximin and Minimax Principles.	K3
CLO4	Apply the models of queuing theory in the real-world applications	K3
CLO5	Analyze the knowledge of drawing project networks for quantitative analysis of projects	K4
K1 - Remember;**K2** –Understand, **K3** - Apply; **K4** – Analyze		

CLO – PLO Mapping

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

Allied III: Operations Research

Unit	Details	No. of Hours
I	**Linear Programming Problems:** Introduction to Linear Programming - Mathematical Formulation of Linear Programming Problem – Graphical method - Simplex method.	12
II	**Transportation Problems:** Introduction to transportation problem – The transportation table – Solution of transportation problem – Finding an initial basic feasible solution **Assignment Problems:** Introduction – Mathematical Formulation – Solution Methods – Special case – The Traveling Salesman Problem.	12
III	**Game Theory:** Introduction – Two Person Zero – Sum Games – Some basic terms – The Maximin – Minimax Principle – Games without Saddle Points - Mixed Strategies – Graphical Solution of 2 x n and m x 2 Games - Dominance Property.	12
IV	**Queuing Theory:** Introduction – Queuing System- Elements of Queuing System- Operating Characteristics of Queuing System- Classification of Queuing Models- Model I (M/M/1):(∞/FIFO), Model II (M/M/1):(N/FIFO).	12
V	**Network Scheduling by PERT / CPM:** Introduction – Network -Basic Components – Logical Sequencing – Rules of Network Construction – Critical Path Analysis – Probability Consideration in PERT – Distinction between PERT and CPM – Applications of Network Techniques.	12
	Total Hours.	**60**
Text Book		
1.	Manmohan, P.K. Gupta, Kanthiswarup (1997), "Operations Research", S. Chand & Sons. Unit I : Chapter 2 : Section 2.1 – 2.4 Chapter 3 : Section 3.2 Chapter 4 : Section 4.3 Unit II : Chapter 10 : Section 10.5, 10.8, 10.9 Chapter 11 : Section 11.1 – 11.4, 11.7 Unit III: Chapter 17 : Section 17.1 – 17.7 Unit IV: Chapter 21 : Section 21.1 – 21.9 Unit V: Chapter 25 : Section 25.1 – 25.9	
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://archive.nptel.ac.in/courses/111/107/111107128/	

SEC Lab - I : Desktop Publishing with InDesign

Course Code	Course Name	Category	Hours / Week	Credits
24BCA37P	Lab: Desktop Publishing with Adobe InDesign	SEC – Lab I	2	2

S.No	List of Programs
1	Simple Programs, Layout Design Principles for Print and Digital Media.
2	Developing and Managing Multi-Page Documents
3	Exploring Advanced Typography in Page Layouts.
4	Integrating Text and Visual Elements in Design.
5	Preparing Documents for Print and Digital Publishing.
6	File Optimization for Print and Digital Output.
7	Creating and Managing Master Pages, Spreads, and Page Sections.
8	Applying Object, Paragraph, and Character Styles for Design Consistency.
9	Designing Interactive PDFs and EPUBs for Digital Platforms.
10	Efficient Asset Management Using Libraries and Templates.
	Total Hours **30**

Text Books

1. Anton, K. K., & DeJarld, T. (2024). Adobe InDesign classroom in a book (2024 release). Adobe Press.
2. Rydberg, T. (2014). Exploring InDesign. Cengage Learning.

Reference Books

1. Lupton, E. (2010). Thinking with type: A critical guide for designers, writers, editors, & students (2nd ed.). Princeton Architectural Press.
2. Joyce, M. (2019). Designing for print: An insider's guide. Create Space Independent Publishing.

Web Resources (Swayam / NPTEL)

1. https://onlinecourses.nptel.ac.in/noc25_de12/preview

Part – IV – Foundation Course

(All the Undergraduate Programmes)

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

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

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

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

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

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

Question Paper Pattern

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

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

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

Examination Pattern

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

Components for 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

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 4

Semester – 4									
Course Code	**Part**	**Course category**	**Course Name**	**Hours/ Week**	**Examination**				**Credits**
					Duration in Hours	**Max Marks**			
						CIA	**ESE**	**Total**	
24TAM41L	I	Language – I	Tamil –IV	4	3	25	75	100	3
24HIN41L	I		Hindi –IV						
24MAL41L	I		Malayalam –IV						
24FRE41L	I		French –IV						
24ENG42L	II	Language – II	English –IV	4	3	25	75	100	3
24BCA43C	III	Core – VII	Database Management System	5	3	25	75	100	4
24BCA44P	III	Core Lab – IV	**Lab :**Database Management System	4	3	40	60	100	2
24BCA45C	III	Core – VIII	Software Engineering	5	3	25	75	100	4
24BCA46A	III	Allied – IV	Digital Marketing	4	3	25	75	100	3
24BCA47P	III	SEC – II	**Lab:** Product Mockups & Brand Visualization	2	3	40	60	100	2
24IDT4AE/	IV	AECC - IV	Innovation & Design Thinking /	2	2	-	50	50	2
24IPR4AE/			Intellectual Property Rights /						
24END4AE			Entrepreneurship Development						
24EXC4LA	V	Extra - Curricular and Co-curricular	Liberal Arts	-	-	50	-	50	2
			Total	**30**				**800**	**25**

Part – I: Language – I

தமிழ் – IV

(All the UG Programmes)

Course Code	Course Name	Category	Hours / Week	Credits
24TAM41L	Tamil - IV	Language - I	4	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	12
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	12

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	12
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.	12

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.	12
	Total Hours	**60**

Reference Books

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

Part – I: Language – I
Hindi – IV

Course Code	Course Name	Category	Hours / Week	Credits
24HIN41L	Hindi – IV	Language - I	4	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	12
II	Novel - Nirmala – Premchand	12
III	Lokkothi & Muhavare - Naveen Hindi Vyakaran (Selected Lokkokthi -10 & Muhavare-10)	12
IV	General Essay :Aadarsh Nibandh	12
V	Translation : Hindi-English Only Anuvadh Abhyas – III (16-30 Lessons Only)	12
	Total Hours	**60**

Text Books

1.	Jayashankar Prasad (2015), Dhuvasaminy, Drama, , 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	4	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	12
II	Screenplay – Perumthachan	12
III	Drama – Saketham	12
IV	Drama – Saketham	12
V	Drama – Saaketham	12
	Total Hours	**60**

Text Books

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

Reference Books

1. Malayala Nataka Sahithya Charithram. G Sankara Pillai (Kerala 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	4	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)	12
II	Etape 6 (Lecons 1 - 3)	12
III	Etape 7 - Leçons 1 – 2	12
IV	Etape 7 – Leçon 3, Etape 8 – Leçon 1	12
V	Etape 8 – Leçons 2 – 3	12
Etapes 5 to 8, Pages 63 to 114		
	Total Hours	**60**

Text Book

1	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: English –IV

(All the Undergraduate Programmes)

English for Competitive Examinations

Course Code	Course Name	Category	Hours / Week	Credits
24ENG42L	English-IV	Language-II	4	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	12
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,	12
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.	12
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	12
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**)	12
	Total Hours	**60**

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

Core Theory–VII: Database Management System

Course Code	Course Name	Category	Hours / Week	Credits
24BCA43C	Database Management System	Core–VII	5	4

Course Objectives

The Course intends to:

- Learn the designing of database systems, foundation on the relational model of data and normal forms.
- Understand the concepts of database management system, design simple Database models.
- Apply SQL & PL/SQL to write queries.

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 database systems and its models.	K1,K2
CLO2	Design relational databases using keys, integrity rules, ER diagrams and normalization techniques.	K3
CLO3	Apply SQL commands for data definition, manipulation, joins and advanced query operations.	K3
CLO4	Implement subqueries, SQL functions, PL/SQL fundamentals and differentiate between SQL and NoSQL databases.	K3
CLO5	Develop PL/SQL programs using control structures , cursors , exceptions, procedures, functions , packages and triggers	K3
K1 – Remember ; K2-Understand; **K3** – Apply		

CLO-PLO Mapping

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

Core Theory–VII: Database Management System

Unit	Content	No. of Hours
I	**Database Concepts:** Database Systems - Data vs Information - Introducing the database - File system - Problems with file system. **Data models** - Importance - Basic Building Blocks - Business rules - Evolution of Data models - Degrees of Data Abstraction	15
II	**Design Concepts:** Relational database model - logical view of data-keys -Integrity rules - relational set operators - data dictionary and the system catalog - relationships -data redundancy revisited -indexes - Codd's rules. Entity relationship model - ER diagram. **Normalization of Database Tables**: Database tables and Normalization – The Need for Normalization –The Normalization Process – Higher level Normal Form.	15
III	**Introduction to SQL**: Data Definition Commands – Data Manipulation Commands – SELECT Queries – Additional Data Definition Commands – Additional SELECT Query Keywords – Joining Database Tables. **Advanced SQL**: Relational SET Operators: UNION – UNION ALL – INTERSECT - MINUS.SQL Join Operators: Cross Join – Natural Join – Join USING Clause – JOIN ON Clause – Outer Join.	15
IV	**Sub Queries and Correlated Queries**: WHERE – IN – HAVING – ANY and ALL – FROM. **SQL Functions**: Date and Time Function – Numeric Function – String Function – Conversion Function. **NoSQL:** Overview of NoSQL-Difference between SQL and NoSQL. **PL/SQL**:A Programming Language: History – Fundamentals – Block Structure – Comments – Data Types – Other Data Types – Variable Declaration – Assignment operation –Arithmetic operators.	15
V	**Control Structures and Embedded SQL**: Control Structures – Nested Blocks – SQL in PL/SQL – Data Manipulation – Transaction Control statements. **PL/SQL Cursors and Exceptions**: Cursors – Implicit Cursors, Explicit Cursors and Attributes – Cursor FOR loops – SELECT…FOR UPDATE – WHERE CURRENT OF clause – Cursor with Parameters – Cursor Variables – Exceptions – Types of Exceptions. **Named Blocks**: Procedures –Functions – Packages –Triggers.	15
	Total Hours	**75**

Text Books

1.	Coronel C. & Morris, S. (2009). Database Systems: Design, Implementation, and Management 9th Edition, Cengage Learning.
2.	Shah N. (2016). Database Systems using Oracle 2nd Edition, Pearson Education India.

Reference Books

1.	Silberschatz A., Korth, H. F., & Sudarshan, S. (2011). Database System Concepts 6th Edition McGraw-Hill International.
2.	Singh S. K. (2011). Database Systems 2nd Edition, Pearson Education.

Web Resources (Swayam/NPTEL)

1.	https://onlinecourses.nptel.ac.in/noc22_cs91/preview

Core Lab - IV: Database Management System

Course Code	Course Name	Category	Hours/ Week	Credits
24BCA44P	Lab: Database Management System	Core Lab - IV	4	2

S.No.	List of Programs	
1.	***SQL*** 1. DDL Commands 2. DML Commands 3. TCL Commands	
2.	***PL/SQL*** 1. Fibonacci Series 2. Factorial 3. String Reverse 4. Sum of Series 5. Trigger	
3.	***CURSOR*** Student Mark Analysis Using Cursor	
4.	***APPLICATION*** 1. Library Management System 2. Student Mark Analysis	
	Total Hours	**60**
Text Books		
1.	Coronel C. & Morris, S. (2009). Database Systems: Design, Implementation, and Management 9th Edition, Cengage Learning.	
2.	Shah N. (2016). Database Systems using Oracle 2nd Edition, Pearson Education India.	
Reference Books		
1.	Silberschatz A., Korth, H. F., & Sudarshan, S. (2011). Database System Concepts 6th Edition McGraw-Hill International.	
2.	Singh S. K. (2011). Database Systems 2nd Edition, Pearson Education.	
Web Resources(Swayam/NPTEL)		
1.	https://onlinecourses.nptel.ac.in/noc22_cs91/preview	

Core Theory–VIII: Software Engineering

Course Code	Course Name	Category	Hours /Week	Credits
24BCA45C	Software Engineering	Core Theory-VIII	5	4

Course Objectives

The course intends to:

- Learn about the various phases and models (waterfall, evolutionary, agile, etc.) used in building software.
- Elicit user requirements, build use cases, and develop software requirements specifications.
- Apply design principles to create models and develop robust software solutions.
- Understand testing strategies, debugging, and quality assurance concepts to ensure reliable software.
- Gain knowledge of project planning, scheduling, and risk management in software development.

Course Learning Outcomes

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

. CLO	CLO Statements	Knowledge Level
CLO1	Understand Software Engineering process models.	K1, K2
CLO2	Understand software requirements, create SRS documents, and use UML modeling to design systems.	K2, K3
CLO3	Apply the knowledge of different software architectural styles and design patterns.	K3
CLO4	Identify and apply software testing approaches, verification, validation and quality control strategies.	K3
CLO5	Understand the CASE tools and Software Maintenance.	K2
K1-Remember**, K2**-Understand, **K3-**Apply		

CLO-PLO Mapping

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

Core–VIII: Software Engineering

Unit	Content	No. of Hours
I	**Introduction**: The software engineering discipline, programs vs. software products, why study software engineering, emergence of software engineering, Notable changes in software development practices, computer systems engineering. **Software Life Cycle Models**: Why use a life cycle model, Classical waterfall model, iterative waterfall model, prototyping model, evolutionary model, spiral model, Agile model, comparison of different life cycle models.	15
II	**Requirements Analysis and Specification:** Requirements gathering and analysis, Software requirements specification (SRS). **Software Design:** Good software design, cohesion and coupling, neat arrangement, software design approaches, object- oriented vs function-oriented design	15
III	**Function-Oriented Software Design:** Overview of SA/SD methodology, structured analysis, data flow diagrams (DFD's), structured design, detailed design. **User-Interface design:** Characteristics of a good interface; basic concepts; types of user interfaces; component-based GUI development, a user interface methodology.	15
IV	**Coding and Testing:** Coding; code review; testing; testing in the large vs testing in the small; unit testing; black-box testing; white-box testing; debugging; program analysis tools; integration testing; system testing; some general issues associated with testing. **Software Reliability and Quality Management:** Software reliability; statistical testing; software quality; software quality management system; SEI capability maturity model; personal software process.	15
V	**Computer Aided Software Engineering:** CASE and its scope; CASE environment; CASE support in software life cycle; other characteristics of CASE tools; towards second generation CASE tool; architecture of a CASE environment. **Software Maintenance:** Characteristic of software maintenance; software reverse engineering; software maintenance process models; estimation of maintenance cost.	15
	Total Hours	**75**
Text Books		
1.	Rajib Mall, (2018), Fundamentals of Software Engineering, Fifth Edition, Prentice-Hall of India.	
Reference Books		
1.	Richard Fairley, (1997), Software Engineering Concepts, Tata McGraw-Hill Publishing company Ltd, Edition.	
2.	Pressman, R. S. (2010). Software Engineering: A Practitioner's Approach (7th ed.). McGraw-Hill.	
3.	Senn, J. A. (1989). Analysis and Design of Information Systems (2nd ed.). McGraw-Hill International.	

Allied – IV: Digital Marketing

Course Code	Course Name	Category	Hours /Week	Credits
24BCA46A	Digital Marketing	Allied -IV	4	3

Course Objectives

The Course intends to

- Enable the learners to know about basic concepts of digital marketing
- Analyse the buyer behavior and marketing communication
- Know about the advertising and social networking
- Enable the knowledge of digital marketing tool, online marketing matrixes
- Comprehend the Web Marketing Strategies

Course Learning Outcomes

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

CLOs	CLO Statements	Knowledge Level
CLO1	Learn the scope of digital marketing with global marketing strategy	K1
CLO2	Understand the suitability of digital channels	K2
CLO3	Apply the digital marketing campaign, to attain business objectives	K3
CLO4	Demonstrate the usage of internet for promotion using digital marketing communication	K2
CLO5	Apply the web marketing strategies	K3
K1-Remember; **K2** - Understand; **K3** – Apply		

CLO-PLO Mapping

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

Allied – IV: Digital Marketing

Unit	Content	No. of Hours
I	**Introduction to Digital Marketing:** Meaning, scope and Importance, Types, Digital Marketing Channels. **Traditional Marketing Vs Digital Marketing**: Reason for choosing Digital Marketing - Opportunities and challenges in Digital Marketing.	12
II	**Online Buyer Behaviour :** Website Design - Online user experience - online site design - Integrated Internet Marketing Communications - Interactive Marketing Communication- Search Engine Optimization- Creating and Managing Campaigns.	12
III	**Digital Promotion Techniques**: E-Mail marketing- Permission Marketing - Viral Marketing- Social Media Marketing- Content Marketing- Facebook Advertising- Visual Advertising- Display Advertising- Mobile Advertising- Image Advertising- Video Advertising-YouTube Advertising- Social Networking Site(SNS) Industry - Concept of Industry .	12
IV	**Google Analytics :** Tracking Performance- Tracking Mobile Marketing Performance - Web Analytics- Traffic Report - Behaviour reports- Key Performance Indicators (KPI) in Analytics, Tracking Social Media Marketing(SMM) Performance, Influence Marketing.	12
V	**Web Marketing Strategy :** Web Marketing Environment, Web Content Marketing, Web Marketing Strategy Tools.	12
	Total Hours	**60**

Text Books

1.	Ryan Damian(2020), Understanding Digital Marketing, 5th edition, Kogan Page, London, UK
2.	Parkin Godfrey(2009), Digital Marketing: Strategies For Online Success, New Holland Publishers, London
3.	Hanson, W. and Kalyanam(2012), E-Commerce and Web Marketing,2nd edition, Cengage Learning.
4.	Puneet Singh Bhatia(2019), Fundamentals of Digital Marketing, Pearson, New Delhi

Reference Books

1.	Whitley, David(2017), E-Commerce Strategy, Technologies And Applications, Macgraw Hill, New Jersey.
2.	Seema Gupta(2022), Digital Marketing, 3rd edition,Mcgraw Hill Education, New Delhi
3.	Swaminathan T N , Digital Marketing: From Funamentals To Future, Cengagae Learning, Boston
4.	Whitley, David, E-Commerce Strategy, Technologies and Applications, Macgraw Hill, New Jersey

Web Resources

1.	https://digitalfireflymarketing.com/wp-content/uploads/2017/02/Big-Book-of-Digital-
2.	https://www.7boats.com/academy/wp-content/uploads/2016/10/50-shades-of-digital-
3.	https://www.redandyellow.co.za/content/uploads/woocommerce_uploads/2017/10/emarketing_te
4.	https://webmarketingacademy.in/wp-content/uploads/2015/09/A-Step-By-Step-Guide-to-
5.	https://www.gbv.de/dms/zbw/865712123.pdf

SEC Lab –II : Product Mockups & Brand Visualization

Course Code	Course Name	Category	Hours / Week	Credits
24BCA47P	Lab : Product Mockups & Brand Visualization	SEC Lab - II	2	2

S. No.	List of Programs	No. of Hours
1.	Create simple 3D exercises to explore core tools. Master the Adobe Dimension interface and workspace.	
2.	Create a basic scene using primitive shapes to learn composition. Practice transforms, alignment, and camera framing in Adobe Dimension.	
3.	Create clean layouts by importing and arranging external 3D models. Organize hierarchy and snap precisely in Adobe Dimension.	
4.	Create distinctive looks by designing and applying custom materials. Control UVs, roughness, metallic, and decals in Adobe Dimension.	
5.	Create believable scenes with purposeful lighting. Tweak HDRIs, physical lights, and shadows for realism in Adobe Dimension.	
6.	Create a polished product visualization ready for review. Set output size, render settings, and export passes in Adobe Dimension.	
7.	Create Mock-Up 1: a coffee cup or cosmetic product. Apply labels and render hero shots in Adobe Dimension.	
8.	Create Mock-Up 2: a signage or billboard concept. Place it in context and render variants in Adobe Dimension.	
9.	Create a desktop-publishing mock-up from your 3D render. Flow images and text into layouts using Adobe InDesign.	
10.	Create final polish with professional post-processing. Refine color, contrast, and composites in Adobe Photoshop and Illustrator.	
	Total Hours	**30**
Text Books		
1.	Gilbert, K. (2021). Adobe Dimension Classroom in a Book (2021 Release). Adobe Press. ISBN: 9780136870104.	
2.	Gilbert, K. (2020). Adobe Dimension Classroom in a Book (2020 Release). Adobe Press. ISBN: 9780136583936.	
Reference Books		
1.	Gilbert, K. (2019). Adobe Dimension CC Classroom in a Book (earlier edition) — useful for historical context and foundational techniques.	
Web Resources (Swayam/NPTEL)		
1.	https://onlinecourses.nptel.ac.in/noc25_mg106/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

The course intends to

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

Course Learning Outcomes

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

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

Ability Enhancement Compulsory Courses(AECC)-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	

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
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	

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

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

Question Paper Pattern

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

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

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

Examination Pattern

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

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

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

Semester 5

Semester - 5									
Course Code	**Part**	**Course Category**	**Course Name**	**Hours/ Week**	**Examination**				**Credits**
					Duration in Hours	**Max Marks**			
						CIA	**ESE**	**Total**	
24BCA51C	III	Core - IX	Full Stack Development	5	3	25	75	100	4
24BCA52P	III	Core Lab - V	**Lab:** Full Stack Development	5	3	40	60	100	3
24BCA53C	III	Core - X	Linux and Shell Programming	5	3	25	75	100	4
24BCA54P	III	Core Lab - VI	**Lab:** Linux and Shell Programming	5	3	40	60	100	3
24BCA55C	III	Core - XI	Visual Basic	5	3	25	75	100	4
24BCA5AE/	III	Elective – I	Machine Learning **(Artificial Intelligence)**	5	3	25	75	100	3
24BCA5BE/			Cryptography & Network Security **(Cyber Security)**						
24BCA5CE			Data Mining **(Data Mining)**						
24BCA56I	III	SEC-III	Internship	-	2	50	-	50	2
Total				**30**				**650**	**23**

Core - IX: Full Stack Development

Course Code	Course Name	Category	Hours / Week	Credits
24BCA51C	Full Stack Development	Core - IX	5	4

Course Objectives

The course intends to cover:

- JavaScript fundamentals and its techniques.
- Core programming concepts, DOM, event handling and browser APIs for developing dynamic web applications.
- The Skills required for full-stack 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 fundamentals of JavaScript to incorporate interactive and dynamic behaviour on websites.	K1,K2
CLO2	Apply object-oriented principles and develop JavaScript applications.	K3
CLO3	Analyze event flow, delegation and browser interactions for efficient UI performance.	K4
CLO4	Build dynamic user interfaces using React concepts.	K3
CLO5	Analyze back-end architecture, middleware and API design for dynamic application development.	K4
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** – Analyze		

CLO – PLO Mapping

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

Core - IX: Full Stack Development

Unit	Content	No. of Hours
I	**JavaScript Fundamentals & Functions:** Introduction to JavaScript - Setting Up the Environment - First JavaScript Program - Variables & Constants - Data Types - Primitive - Non-Primitive - Array, Object, Function - Reference Types - Type Conversion - Operators - Conditional Statements - Loop / Control Statements - User-Defined Functions - Arrow Functions (ES6) - Callback Functions - Scope & Hoisting - Closures - Built-in Math Functions - Built-in String Functions - Arrays & Creation - Array Built-in Methods - Array Iteration Methods.	15
II	**Objects, OOP & Asynchronous JavaScript:** Objects - Object Methods - Destructuring - Spread & Rest Operators, Rest in Functions - Iterating Objects - Arrays of Objects - Call, Bind & Apply - Date Object - ES6 Classes - Inheritance - Getters & Setters - Static Members - Prototypes - ES6 Modules - Set & Weak Map - Exception Handling - JSON - Timers - Promises - Async / Await - Fetch API.	15
III	**DOM Manipulation, Events & Browser APIs:** DOM Introduction - DOM Selectors & Traversal - DOM Manipulation Methods - DOM Properties - Class List API - Mouse Events - Keyboard Events - Form Events - add Event Listener() - Event Loop - Event Bubbling & Delegation - De bouncing - Regular Expressions - Browser Storage - Local Storage - Session Storage.	15
IV	**Front-End Development with React.js:** Introduction to React - JSX Syntax - Components - Props - State &useState Hook - useEffect Hook - Event Handling in React - Conditional Rendering - Lists & Keys - Forms in React - Lifting State Up - useRef Hook - React Router (v6) - Context API &useContext - Fetching Data in React.	15
V	**Back-End Development with Node.js, Express &MongoDB:** Introduction to Node.js - Node.js Core Modules – npm & package.json - Introduction to Express.js - Routing in Express - Middleware - RESTful API Design - Introduction to MongoDB - Mongoose ODM - CRUD Operations with Mongoose - Environment Variables - MVC Architecture - Authentication Basics - Connecting React with Express - Deployment Overview.-JWT Concepts - Mastering responsive design using AI.	15
	Total Hours	**75**

Text Books	
1.	Flanagan, D. (2020). JavaScript: The Definitive Guide (7th ed.). O'Reilly Media.
2.	Banks, A., &Porcello, E. (2020). Learning React (2nd ed.). O'Reilly Media.
3.	Brown, E. (2019). Web Development with Node and Express (2nd ed.). O'Reilly Media.
Reference Books	
1.	Haverbeke, M. (2018). Eloquent JavaScript (3rd ed.). No Starch Press.
2.	Simpson, K. (2020). You Don't Know JS (Book Series). O'Reilly Media.
3.	Duckett, J. (2014). JavaScript & jQuery: Interactive Front-End Web Development. Wiley.
Web Resources ((Swayam / NPTEL/Others)	
1.	https://onlinecourses.swayam2.ac.in/nou24_cs09/preview
2.	https://developer.mozilla.org/en-US/docs/Web/JavaScript
3.	https://react.dev
4.	https://www.theodinproject.com/paths/full-stack-javascript
5.	https://learn.mongodb.com
6.	https://learnwoo.com/how-to-make-websites-using-ai-a-detailed-guide/

Core Lab –V: Full Stack Development

Course Code	Course Name	Category	Hours / Week	Credits
24BCA52P	Lab : Full Stack Development	Core Lab - V	5	3

S. No.	List of Programs
1	Develop a Basic Calculator using functions, conditional statements, and switch-case
2	Demonstrate variable scoping using var, let, and const with hoisting and block scope.
3	Implement string and array utilities using built-in methods (map, filter, reduce).
4	Implement closure-based counter and memorization using higher-order functions.
5	Design a Student Management System using ES6 classes and inheritance.
6	Implement a Library System demonstrating prototypes and ES6 modules.
7	Implement asynchronous programming using Promises and async/await with error handling.
8	Develop a registration form with real-time validation using DOM and events.
9	Build a dynamic To-Do list using DOM manipulation and local Storage.
10	Create a live search filter with debouncing and session Storage.
11	Build a React Counter and To-Do List using useState and event handling.
12	Develop a multi-page application using React Router.
13	Create a dashboard using React with API integration.
14	Build a RESTful API using Express and MongoDB with CRUD operations.
15	Develop a full-stack application with authentication using JWT.
	Total Hours **75**

Text Books

1. Banks, A., &Porcello, E. (2020). Learning React (2nd ed.). O'Reilly Media.
2. Brown, E. (2019). Web Development with Node and Express (2nd ed.). O'Reilly Media.
3. Haverbeke, M. (2018). Eloquent JavaScript (3rd ed.). No Starch Press.

Reference Books

1. Flanagan, D. (2020). JavaScript: The Definitive Guide (7th ed.). O'Reilly Media.
2. Simpson, K. (2015-2020). You Don't Know JS (Book Series). O'Reilly Media.
3. Duckett, J. (2014). JavaScript &jQuery: Interactive Front-End Web Development. Wiley.

Web Resources (Swayam / NPTEL/Others)

1. https://onlinecourses.swayam2.ac.in/nou24_cs09/preview
2. https://react.dev
3. https://www.theodinproject.com/paths/full-stack-javascript
4. https://learn.mongodb.com
5. https://developer.mozilla.org/en-US/docs/Web/JavaScript

Core - X : Linux and Shell Programming

Course Code	Course Name	Category	Hours / Week	Credits
24BCA53C	Linux and Shell Programming	Core - X	5	4

Course Objectives

The course intends to cover

- The fundamentals of the Linux operating system.
- Concepts related to user & system administration and Process.
- Automation of Shell Scripting.
- Linux networking and security practices.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Understand the fundamentals of Linux operating system and system administration concepts.	K1,K2
CLO2	Apply Linux commands to manage files, directories, users, and file systems.	K3
CLO3	Demonstrate process management and command line operations in Linux environment.	K2
CLO4	Execute shell scripts using variables, conditional statements, and loops for automation.	K3
CLO5	Analyze Linux networking, security mechanisms, and system logs to detect issues.	K4
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze;		

CLO – PLO Mapping

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

Core -X: Linux and Shell Programming

Unit	Content	No. of Hours
I	**Introduction to Linux Operating System:** Introduction to OS – The Linux Operating System – Basic Commands in Linux. **Types of Linux Distributions:** Debian-Ubuntu - Red Hat-Fedora-CentOS-Kali Linux-Arch Linux-SUSE Linux. **Linux System Administration:** Introduction to Linux System Administration – Role of system administrator – Responsibilities of Linux system administration – Managing system resources-AI Development on Linux**.**	**15**
II	**Managing Files and Directories:** Introduction – Directory Commands in Linux – File Commands in Linux.**User and Group Management:** Creating and managing user accounts – Group management – Password policies – Switching users – Administrative privileges.**Process Management:** Process concept – Foreground and background processes – Process monitoring – Process priority management – Terminating processes.	**15**
III	**Creating Files using the vi Editor:** Text Editors–The vi Editor. **Managing Documents**: Locating Files in Linux –Redirection– Filters –Pipes.**Disk and File System Management:** Linux file system hierarchy – Disk space management – Mounting and unmounting file systems – Checking disk usage. **Backup and Compression Utilities:** Backup techniques – File compression and archiving.	**15**
IV	**Securing files in Linux:** File Access Permissions – Viewing File Access Permissions – Changing File Access Permissions. **Automating Tasks using Shell Scripts**: Introduction – Variables - Local and Global Shell Variables – Command Substitution.**Linux Networking and Security:** Introduction to Linux Networking-Basic Networking Concepts – Network Configuration – IP Addressing – Network Troubleshooting. **Network Monitoring and Diagnostics:** Monitoring Network Connections – Checking Active Ports and Services.	**15**
V	**Using Conditional Execution in Shell Scripts:** Conditional Execution – The case ... esac construct. **Managing repetitive tasks using Shell Scripts:** Using Iteration in Shell Scripts– The while construct – until construct – for construct – break and continue Commands – Simple Programs using Shell Scripts. **Remote Access and File Transfer:** Secure remote login – File transfer between Linux systems. **Firewall and Network Protection:** Linux firewall concepts – Packet filtering – Managing firewall rules. **System Logs and Security Monitoring:** Importance of log files – Monitoring system activity – Detecting suspicious activity.	**15**
	Total Hours	**75**

Text Books	
1.	NIIT (2006), Operating System Linux, Eastern Economy Edition, PHI Learning.
2.	Venkateswarlu, N.B. (2008), Introduction to Linux: Installation and Programming, 1st Edition, BS Publications**.**
3.	Christopher NegusC. (2025), Linux Bible, 10th Edition, Wiley publishers.
Reference Books	
1.	Petersen, R. (2008), Linux: The Complete Reference, 6th Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi.
2.	Soyinka, W. (2015), Linux Administration: A Beginner's Guide, McGraw-Hill Education.
3.	Jones, M. T. (2009), Linux System Programming and Administration, Jones & Bartlett Learning.
Web Resources (Swayam / NPTEL/Others)	
1.	https://www.classcentral.com/course/swayam-linux-applications-in-engineering-education-503682?
2.	https://www.redhat.com/en/services/training/getting-started-with-linux-fundamentals?
3.	https://developers.redhat.com/
4.	https://grokipedia.com/page/AI_Development_on_Linux

Core Lab - VI : Linux and Shell Programming

Course Code	Course Name	Category	Hours / Week	Credits
24BCA54P	Linux and Shell Programming	Core Lab - VI	5	3

S.No.	List of Programs
1	Write a shell script to stimulate the file commands : rm, cp, cat, mv, cmp, wc, split, diff.
2	Write a shell script to show the following system configuration: a. Currently logged user and his log name b. Current shell, home directory, Operating System type, current Path setting, current working directory c. Show currently logged number of users, show all available shells d. Show CPU information like processor type, speed e. Show memory information
3	Write a shell script to implement the following: pipes, Redirection and tee commands.
4	Write a shell script for displaying current date, user name, file listing and directories by getting user choice.
5	Write a shell script to implement the filter commands.
6	Write a shell script to remove the files which has file size as zero bytes.
7	Write a shell script to find the sum of the individual digits of a given number.
8	Write a shell script to find the greatest among the given set of numbers using command line arguments.
9	Write a shell script for palindrome checking.
10	Write a shell script to print the multiplication table of the given argument using for loop.
11	Write a shell script to display and analyze group information. a. Display all groups available in the system. b. Display the group ID of a specified group. c. List users belonging to a particular group. d. Count the total number of groups available. e. Display groups assigned to the current user.
12	Write a shell script to monitor process activities. a. Display all running processes. b. Display processes belonging to the current user. c. Show top five CPU consuming processes. d. Display process ID and parent process ID. e. Display the total number of running processes.
13	Write a shell script to display network configuration information. a. Display system hostname. b. Display IP address of all network interfaces. c. Display routing table information. d. Display DNS server configuration. e. Test network connectivity with a remote host.
14	Write a shell script to monitor system logs and detect suspicious activity. a. Display recent system log entries. b. Display login history of users. c. Display failed login attempts. d. Search for specific keywords in log files. e. Display the last 10 security related log messages.

S.No.	List of Programs	
15	Write a shell script to analyze disk usage. a. Display disk usage of all directories in the home folder. b. Display the top 5 largest directories in the system. c. Display the number of files in each directory. d. Display the file system type of each partition. e. Display free disk space available.	
	Total Hours	**75**
Text Books		
1.	NIIT. (2006), Operating System Linux, Eastern Economy Edition, PHI Learning.	
2.	Venkateswarlu, N.B. (2008), Introduction to Linux: Installation and Programming, 1st Edition, BS Publications**.**	
3.	Christopher Negus C. (2025), Linux Bible, 10th Edition, Wiley publishers.	
Reference Books		
1.	Petersen, R. (2008), Linux: The Complete Reference, 6th Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi.	
2.	Soyinka, W. (2015), Linux Administration: A Beginner's Guide, McGraw-Hill Education.	
3.	Jones, M. T. (2009), Linux System Programming and Administration, Jones & Bartlett Learning.	
Web Resources(Swayam/NPTEL)		
1.	https://www.classcentral.com/course/swayam-linux-applications-in-engineering-education-503682?	
2.	https://www.redhat.com/en/services/training/getting-started-with-linux-fundamentals?	
3.	https://developers.redhat.com/	
4.	https://grokipedia.com/page/AI_Development_on_Linux	

Core - XI : Visual Basic

Course Code	Course Name	Category	Hours /Week	Credits
24BCA55C	Visual Basic	Core - XI	5	4

Course Objectives

The course intends to cover

- Visual Basic programming skills required for application development.
- The controls available in Visual Basic.
- Database and management using data controls.
- Tools available in VB for developing projects.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Understand Visual Basic environment including Forms, Procedures and Controls.	K1, K2
CLO2	Implement MDI applications using forms, dialog boxes and MSFlex Grid.	K3
CLO3	Understand the connectivity between VB with MS-ACCESS database.	K2
CLO4	Apply OLE drag-and-drop operations in applications.	K3
CLO5	Analyze requirements and design solutions to build user-friendly VB applications.	K4
K1-Remember; **K2**-Understand; **K3**-Apply;**K4**-Analyze		

CLO–PLO Mapping

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

Core - XI : Visual Basic

Unit	Content	No. of Hours
I	**Introduction to VB:** Getting Started with VB6 - Programming Environment - working with Forms - Developing an application – Variables - Data types and Modules - procedures and control structures - arrays. **Working with Controls:** Creating and using controls- working with control arrays.	15
II	**Menus in VB:** Menus - Mouse events - Dialog boxes. **MDI and Flexgrid:** MDI - Using the Flex grid control	15
III	**ODBC and Data Access Objects:** Data Access Options - ODBC - Remote data objects. **ActiveX EXE and ActiveX DLL:** Introduction - Creating an ActiveX EXE Component - Creating ActiveX DLL Component.	15
IV	**Object Linking and Embedding:** OLE fundamentals - Using OLE Container Control - Using OLE Automation objects - OLE Drag and Drop. **File and File System Control:** File System Controls - Accessing Files - Visual Basic for AI Driven Neural Network Modeling.	15
V	**Controls in VB:** Additional controls in VB: sstab control - Setting properties at runtime, adding controls to tab - list control - tab strip control - MSFlex grid control - Why ADO - Establishing a reference - Crystal and Data reports. **VB.Net:** Introduction – CLR – CTS – CLS.	15
	Total Hours	**75**

Text Books

1. Content Development Group (2007), Visual Basic 6.0 Programming, TMH, 8th reprint.
2. Mohammed Azam, Vikas (2006), Programming with Visual Basic 6.0, Publishing House, 4th reprint.

Reference Books

1. Gray Cornell (2003), Visual Basic6 from ground up TMH, New Delhi,1st Edition,
2. Deitel and Deitel, Nieto T R (1998), Visual Basic6-How to Program, Pearson Education. 1st Edition.

Web Resources

1. https://learn.microsoft.com/en-us/shows/visual-basic-fundamentals-for-absolute-beginners/
2. https://learn.microsoft.com/en-us/dotnet/visual-basic/
3. https://www.codeguru.com/visual-basic/setting-up-a-neural-network-using-visual-basic-and-ai/

Elective - I: Machine Learning

Course Code	Course Name	Category	Hours / Week	Credits
24BCA5AE	Machine Learning	Elective - I	5	3

Course Objectives

The course intends to cover:

- Basics and methods of Machine Learning (ML).
- ML techniques in real time applications.
- Fundamentals of Data Analytics and ML use cases.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Understand the principles of Machine Learning	K1,K2
CLO2	Understand the working of neural networks, decision trees, suppor vector machines and ensemble methods	K2
CLO3	Apply techniques to design and tune model pipelines for ranking and recommendation systems.	K3
CLO4	Analyze Machine Learning to Predictive Data Analytics.	K4
CLO5	Apply ML models for real world applications.	K3
K1-Remember; **K2**-Understand; **K3**-Apply;**K4**-Analyze		

CLO – PLO Mapping

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

Elective - I: Machine Learning

Unit	Content	No. of Hours
I	**Machine Learning Basics :** Introduction to Machine Learning (ML) - Essential concepts of ML - Types of learning - Machine learning methods based on Time - Dimensionality - Linearity and Non linearity - Early trends in Machine learning - Data Understanding Representation and visualization	15
II	**Machine Learning Methods:** Linear methods - Regression - Classification - Perception and Neural networks - Decision trees - Support vector machines - Probabilistic models -Supervised, Unsupervised and Reinforcement learning - Featurization.	15
III	**Machine Learning in Practice:** Ranking - Recommendation System - Designing and Tuning model pipelines- Performance measurement - Azure Machine Learning - Open-source Machine Learning libraries-Prompting Strategies.	15
IV	**Machine Learning and Data Analytics:** Machine Learning for Predictive Data Analytics - Data Insights to Decisions - Data Exploration - Information based Learning - Similarity based learning - Probability based learning - Error based learning - Evaluation - The Art of Machine Learning to Predictive Data Analytics.	15
V	**Applications of Machine Learning :**Image Recognition - Speech Recognition - Email spam and Malware Filtering - Online fraud detection - Medical Diagnosis. Automated Knowledge Acquisition, Pattern Recognition, Program Synthesis, Text and Language Processing, Internet-based Information Systems- Integration of Machine Learning with Indian Knowledge System.	15
	Total Hours	**75**
Text Books		
1.	Ameet V Joshi(2020), Machine Learning and Artificial Intelligence, Springer Publications.	
2.	John D. Kelleher, Brain Mac Namee, Aoife D' Arcy(2015), Fundamentals of Machine learning for Predictive Data Analytics, Algorithms, Worked Examples and case studies, MIT press.	
Reference Books		
1.	Christopher M. Bishop(2011), Pattern Recognition and Machine Learning, Springer Publications.	
2.	Stuart Jonathan Russell, Peter Norvig, John Canny(2020), Artificial Intelligence: A Modern Approach, Prentice Hall.	
3.	John Paul Muller, Luca Massaron(2021), Machine Learning Dummies, Wiley Publications.	
Web Resources (Swayam / NPTEL/Others)		
1.	https://nptel.ac.in/courses/113104517	
2.	https://nptel.ac.in/courses/127108778	
3.	https://archives.publishing.org.in/index.php/archives/issue/view/55	

Elective - I: Cryptography & Network Security

Course Code	Course Name	Category	Hours / Week	Credits
24BCA5BE	Cryptography & Network Security	Elective - I	5	3

Course Objectives

The course intends to cover

- Basic concepts of Cryptography.
- Digital certificates and Public Key Infrastructure (PKI) protocols.
- Authentication techniques.

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 Cryptography.	K1,K2
CLO2	Interpret symmetric and asymmetric cryptography algorithms.	K2
CLO3	Apply Internet security protocols for communication.	K3
CLO4	Understand authentication mechanisms and cryptography.	K2
CLO5	Analyze firewalls, VPNs and network security mechanisms.	K4
K1-Remember; **K2**-Understand; **K3**-Apply;**K4**-Analyze		

CLO – PLO Mapping

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

Elective - I: Cryptography & Network Security

Unit	Content	No. of Hours
I	**Attacks on Computers and ComputerSecurity:**Introduction - Need for Security - Security approaches - Principles of Security - Types of attacks. **Cryptography Techniques:** Basic terms - Plain text and Cipher text - Substitution techniques - Transposition techniques - Encryption and decryption - Symmetric and Asymmetric key cryptography. Applications of AI in Cryptography.	15
II	**Symmetric Key Algorithms and AES :** Introduction - Algorithm Types and Modes - An overview of Symmetric key Cryptography - Data Encryption Standard (DES) - Blowfish - Advanced Encryption Standard (AES). **Asymmetric Key Algorithms**: Introduction - Brief History of Asymmetric Key cryptography - An Overview of Asymmetric Cryptography - The RSA algorithm - Symmetric and Symmetric Cryptography together - Digital Signatures.	15
III	**Public Key Infrastructure (PKI):** Introduction - Private Key Management - The PKIX Model - Public key Cryptography standards - XML, PKI and Security - **Internet Security Protocols :** Introduction - Basic Concepts - Secure Socket Layer - (SSL) - Transport Layer Security(TLS) - 3-D secure Protocol - Electronic Money - Email Security.	15
IV	**User Authentication and Kerberos:** Introduction - Authentication basics - Passwords - Authentication Tokens - Biometric Authentication - Kerberos - Key Distribution Centre - Security Handshake Pitfalls. **Cryptography in Java, .NET:**Introduction - Cryptographic Solution using Java - Cryptographic Solutions using Microsoft .NET Framework – Cryptographic Toolkits - Security and Operating Systems - Database Security.	15
V	**Network Security Firewalls and Virtual Private Networks (VPN) :** Introduction - Brief introduction to TCP/IP - Fire walls-Types of Firewall Configuration - Limitation of Firewall - IP security - IPSec Overview-IPSec Key Management - Virtual Private networks (VPN) - Intrusion.	15
	Total Hours	**75**
Text Books		
1.	AtulKahate (2019), Cryptograpy and Network Security, 4th Edition, Tata McGraw-Hill Publishing.	
2.	William Stallings (2023), Cryptography and Network Security Principles and Practices, 8th edition, PHI Education Asia.	
Reference Books		
1.	Andrew S. Tanenbaum(2021),Computer Networks, 6th Edition, PHI.	
2.	Bernard L Menezes,andRavinder Kumar (2018) ,Cryptography,Network Security and Cyber Laws,Cengage Learning India Pvt Limited.	
3.	Behrouz A. Forouzan (2015),Cryptography and Network Security,TMH.	
Web Resources(Swayam / NPTEL/Others)		
1.	https://nptel.ac.in/courses/106/105/106105167/	
2.	https://www.tutorialspoint.com/computer networks/index.htm	
3.	https://www.javatpoint.com/computer networks-tutorial	
4.	https://drive.google.com/file/d/1v0lj53dG3V-rVt73uxISN38vmizRbOxD/view?usp=sharing	

Elective – I: Data Mining

Course Code	Course Name	Category	Hours / Week	Credits
24BCA5CE	Data Mining	Elective - I	5	3

Course Objectives

The course intends to cover

- Tasks and technology of Data mining for enterprise data management.
- Techniques and algorithms of Data mining for applications.
- Data mining process using Large Item Sets.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Understand basic data mining tasks, issues and metrics.	K1, K2
CLO2	Apply data mining algorithms in real-time applications.	K3
CLO3	Analyze the data by comparing the classification algorithms.	K3
CLO4	Apply the clustering algorithms on transactional databases.	K3
CLO5	Develop appropriate data mining models.	K3-K5
K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze; **K5**-Evaluate		

CLO–PLO Mapping

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

Elective – I : Data Mining

Unit	Content	No. of Hours
I	**Basic Data Mining Tasks :**Data Mining Versus Knowledge Discovery in Data Bases - Data Mining Issues - Data Mining Metrices - Social Implications of Data Mining - Data Mining from Database Perspective.	15
II	**Data Mining Techniques:** A Statistical Perspective on Data Mining - Similarity Measures - Decision Trees - Neural Networks - Genetic Algorithms.	15
III	**Classification:** Introduction - Statistical - Based Algorithms - Distance - Based Algorithms - Decision Tree - Based Algorithms - Neural Network - Based Algorithms - Rule- Based Algorithms - Combining Techniques.	15
IV	**Clustering:** Introduction - Similarity and Distance Measures - Outliers - Hierarchical Algorithms - Partitional Algorithms - Clustering Large Databases – BIRCH – DBSCAN - CURE Algorithm-*Outlier Concepts.*	15
V	**Association Rules:** Introduction - Large Item Sets - Basic Algorithms - Parallel & Distributed Algorithms - Comparing Approaches - Incremental Rules –Incremental Learning in AI System-Measuring the Quality of Rules.	15
	Total Hours	**75**
Text Books		
1.	Margaret H.Dunham (2008), Data Mining Introductory and Advanced Topics, Pearson Education	
2.	ArunK.Pujari (2020),Data Mining Techniques, Universities Press	
Reference Books		
1.	JiaweiHan & MichelineKamber (2022), Data Mining Concepts &Techniques.	
2.	K.P.Soman, ShyamDiwakar,V.Ajay (2009) , Insight into Data MiningTheory and Practice	
Web Resources (Swayam/ NPTEL/Others)		
1.	https://onlinecourses.nptel.ac.in/noc21_cs06/preview	
2.	https://onlinecourses.nptel.ac.in/noc26_cs14/preview	
3.	https://aiixx.ai/blog/a-comprehensive-guide-to-incremental-learning-in-ai	

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

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

Question Paper Pattern

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

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

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

Examination Pattern

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

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

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

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

Question Paper Pattern

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

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

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

Components of Internship (Internal Assessment Only)

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

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

Semester 6

Semester – 6									
Course Code	**Part**	**Course Category**	**Course Name**	**Hours / Week**	**Examination**				**Credits**
					Duration in Hours	**Max Marks**			
						CIA	**ESE**	**Total**	
24BCA61C	III	Core – XII	Graphics and Multimedia	6	3	25	75	100	4
24BCA62P	III	Core Lab – VII	**Lab :** Graphics and Multimedia	5	3	40	60	100	3
24BCA63C	III	Core - XIII	Data Visualisation	6	3	25	75	100	4
24BCA6AE/	III	Elective - II	Natural Language Processing **(Artificial Intelligence)**	5	3	25	75	100	3
24BCA6BE/			Cyber Security and Cyber Law **(Cyber Security)**						
24BCA6CE			Big Data Processing and Analytics **(Data Mining)**						
24BCA64P	III	SEC Lab - III	**Lab:** Data Visualisation	2	3	40	60	100	2
24BCA6PR	III	Project	**Core :** Project Work	6	3	40	60	100	5
			Total	**30**				**600**	**21**
			Grand Total	**180**				**4250**	**140**

Course Code	Course Name	Category	Hours / Week	Credits
24BCA61C	Graphics and Multimedia	Core - XII	6	4

Course Objectives

The course intends to cover

- Line, circle, ellipse algorithms and output primitive attributes for innovative digital application design.
- 2D transformations, viewing and clipping operations.
- Types of text, image, color models and audio formats.
- Various operations in video, animation, audio and video file compression.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Understand the digital and technological applications using output primitive attributes.	K1,K2
CLO2	Use 2D geometric transformations, matrix representations, clipping operations and AI-based image segmentation techniques to solve computer graphics and image-processing problems.	K3
CLO3	Apply image enhancement techniques to improve image quality in multimedia applications.	K3
CLO4	Implement audio recording and processing techniques to improve sound quality in multimedia content.	K3
CLO5	Apply video editing and animation techniques to develop multimedia content.	K3
K1 - Remember; **K2** - Understand; **K3**-Use, Apply, Implement		

CLO – PLO Mapping

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

Core – XII : Graphics and Multimedia

Unit	Content	No. of Hours
I	**Output Primitives**: Points and Lines – Line-Drawing algorithms – Loading frame Buffer – Line function – Circle-Generating algorithms – Ellipse-generating algorithms. Attributes of Output Primitives: Line Attributes – Curve attributes – Color and Grayscale Levels – Area-fill attributes – Character Attributes**.** Basic applications of AI in image recognition.	18
II	**2D Geometric Transformations**: Basic Transformations – Matrix Representations – Composite Transformations – Other Transformations. 2D Viewing: The Viewing Pipeline – Viewing Co-ordinate Reference Frame – Window-to-Viewport Co-ordinate Transformation - 2D Viewing Functions – Clipping Operations - AI-Based Image Segmentation.	18
III	**Text**: Types of Text – Unicode Standard – Font – Insertion of Text – Text compression – File formats. Image: Image Types – Seeing Color – Color Models – Basic Steps for Image Processing – Scanner – Digital Camera – Interface Standards – Specification of Digital Images – CMS – Device Independent Color Models – Image Processing software – File Formats – Image Output on Monitor and Printer. Image Enhancement.	18
IV	**Audio:** Introduction – Acoustics – Nature of Sound Waves – Fundamental Characteristics of Sound – Microphone – Amplifier – Loudspeaker – Audio Mixer – Digital Audio – Synthesizers – MIDI – Basics of Staff Notation – Sound Card – Audio Transmission – Audio File formats and CODECs – Audio Recording Systems – Audio and Multimedia – Voice Recognition and Response - Audio Processing Software – Speech to Text and Text to Speech.AI Music Generator.	18
V	**Video:** Analog Video Camera – Transmission of Video Signals – Video Signal Formats – Television Broadcasting Standards – PC Video – Video File Formats and CODECs – Video Editing – Video Editing Software**. Animation:** Types of Animation – Computer Assisted Animation – Creating Movement – Principles of Animation – Some Techniques of Animation – Animation on the Web – Special Effects – Rendering Algorithms. Compression: MPEG-1 Audio – MPEG-1 Video - MPEG-2Audio – MPEG-2 Video. AI-Powered Video Editing.	18
	Total Hours	**90**

Text Books	
1	Donald Hearn, M.Pauline Baker, Computer Graphics, 2nd Edition, PHI
2.	Ranjan Parekh, (2007),Principles of Multimedia, TMH
Reference Books	
1.	Amarendra N Sinha, Arun D Udai,(2008) Computer Graphics, Tata McGraw Hill
2.	Tay Vaughan, Multimedia: Making it Work, 7th Edition, Tata McGraw Hill
Web Resources (Swayam, NPTEL / Others)	
1	https://nptel.ac.in/courses/106103224
2	https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_cs104
3	https://mindtitan.com/resources/blog/ai-image-recognition-applications-and-benefits/
4	https://cloudinary.com/guides/ai/ai-image-segmentation
5	https://www.soundverse.ai/blog/article/how-ai-music-generators-work
6	https://bitbaroda.com/blog/ai-powered-video-editing-modern-tools-professional-video

Course Code	Course Name	Category	Hours / Week	Credits
24BCA62P	Lab : Graphics and Multimedia	Core Lab - VII	5	3

S. No.	List of Programs
Graphics :	
1.	Write a program to rotate an image.
2.	Write a program to drop each word of a sentence one by one from the top.
3.	Write a program to drop a line using DDA Algorithm.
4.	Write a program to move a car with sound effect.
5.	Write a program to bounce a ball and move it with sound effect.
6.	Write a program to test whether a given pixel is inside or outside or on a polygon.
Multimedia :	
7.	Create Sun Flower using Photoshop.
8.	Animate Plane flying in the Clouds using Photoshop.
9.	Create Plastic Surgery for the Nose using Photoshop.
10.	Create See-through text using Photoshop.
11.	Create a Web Page using Photoshop.
12.	Convert Black and White Photo to Color Photo using Photoshop.
	Total Hours **75**
Text Books	
1.	Donald Hearn, M. Pauline Baker Computer Graphics, 2nd edition, PHI.
2.	Ranjan Parekh (2007) Principles of Multimedia, TMH.
Reference Books	
1.	Amarendra N Sinha, Arun D Udai,(2008), Computer Graphics, TMH.
2.	Tay Vaughan Multimedia: Making it Work, 7th edition, TMH.
Web Resources (Swayam / NPTEL)	
1.	https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_cs178
2.	https://onlinecourses.swayam2.ac.in/e-learning/preview/nou26_cs21

Course Code	Course Name	Category	Hours / Week	Credits
24BCA63C	Data Visualisation	Core-XIII	6	4

Course Objectives

The Course intends to cover

- Data Preparation and Communicating data through Visualization.
- Quantitative Methods for effective data visualization and interpretation.
- Quantitative relationships and data variations for effective visualization and interpretation.
- Temporal and geospatial visualization techniques for effective data representation and interpretation.
- Advanced data visualization and dashboard design techniques for effective data analysis and presentation.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Understand the principles and processes involved in effective data communication.	K1, K2
CLO2	Understand and calculate ratios, rates, proportions, and percentages for effective data analysis.	K2
CLO3	Use data variation, control charts, scatterplots, regression and trend lines for data visualization.	K3
CLO4	Apply time charts, timelines, slope graphs, maps for location-based visualizations.	K3
CLO5	Use AI-powered data visualization tools to generate insights and enhance dashboard development.	K3
K1 - Remember; **K2** - Understand; **K3** – Use,Apply		

CLO – PLO Mapping

CLOs/PLOs	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
CLO1	2	2	2	1	2
CLO2	3	3	2	1	1
CLO3	3	3	2	2	1
CLO4	3	2	3	1	1
CLO5	2	3	3	2	2
3 - Substantial (high)		**2** - Moderate (medium)		**1** - Slight (low)	

Core – XIII: Data Visualisation

Unit	Content	No. of Hours
I	**Communicating Data:** Introduction - A Step in the Process - A Model of Communication - Three types of Communication Problems - Six Principles of Communicating Data. **Handling Data Gathering:** Finding sources - Data Scraping - **Formatting Data:** Data Formats - Formatting Tools - Formatting with Code	18
II	**Ratios and Rates:** Ratios – Two Ways of Adding Rank – **Rates:** Blending Data Source - Visualizing Rate. **Proportions and Percentages:** Introducing Filters and Quick Filters - Introducing Table Calculations - Proportions as Waterfall Charts using Gantt - Current-to-Historical - Actual-to-Target. **Mean and Median:** The Normal Distribution.	18
III	**Variations and Multiple Quantities**: **Variations:** Visualizing Variation over Time - Control Charts – Anatomy of a Control Chart - Creating a control chart -Understanding – Uncertainty. **Multiple Quantities:** Scatterplots - Stacked Bars - Regression and Trend Lines - The Quadrant Charts.	18
IV	**Time Charts and Map Location:** The Origin of Time charts - The Line chart - The Dual Axis Line chart - The Connected Scatterplots - The Date Filed Type - The Timeline - The Slope graph. **Maps and Locations:** Special Map - Circle Maps - Filled Maps - Dual Encoded Maps - A Dual Encoded Circle Maps.	18
V	**Dashboards:** Types of Dashboards - Building and Exploratory Dashboard. **Advanced Dashboards Features:** Animating Dashboards - Showing Multiple Tabs - Adding Navigation with Filters - Custom Header Images - Adding Google Maps to Dashboards – AI Data Visualization Tools.	18
	Total Hours	**90**

Text Books

1.	Ben Jones, (2014), Communication Data with Tableau, (1st Edition.), O'Reilly Media
2.	Nathan Yau, (2011), Visualize This: The Flowing Data guide to Design, Visualization and Statistics, (1st Edition.) Wiley

Reference Books

1.	Steve Wexler, Jeffrey Shaffer, et al, (2017), The Big Book of Dashboards: Visualizing Your Data Using Real-World Business Scenarios, Wiley.
2.	Cole Nussbaumer Knaflic, (2015), Storytelling with Data: A Data Visualization Guide for Business Professionals, John Wiley & Sons.

Web Resources (Swayam / NPTEL/Others)

1.	https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_bt26
2.	https://deepnote.com/blog/ai-data-visualization-tools

Course Code	Course Name	Category	Hours / Week	Credits
24BCA6AE	Natural Language Processing	Elective- II	5	3

Course Objectives

The Course intends to cover

- Introduction to NLP, its levels of analysis, text representation, encoding standards and formal foundations.
- Lexical and morphological analysis, linguistic resource representation, error correction and part-of-speech tagging techniques.
- Formal grammars, parsing techniques, language models, recurrent neural networks and contextual embedding.
- Semantic analysis, ambiguity resolution, semantic models, word sense disambiguation and semantic role labelling.
- Pragmatic analysis, discourse processing, knowledge representation, sentiment analysis and natural language generation techniques.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Understand the foundational levels of analysis, encoding standards, and finite state automata structures used in early text processing.	K1, K2
CLO2	Classify morphological processing techniques, linguistic data resources, and part-of-speech tagging models.	K2
CLO3	Use context-free grammar normalization sequences and recurrent neural network components like LSTMs or GRUs for sequential data mapping.	K3
CLO4	Apply vector space distributions, word sense disambiguation processes, and semantic networks for structural ambiguity resolution.	K3
CLO5	Analyze natural language generation sequences, sentiment analysis features, and pragmatic belief models to isolate structural errors.	K4
K1-Remember; **K2**-Classify, Understand; **K3**-Use, Apply; **K4**-Analyze		

CLO–PLO Mapping

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

Elective – II: Natural Language Processing

Unit	Content	No. of Hours
I	**Natural Language Processing (NLP)**: Introduction - Key issues and Levels of Analysis in NLP – Applications of NLP Techniques – Morphological, Lexical, Syntactic, Semantic, Pragmatic and Markup Analysis – Text Representation and Encoding Standards (TEI and Unicode). **Formal Foundations of NLP:** Finite State Automata, Recursive and Augmented Transition Networks – Open Problems in NLP.	13
II	**Lexical Level Analysis and Morphological Processing** : Efficient Representation of Linguistic Resources (Lexica, Grammars, Tries and Finite State Automata) – Finite State Transducers for Morphological Analyzer Design – Error-Tolerant Lexical Processing and Spelling Error Correction – Introduction to Syntactic Analysis – Part-of-Speech Tagging Techniques (Brill Tagger and Hidden Markov Models).	14
III	**Formal Grammars and Parsing**: Context-Free Grammars – Grammar Equivalence and Normal Forms – Constituency Grammars – Lexicalized Grammars. **Syntactic Level Analysis:** Language Models – Recurrent Neural Networks (RNNs). **Context Management in RNNs:** Long Short-Term Memory (LSTM) and Gated Recurrent Units (GRUs) – Contextual Embeddings.	16
IV	**Semantics and Ambiguity Resolution**: Introduction - Types of Linguistic Ambiguity and Resolution Techniques. **Symbolic and Formal Semantics:** Semantic Networks and Parsers – Procedural Semantics – Montague Semantics – Vector Space Models and Distributional Semantics – Lexical Semantics and Word Sense Disambiguation – Compositional Semantics – Semantic Role Labeling – Semantic Parsing.	15
V	**Pragmatic Level Analysis and Discourse Processing**: Knowledge Representation and Reasoning – Plan and Goal Recognition – Speech Acts and Intentions – Belief Models – Reference Resolution – Subjectivity and Sentiment Analysis. **Natural Language Generation (NLG)**: Content Determination – Sentence Planning – Surface Realization – Applications of AI in Knowledge Representation and Reasoning.	17
	Total Hours	**75**
Text Books		
1.	Daniel Jurafsky and James H. Martin , (2009), Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition, Pearson Prentice Hall.	
Reference Books		
1.	Steven Bird, Ewan Klein and Edward Loper (2009) , Natural Language Processing with Python, First Edition, OReilly Media	
Web Resources (Swayam/NPTEL)		
1.	https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_cs180	

Course Code	Course Name	Category	Hours /Week	Credits
24BCA6BE	Cyber Security and Cyber Law	Elective- II	5	3

Course Objectives

The Course intends to cover

- Cybercrime Fundamentals, Legal Aspects and Global Perspectives in Information Security
- Cybersecurity Threats and Protection and organizational security measures for securing mobile devices and laptops.
- Cyber Attack Techniques and Security Threats in Network and Web Environments
- Cyber Law and Legal Aspects of Cyberspace for E-Commerce and Electronic Transactions
- Information Technology Law and Cybersecurity Framework for Cybercrime Prevention and Information Security

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Identify the meaning, origin, types, and major forms of cybercrime in the digital environment	K1
CLO2	Understand common cyber offences and cyber-attacks and their impact on individuals and organizations	K2
CLO3	Apply suitable security measures against phishing, identity theft, and wireless attacks to protect digital information and devices	K3
CLO4	Apply cyber law principles to common cybercrime and electronic transaction cases in the digital environment	K3
CLO5	Analyze information security challenges in the digital environment and identify suitable security measures	K4
K1- Identify ; **K2**-Understand; **K3**-Apply; **K4**-Analyze		

CLO–PLO Mapping

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

Elective – II: Cyber Security and Cyber Law

Unit	Content	No. of Hours
I	**Introduction to Cybercrime:** Cybercrime definition and origins of Cybercrime of the world – Cybercrime and Information Security – Classifications of Cybercrime – Cybercrime and the Indian IT Act, 2000 – A Global perspective on Cybercrimes.	12
II	**Cyber Offences and Cybercrime:** Strategic attacks - Types of Attacks – Proliferation of Mobile and Wireless Devices – Trends in Mobility and Wireless devices – Security Challenges faced by Mobile devices – Registry Setting for Mobile devices – Authentication Service Security – Attacks on Mobile Phones – Security implications for Organizations . **Organizational Measures for handling Mobile Phones:** Device Related security issues – Security policies and Measure in Mobile Computing era and Laptops.	17
III	**Methods and Tools used in Cyber Line**: Password Cracking – Malwares – DoS and DDos Attacks – SQL injection and Buffer overflow – Phishing and Identity Theft – Enumeration – Attacks on Wireless Networks.	15
IV	**Cyberspace and Cyber Law**: E-Commerce – Contract aspects in Cyber Law – Security aspects of Cyber Law – Intellectual property aspect in Cyber Law and evidence aspect in Cyber Law – Criminal Aspects in Cyber Law – Global trends in Cyber Law - Legal framework for electronic Data Interchange Law relating to electronic ranking – Need for Indian Cyber Law.	15
V	**Information Technology Act:** Introduction of Cybercrime and Cyber Security – Information Technology Act 2000 – Penalties, Adjudication and Appeals under the Information Technology Act, 2000 – Offences under Information Technology Act, 2000 - Information Technology Act, 2008 and its Amendments - Importance of Information Security Standards – Information Security Challenge. AI-Driven Password Cracking and Smart Keylogging	16
	Total Hours	**75**

Text Book

1.	Nilakshi Jain, Ramesh Menon (2021), Cyber Security and Cyber Laws, Wiley India Pvt Ltd, 1st Edition

Reference Books

1.	D. P. Mittal (2018). Law of Information Technology (Cyber Law), TAXMANN'S, 1st Edition
2.	Faiyaz Ahamad (2013), Cyber Law and Information Security, Dreamtech Press, 2nd Edition

Web Resources (Swayam/ NPTEL / Others)

1.	https://nptel.ac.in/courses/129106894
2.	https://nptel.ac.in/courses/106106248
3.	https://www.keepersecurity.com/blog/2023/08/17/how-ai-can-crack-your-passwords/

Course Code	Course Name	Category	Hours /Week	Credits
24BCA6CE	Big Data Processing and Analytics	Elective- II	5	3

Course Objectives

The Course intends to cover:

- Big Data, Sources, Quality Data Storage and Analysis.
- Hadoop, Map Reduce concepts and Hadoop Eco System.
- NoSQL Big Data Management, MongoDB, Casandra Databases.
- Map Reduce, Hive and Pig.
- Machine Learning Algorithms.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Understand Big Data and processing of large datasets.	K1, K2
CLO2	Apply Hadoop Ecosystem tools to create, store, retrieve and manage distributed datasets	K3
CLO3	Apply NoSQL data architecture patterns and shared-nothing architecture for distributed Big Data applications.	K3
CLO4	Apply Pig and Hive tools for large-scale data processing and analysis.	K3
CLO5	Apply Machine Learning Algorithms for Big Data Analytics.	K3
K1 – Remember**; K2 –** Understand; **K3 –** Apply		

CLO-PLO Mapping

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

Elective – II: Big Data Processing and Analytics

Unit	Content	No. of Hours
I	**Big Data Analytics:** Introduction – Big Data – Scalability and Parallel Processing - Designing Data Architecture . **Data**: Sources - Quality - Pre-Processing and Storing – Data Storage and Analysis – Big Data Analytics Applications and Case Studies - AI-enabled Data Collection and Preprocessing**.**	15
II	**Hadoop:** Introduction - Hadoop and its Ecosystem- HDFS (Hadoop Distributed File System) – MapReduce Framework and Programming Model – Hadoop Yarn. **Hadoop Ecosystem Tools**: Hadoop Ecosystem – Ambari – Hbase – Hive – Pig – Mahout.	15
III	**NoSQL Big Data Management, MongoDB and Cassandra:** Introduction – NoSQL Data Store – NoSQL Data Architecture Patterns – NoSQL to Manage Big Data – Shared-Nothing Architecture for Big Data Tasks – MongoDB Database – Casandra Databases.	15
IV	**MapReduce, Hive and Pig:** Introduction – MapReduce Tasks – Composing MapReduce for Calculations and Algorithms – Hive – HiveQL – Pig.	15
V	**Machine Learning Algorithms for Big Data Analytics –** Correlation – Regression Analysis - Finding Similar Items – Similarity of Sets and Collaborative Filtering – Frequent Item Sets and Association Rule Mining – Clustering - Classification – Recommendation System.	15
	Total Hours	**75**

Text Books	
1.	Raj Kamal, Preeti Saxena (2025), Big Data Analytics – Introduction to Hadoop, Spark and Machine Learning, McGraw Hill Education (India) Private Limited.
2.	Rajaraman, A., & Ullman, J. D. (2012*)*, Mining of massive datasets, Cambridge University Press.
3.	Liebowitz, J. (2013*)*, Big data and business analytics, Auerbach Publications, CRC Press.
4.	Plunkett, T., & Hornick, M. (2013), Using R to unlock the value of big data: Big data analytics with Oracle R Enterprise and Oracle R Connector for Hadoop, McGraw-Hill/Osborne Media
Reference Books	
1.	Franks, B. (2012*)*, Taming the big data tidal wave: Finding opportunities in huge data streams with advanced analytics, John Wiley & Sons.
2.	Minelli, M., Chambers, M., & Dhiraj, A. (2013), Big data, big analytics: Emerging business intelligence and analytic trends for today's businesses, Wiley.
3.	Sathi, A. (2012*)*, Big data analytics: Disruptive technologies for changing the game, MC Press.
Web Resources (Swayam/NPTEL/Others)	
1.	https://nptel.ac.in/courses/106104189
2.	https://nptel.ac.in/courses/106105848
3.	https://www.crystalhues.com/blog/ai-data-processing-explained-why-it-matters-and-how-it-works

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Course Code	Course Name	Category	Hours / Week	Credits
24BCA64P	Lab: Data Visualisation	SEC Lab - III	2	2

S.No	List of Programs
1	Construct a tree map using the call center dataset, create hierarchical views, and explore the data.
2	Create an Excel file and use Tableau to build a bar chart showing the same hierarchy as the tree map, with colors emphasizing similar results.
3	Create two versions of a visualization with similar functionality and differentiate them by adding filters.
4	Create a visualization showing the total number of calls, separated by incoming and outgoing.
5	Create a visualization showing the employees/branches with the largest number of outgoing calls.
6	Create a visualization showing the time block with the most calls.
7	Analyze the data and create visualization(s) supporting the downsizing of the company by closing one branch.
8	Analyze the data and create visualization(s) supporting the recommendation of one employee for Employee of the Month.
9	Analyze the data and create visualization(s) supporting an employee needing improvement or a branch for expansion.
10	Create a dashboard combining the visualizations from the previous programs.
	Total Hours **30**

Text Books

1.	Ben Jones, (2014), Communication Data with Tableau, (1st Edition.), O'Reilly Media.
2.	Nathan Yau, (2011), Visualize This: The Flowing Data guide to Design, Visualization and Statistics, (1st Edition.) Wiley.

Reference Books

1.	Steve Wexler, Jeffrey Shaffer, et al, (2017), The Big Book of Dashboards: Visualizing Your Data Using Real-World Business Scenarios, Wiley.
2.	Cole Nussbaumer Knaflic, (2015), Storytelling with Data: A Data Visualization Guide for Business Professionals, John Wiley & Sons.

Web Resources (Swayam / NPTEL/Others)

1.	https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_bt26
2.	https://deepnote.com/blog/ai-data-visualization-tools

Course Code	Course Name	Category	Hours/Week	Credits
24BCA6PR	Core : Project Work	Core	6	5

Evaluation Pattern :

1. Viva-Voce will be conducted at the end of the year by both Internal (Respective Guides) and External Examiners for a total of 100 marks

2. Out of 100 marks,

CIA – **40 marks** (15 Marks - Review I + 15 marks - Review II + 10 marks - Internal Viva Voce)

ESE – **60 marks** (15 marks – Project Report + 30 marks - Implementation/Execution/Presentation + 15 Viva Voce).

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BIBILIOGRAPHY

APPENDICES

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Components of Assessment (CIA & ESE)

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

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

Question Paper Pattern (CIA & ESE)

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

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

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

Examination Pattern

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

Components of Project Work*

Components	Marks	
Review - 1	15	
Review - 2	15	
Internal Viva-Voce	10	
Total Marks - CIA		**40**
Project Report	15	
Implementation/Execution/Presentation	30	
Viva-Voce	15	
Total Marks - ESE		60
Total Marks		**100**

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