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: B.Sc. Mathematics

Programme Code : BMA

(Applicable for the Students admitted during the Academic Year 2024 - 25 onwards)

Eligibility

The student should have passed Higher Secondary Examination with Mathematics along with Physics and Chemistry.

(As per the eligibility conditions given by Bharathiar University Ref. BU/R/B3-B4/ Eligibility Condition/2024/9206 dated 24/05/2024).

Program Learning Outcomes (PLOs)

The successful completion of the B.Sc. Mathematics programme shall enable the students to:

PLO1	Proficiency in programming languages coupled with expertise in computational mathematics offers career opportunities in software industry.
PLO2	Understand the Indian Knowledge System and harness Vedic mathematics to enhance speed and accuracy in competitive exams and vitalize curiosity to lifelong learning.
PLO3	Critically think with intellectual rigor in mathematics paves the way for opportunities as/in actuarial scientist, meteorologist, banking, market research, and investment analysis.
PLO4	Pose pertinent inquiries about concepts across different branches of mathematics that nurtures a research-driven mindset focused in exploration.
PLO5	Master problem solving methodologies across various domains fosters a fertile ground for entrepreneurial triumph.

B.Sc. Mathematics

Distribution of Credits and Hours for all the Semesters

Part	Course Category	No. of Courses	Hours		Credits		Total Credits	Semester
I	Language – I	4	4 X 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)	5	5 X 6	30	5 X 4	20	100	3, 5, 6
	Core Theory (5 hrs. / Week)	9	9 X 5	45	9 X 4	36		1,2,4,5
	Core Theory (5 hrs. / Week)	1	1 X 5	5	1X3	03		6
	Core Lab (4 hrs. / Week)	5	5 X 4	20	5 X 2	10		1 - 5
	Allied Theory	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 5	5	1 X 5	5		6
	Internship (IT)	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	4 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 & 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**	**12**	**14**	**-**	**2**	**180**	**140**

Curriculum

B.Sc. Mathematics

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
24BMA13C	III	Core – I	Classical Algebra	5	3	25	75	100	4
24BMA14C	III	Core – II	Calculus	5	3	25	75	100	4
24BMA15P	III	Core Lab – I	**Lab:** Calculus using Scilab	4	3	40	60	100	2
24BMA16A	III	Allied – I	Statistics - I	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
24BMA23C	III	Core-III	Analytical Geometry	5	3	25	75	100	4
24BMA24C	III	Core-IV	Trigonometry, Vector Calculus and Fourier Series	5	3	25	75	100	4
24BMA25P	III	Core Lab-II	**Lab:** Statistics with R Programming	4	3	40	60	100	2
24BMA26A	III	Allied – II	Statistics – II	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	**ESA**	**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
24BMA33C	III	Core-V	Differential Equations and Laplace Transforms	6	3	25	75	100	4
24BMA34C	III	Core-VI	Statics	6	3	25	75	100	4
24BMA35P	III	Core Lab -III	**Lab:**Octave Programming	4	3	40	60	100	2
24BMA36A	III	Allied-III	Principles of Information Technology	4	3	25	75	100	3
24BMA37P	III	SEC-I	**Lab:**3D Visualization in Geogebra	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
24BMA43C	III	Core - VII	Dynamics	5	3	25	75	100	4
24BMA44C	III	Core - VIII	Programming in C	5	3	25	75	100	4
24BMA45P	III	Core Lab - IV	**Lab:**Programming in C Lab	4	3	40	60	100	2
24BMA46A	III	Allied - IV	Introduction to Web Technology	4	3	25	75	100	3
24BMA47P	III	SEC - II	**Lab:** SageMath Lab	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 & Co-Curricular	Liberal Arts	-	2	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	
24BMA51C	III	Core-IX	Mathematical Analysis	6	3	25	75	100	4
24BMA52C	III	Core-X	Complex Analysis-I	5	3	25	75	100	4
24BMA53C	III	Core-XI	Modern Algebra - I	5	3	25	75	100	4
24BMA54C	III	Core-XII	Discrete Mathematical Structures	5	3	25	75	100	4
24BMA55P	III	Core Lab –V	**Lab:** Data Analytics using Python	4	3	40	60	100	2
24BMA5AE	III	Elective I	Numerical Methods- I **(Applied Mathematics)**	5	3	25	75	100	3
24BMA5BE			Astronomy-I **(Astrophysics)**						
24BMA5CE			Probability and Queuing Theory **(Probability Theory)**						
24BMA56I	III	SEC-III	Internship	-	-	50	-	50	2
Total				**30**				**650**	**23**

Semester – 6									
Course Code	**Part**	**Course Category**	**Course Name**	**Hours / Week**	**Examination**				**Credits**
					Duration in Hours	**Max Marks**			
						CIA	**ESE**	**Total**	
	III	Core-XIII	Complex Analysis II	6	3	25	75	100	4
	III	Core-XIV	Modern Algebra II	6	3	25	75	100	4
	III	Core Lab-VI	Optimization Theory	5	3	40	60	100	3
	III	Elective- II	Numerical Methods II **(Applied Mathematics)** Astronomy II **(Astro Physics)** Stochastic Process **(Probability Theory))**	5	3	25	75	100	3
	III	SEC-IV	**Lab :**Latex Programming	2	-	40	60	100	2
	III	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
24BMA13C	III	Core – I	Classical Algebra	5	3	25	75	100	4
24BMA14C	III	Core – II	Calculus	5	3	25	75	100	4
24BMA15P	III	Core Lab – I	**Lab:** Calculus using Scilab	4	3	40	60	100	2
24BMA16A	III	Allied – I	Statistics – I	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

(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 Hours	**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
24BMA13C	Classical Algebra	Core	5	4

Course Objectives

The Course intends to cover

- Binomial, exponential, and logarithmic series, as well as instruct them on their application in calculating sums of series.
- The demonstration of typical methods used to solve transcendental and polynomial equations.
- The common techniques for resolving equations of the transcendental and polynomial types.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Remember the concept of summarizing series using binomial and exponential series.	K1
CLO2	Understand the logarithmic series to determine if an infinite series is convergent or divergent.	K2
CLO3	Apply the tests for uniform convergence of a series.	K3
CLO4	Analyze the number of positive and negative roots in a polynomial equation by applying Descartes rule of signs.	K4
CLO5	Analyze the method of approximation to troubleshoot the problems with precision in auto mechanics	K4
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** – Analyze		

CLO – PLO Mapping

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

Core - I: Classical Algebra

Unit	Content	No. of Hours
I	Introduction to Binomial expansion - Binomial theorem for a rational index, Exponential theorem based problems – the immediate application to summation and approximation problems.	15
II	Logarithmic series theorem -Immediate application to summation and approximation problems. Convergency and divergency of series –theorems and elementary results	15
III	Series of positive terms- Comparison tests - Cauchy's condensation test - De -Alembert's ratio tests-Cauchy's root test - Raabe's test - Absolute convergence series – Uniform Convergence – Test for uniform convergence of a series	15
IV	Theory of equations - Roots of an equation- Relations between the roots and coefficients of equations- Symmetric function of roots - Transformations of equations- Reciprocal equations -Descartes rule of signs.	15
V	Rolle's theorem - Multiple roots - position of real roots of f(x) =0 - Newton's method of approximation to a root - Horner's method.	15
	Total Hours.	**75**
Text Book		
1.	T.K. Manickavachagom Pillay, T. Natarajan & K.S. Ganapathy (2019), Algebra, S.Viswanatham Printers & Publishers Private Ltd. Unit I: Chapter 3 : Section : 1-1.3 Section : 5-8 Section : 10 & 14 Chapter 4 : Section : 1-3.1 & 11 Unit II: Chapter 4 : Section : 5-11 Chapter 2 : Section : 1-11 Unit III: Chapter 2 : Section : 12-25 Unit IV :Chapter 6 : Section : 1-12 Section : 15-18 Section : 24-24.3 Unit V :Chapter 6 : Section : 25-27 Section : 29.4-30	
Reference Books		
1.	P. Kandasamy, K.Thilagavathy. (2004, 2022). Mathematics for B.Sc. Branch I (Vol. 1). S. Chand and Company Ltd., New Delhi.	
2.	N.P. Bali, (2010), Algebra, Laxmi Publications, New Delhi.	
Web Resources (Swayam / NPTEL)		
1.	https://nptel.ac.in/courses/111101001	

Course Code	Course Name	Category	Hours / Week	Credits
24BMA14C	Calculus	Core	5	4

Course Objectives

The Course intends to cover

- The concepts of curvatures.
- The understanding of integrating various types of functions.
- The fundamentals of double and triple integrals.
- The application of integration for tackling practical challenges encountered across different domains, encompassing rate of change, optimization, area, and volume.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Remember the basics of calculus.	K1
CLO2	Understand the meaning of envelopes and evolutes, as well as how to calculate curvature and evolutes.	K2
CLO3	Apply the double and triple integrals to illustrate the idea of variable change.	K3
CLO4	Analyze and study earth's natural resources to find area and volume which paves way to be a Geologist.	K4
CLO5	Apply the Beta and gamma function to solve the multiple integrals.	K3
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze		

CLO – PLO Mapping

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

Core II: Calculus

Unit	Content	No. of Hours
I	Envelopes – Curvature - radius of curvature in Cartesian and polar forms - evolutes and involutes - Pedal equations - total differentiation co-efficients - homogeneous functions - Euler's theorem on homogeneous functions.	15
II	Definite integrals - Methods of integration - Integrals of functions - Integration of irrational functions, Integration by parts - Bernoulli's Formula.	15
III	Reduction formulae - problems- evaluation of double and triple integrals- applications to calculations of areas and volumes-areas in polar coordinates.	15
IV	Change of order of integration in double integral- Jacobians- Change of variables in double and triple integrals.	15
V	Beta and Gamma integrals-their properties, relation between them- evaluation of multiple integrals using Beta and Gamma functions - Improper Integrals.	15
	Total Hours.	**75**

Text Books	
1.	T.K.Manicavachagom Pillay, S.Narayanan (2016). Calculus (Vol.1), S.Viswanathan Printers & Publishers Private Ltd. Unit I: Chapter: X : Section: 1.1-1.4, 2.1-2.8 Chapter: VIII: Section: 1.3-1.7
2.	T.K. Manicavachagom Pillay. S. Narayanan S. (2016). Calculus (Vol.2), S.Viswanathan Printers & Publishers Private Ltd. Unit II: Chapter: I : Section: 1.1- 6.6, 8-10, 12, 15.1 Unit III: Chapter: I : Section: 13.1-13.10 Section: 3.1, 3.2, 4, 5.1-5.4, 6.1-6.3, 7 Unit IV: Chapter: II : Section: 2.1,2.2 Chapter: VI: Section 1.1, 1.2, 2.1 – 2.4 Unit V Chapter: VII Section: 1.1 - 1.5,2.1 – 2.3, 3, 4, 5, 6.
Reference Books	
1.	P. Kandasamy, K.Thilagavathy (2004), Mathematics for B.Sc., (Vol. 1.) S.Chand and Co.,
2.	Shanthi Narayanan, J.N. Kapoor (2014). A Text book of Calculus, S. Chand & Co.,
3.	G.B.Thomas & R.L Finney(2005),Calculus,9th Ed.,Pearson Education,Delhi.
4.	T.Apostol,Calculus,Volume I and II
Web Resources (Swayam / NPTEL)	
1.	https://nptel.ac.in/courses/111105122

Course Code	Course Name	Category	Hours / Week	Credits
24BMA15P	Calculus using Scilab	Core lab	4	2

S. No.	List of Practicals
1.	Introduction to Scilab
2.	To find the maxima and minima of a function.
3.	To plot the standard cartesian curves.
4.	To plot the standard polar curves.
5.	To plot the standard parametric curves.
6.	To find the area and volume of sphere, cylinder
7.	To verify Euler's theorem, its extension and Jacobian.
8.	To illustrate the left hand and right hand limits for discontinuous functions.
9.	To illustrate the continuity of a function.
10.	To illustrate the differentiability of a function.
11.	To illustrate the integrability of a function.
12.	To verify the Rolle's Theorem.
13.	To verify the Lagrange's theorem.
14.	To verify the Cauchy's mean value theorem.
15.	To verify the Taylor's theorem for a given function.
16.	To evaluation the limits by L'Hospital's rule.
	Total Hours **60**
Text Book	
1.	Narayan, S., & Mittal, P. K. (2014). *Differential Calculus*. S. Chand and Co. Pvt. td.
Reference Book	
1.	Spiegel, E. (2012). *Schaum's Outline of Advanced Calculus* (5th ed.). McGraw Hill.
Web Resources(Swayam/NPTEL)	
1.	https://nptel.ac.in/courses/103106074

Course Code	Course Name	Category	Hours / Week	Credits
24BMA16A	Statistics -I	Allied– I	4	3

Course Objectives

The Course intends to cover

- The random variables, distribution function, probability density function
- The distributions of Binomial, Poisson and Normal
- The central limit theorem with real time application problems.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Remember the classification of random variables.	K1
CLO2	Understand the characteristics of probability distribution functions.	K2
CLO3	Understand probability principles and apply them to actual circumstances.	K2
CLO4	Apply the law of conditional probability and forecast the weather condition.	K3
CLO5	Analyze various distributions to resolve straightforward real-world issues.	K4
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	2	2	2	3	2
CLO3	3	2	3	2	3
CLO4	2	2	3	2	2
CLO5	2	2	3	3	3
3 - Substantial (high)		**2** - Moderate (medium)		**1** - Slight (low)	

Allied I: Statistics-I

Unit	Content	No. of Hours
I	Introduction to distribution function - random variables- discrete and continuous random variables – distribution function - properties of distribution function - discrete random variable probability mass function - discrete distribution function - continuous random variables - probability density function.	12
II	Introduction to mathematical expectation- expected value of a function of random variable- properties of expectation - addition multiplication theorems of expectation.	12
III	Moment Generating Function – cumulants – characteristic function – properties – necessary and sufficient conditions – multivariate – multivariate MGF – Chebychev's inequality – weak law of large numbers.	12
IV	Introduction to Binomial distribution – Poisson distribution.	12
V	Introduction to normal distribution – Lindeberg – Levy theorem (Statement only) – Liapounoff's theorem (Statement only) – linear and curvilinear regression – regression curves.	12
	Total Hours.	**60**

Text Book

1.	S.C. Gupta.Kapoor (2020). Fundamental of Mathematical Statistics (Ed.12) S. Chand and Company Ltd, New Delhi. Unit I: Chapter 5 : Section : 5.1-5.3, 5.4.1 Unit II: Chapter 6: Section : 6.1-6.4 Unit III: Chapter 7: Section : 7.1-7.3,7.5,7.7 Unit IV: Chapter 8: Section : 8.1, 8.4-8.5 Unit V: Chapter 9: Section : 9.1, 9.2, 9.13.2, 9.13.4 Chapter 11: Section : 11.1-11.4

Reference Books

1.	S.P. Gupta(2011). Statistical Methods , Sultan Chand & Sons, New Delhi.
2.	C.B. Gupta, (2004). An Introduction To Statistical Methods, Vikas Publishing House Pvt Ltd.

Web Resources (Swayam / NPTEL)

1.	https://nptel.ac.in/courses/111101004

*** Statistical Table shall be provided for ESE**
***Question paper to be set with 10% theory and 90% problems**

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
			Actual	Weightage	Actual	Weightage	Weightage	Actual	Weightage			
100	25	75	50	**5**	50	**5**	**5**	75	**10**	**5**	**5**	**25**

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
			Actual	Weightage	Actual	Weightage	Actual	Weightage		
100	40	60	50	**10**	50	**10**	60	**15**	**5**	**40**

Examination Pattern

Component	Duration in Hrs.	No. of experiments	Marks			Weightage
			Practical	Record	Total	
Test - I	1	1	50	-	50	10
Test - II	1	1	50	-	50	10
Model	3	2	60	-	60	15
ESE	3	2	50	10	60	-

Part – IV : Foundation Courses

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

Semester – 2

Semester – 2									
Course Code	**Part**	**Course Category**	**Course Name**	**Hours/ Week**	**Examination**				**Credits**
					Duration in Hours	**Max Marks**			
						CIA	**ESE**	**Total**	
24TAM21L	I	Language - 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
24BMA23C	III	Core-III	Analytical Geometry	5	3	25	75	100	4
24BMA24C	III	Core-IV	Trigonometry, Vector Calculus and Fourier Series	5	3	25	75	100	4
24BMA25P	III	Core Lab-II	**Lab:** Statistics with R Programming	4	3	40	60	100	2
24BMA26A	III	Allied – II	Statistics – II	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 : English - II

(All the Undergraduate Programmes)

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

Course Objectives

The course intends to cover

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

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Identify the common techniques underlying free verse and traditional forms of poetry for crafting poems.	K1
CLO2	Understand humour in prose texts psychologically to master the oratory skills.	K2
CLO3	Employ empathy and morale in diplomatic Day-to-day circumstances.	K3
CLO4	Strengthen the writing skills for documentation.	K3
CLO5	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
24BMA23C	Analytical Geometry	Core	5	4

Course Objectives

The Course intends to cover

- Three-dimensional analytical geometry and the geometrical aspects of figs, viz., sphere, cone and cylinder.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Remember the geometrical figures and their properties.	K1
CLO2	Understand the geometrical properties of sphere to measure the distance between stars and galaxy.	K2
CLO3	Apply the equation of tangent and normal at a point on a conic.	K3
CLO4	Analyze condition of tangency and find the tangent plane to the central conicoid.	K4
CLO5	Analyze conics to create computer graphics with 3D modelling.	K4
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze		

CLO – PLO Mapping

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

Core - III: Analytical Geometry

Unit	Content	No. of Hours
I	**Straight Lines:** Equation of straight lines - coplanarity of two straight lines - Shortest Distance (S.D) between two skew lines and equation of two skew lines-simple problems.	15
II	**Sphere:** Equation of sphere - standard equation of sphere-results based on the properties of a sphere-equations of a circle.	15
III	**System of Spheres:** Tangency of spheres- coaxial system of spheres- radical planes- Orthogonal spheres.	15
IV	**Cone and Cylinder:** Cone – equation of cone - cone whose vertex is at the origin-general quadric cone – cylinder – equation of cylinder.	15
V	**Conicoid**: Nature of a conicoid- standard equation of central conicoid –enveloping cone- tangent plane condition for tangency –director Sphere- director plane .	15
	Total Hours.	**75**

Text Book

1.	P. Duraipandian & et.al. , Analytical Geometry, Emerald Publishers. Unit I : Chapter 4 : Section 4.1 – 4.3, 4.6, 4.9 Unit II : Chapter 5 : Section 5.1 – 5.3, 5.6 Unit III : Chapter 5 : Section 5.4, 5.5, 5.7, 5.8 Unit IV : Chapter 6 : Section 6.1 - 6.7 Unit V : Chapter 6 : Section 6.9 – 6.13

Reference Books

1.	N.P.Bali, Solid Geometry, Laxmi Publications.
2.	M.L. Khanna, Solid Geometry, Jainath and Co. Publishers.

Web Resources (Swayam / NPTEL)

1.	https://onlinecourses.nptel.ac.in/noc22_ma68/preview

Course Code	Course Name	Category	Hours / Week	Credits
24BMA24C	Trigonometry, Vector Calculus and Fourier Series	Core	5	4

Course Objectives

The Course intends to cover

- The expansion of trigonometric, hyperbolic functions, vector calculus and the expansions of Fourier series.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Remember the trigonometric ratios.	K1
CLO2	Understand vector differentiation and vector integration.	K2
CLO3	Apply the important quantities associated with vector fields such as the divergence, curl and scalar potential.	K3
CLO4	Analyze fourier series of a given periodic function in forensic science.	K4
CLO5	Analyze line integral, surface integral, volume integral and apply it in control system and signal processing.	K4
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze		

CLO – PLO Mapping

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

Core - IV: Trigonometry, Vector Calculus and Fourier Series

Unit	Content	No. of Hours
I	Expansion in Series – Expansion of cosnθ, sinnθ in a series of cosines and sines of multiples of θ – Expansions of cosnθ ,sinnθ and tannθ in powers of sines , cosines and tangents – Expansion of sin θ, cos θ and tan θ in powers of θ – hyperbolic functions and inverse hyperbolic functions.	15
II	Logarithm of complex quantities - summation of series – when angles are in arithmetic progression – C + iS, method of summation – method of differences.	15
III	Scalar and vector fields – Differentiation of vectors – Gradient, Divergence and Curl-Solenoidal and irrotational vectors-Laplacian Operator.	15
IV	Integration of vectors – line integral – surface integral – Green's theorem in the plane – Gauss divergence theorem – Stoke's theorem.	15
V	Periodic functions – Fourier series of periodicity 2π – half range series.	15
	Total Hours.	**75**
Text Books		
1.	T.K. Manickavachagom Pillay, S.Narayanan (2009). Trigonometry, Viswanathan Publishers and Printers. Unit – I : Chapter 3 : Section 1 – 5 Chapter 4 : Section 1, 2 Unit – II : Chapter 6 : Section 1 - 3	
2.	P.R. Vittal, V. Malini, (2017). Vector Analysis , Margham Publishers. Unit – III : Chapter 1 : Page No. 1 – 53 Unit – IV : Chapter 2 : Page No. 60 – 140	
3.	Dr.Balaji, Transforms and Partial Differential Equations (2023). Balaji Publishers, Unit - V: Chapter 2: Section 2.21, 2.47, 2.73, 2.106, 2.116, 2.130	
Reference Books		
1.	P. Kandasamy., K. Thilagavathi. (2004). Mathematics for B.Sc. Branch I, (Vol. IV), S.Chand and Company Ltd, New Delhi.	
2.	P. Duraipandian., Laxmidurai pandian. (2005)., Vector Analysis, Emerald Publishers.	
3.	G.B. Thomas and R. L. Finny (2010). Calculus and Analytical Geometry (Ed.9) , Pearson Publication.	
Web Resources (Swayam / NPTEL)		
1.	https://nptel.ac.in/courses/111105122	
2.	https://nptel.ac.in/courses/111101164	

Course Code	Course Name	Category	Hours / Week	Credits
24BMA15P	Statistics with R Programming	Core lab	4	2

S. No.	List of Programs	
1.	To create the vectors and perform addition and subtraction two vectors in R	
2.	To find Sum, Mean and Product of Vectors in R	
3.	To Perform Matrix Addition and Subtraction using R	
4.	To Perform Matrix Multiplication, transpose and inverse using R	
5.	To Perform Eigen Value and Eigen vector using R	
6.	To find Mean, Median and Mode using R	
7.	To create Bar Chart and Pie chart using R	
8.	To create Histograms and box plots using R	
9.	To Create Line graphs and Scatter plots using R	
10.	Binomial distribution using R	
11.	Poisson distribution using R	
12.	Normal distribution using R	
13.	Exponential distribution using R	
14.	To find Correlation using R	
15.	To find Simple Linear Regression using R	
16.	To find Simple Multiple Regression using R	
17.	One Way ANOVA using R	
18.	Two way ANOVA using R	
	Total Hours	**60**
Text Book		
1.	Daves, T. M. (2016). The Book of R – A First Course in Programming and Statistics. William Pollock Publisher.	
Reference Books		
1.	Verzani, J. (2018). simpleR – Using R for Introductory Statistics.	
2.	Matloff, N. (2011). The Art of R Programming. No Starch Press	

Course Code	Course Name	Category	Hours / Week	Credits
24BMA26A	Statistics - II	Allied– II	4	3

Course Objectives

The Course intends to cover

- Mathematical aspects of applied statistic.
- The essential skills required to comprehend concepts related to estimation, hypothesis testing, sampling methods, and experimental design.
- Solutions to real-world problems using statistical applications.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Remember the parameters of population and sample.	K1
CLO2	Understand the tests of significance.	K2
CLO3	Apply the concepts of test of hypothesis and relate to real life situations to test if there is a statistical significance between two groups.	K3
CLO4	Apply the concepts of theory of estimation to monitor productive quality in industries.	K3
CLO5	Analyze different estimations and distributions to solve simple practical problems like image processing and signal processing.	K4
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze		

CLO – PLO Mapping

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

Allied II: Statistics-II

Unit	Content	No. of Hours
I	Large sample theory - types of sampling - parameter and statistic - tests of Significance - procedure for testing of hypothesis.	12
II	Tests of significance for large samples – sampling of attributes - sampling of variables	12
III	Exact Sampling Distributions I & II – Introduction to Student's t- distribution- t-test for single mean - t-test for difference of means - F-Distribution - F- test for equality of two population variances - Goodness of fit test- Test of Independence of attributes - contingency Tables.	12
IV	Theory of estimation –Introduction to characteristics of estimators.	12
V	Methods of Estimation- Confidence Interval and Confidence Limits.	12
	Total Hours	**60**
Text Book		
1.	S.C. Gupta, V.K. Kapoor, (2020). Fundamental of Mathematical Statistics (Ed.12) S. Chand and Company Ltd, New Delhi. Unit I: Chapter 14 : Section : 14.1-14.5 Unit II: Chapter 14: Section : 14.6-14.8 Unit III: Chapter 16: Section : 16.1,16.2, 16.31,16.3.2, 16.5,16.6.1 Chapter 15: Section : 15.1,15.6.2,15.6.3 Unit IV: Chapter 17: Section : 17.1,17.2 Unit V: Chapter 17: Section : 17.6,17.7	
Reference Books		
1.	S.P. Gupta (2011). Statistical Methods, Sultan Chand & Sons, New Delhi.	
2.	C.B. Gupta (2004). An Introduction To Statistical Methods, Vikas Publishing House Pvt., Ltd.	
Web Resources (Swayam / NPTEL)		
1.	https://onlinecourses.nptel.ac.in/noc21_ma74/preview	

*** Statistical Table shall be provided for ESE**

***Question paper to be set with 10% theory and 90% problems**

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
			Actual	Weightage	Actual	Weightage	Weightage	Actual	Weightage			
100	25	75	50	**5**	50	**5**	**5**	75	**10**	**5**	**5**	**25**

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
			Actual	Weightage	Actual	Weightage	Actual	Weightage		
100	40	60	50	**10**	50	**10**	60	**15**	**5**	**40**

Examination Pattern

Component	Duration in Hours	No. of Experiments	Marks			Weightage
			Practical	Record	Total	
Test - I	1	1	50	-	50	10
Test - II	1	1	50	-	50	10
Model	3	2	60	-	60	15
ESE	3	2	50	10	60	-

Part – IV : Foundation Course

(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
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 Hours	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	
IV	**Problem-Solving :Do's and Don'ts:** Grammar: Modal verbs; Vocabulary & Speaking: Role play; Listening: Holidays in January; Reading & Writing: Article reading & answering. **Body:** Grammar: First conditional; Vocabulary & Speaking: Personality & Appearance; Listening: Listen to conversations about personality; Reading & Writing: Read and Answer about your skills. **Speed:** Grammar: Present simple passive; Vocabulary & Speaking: Talk about relationships; Listening: Listen & Answer; Reading & Writing: Error spotting. **Work:** Grammar: Adverbs of manner; Vocabulary & Speaking: Talk about work advice; Listening: Observe & Answer; Reading: Read & check your ideas	6
V	**Critical Thinking : Influence:** Grammar: would / past habits; Listening: Sentence Correction; Speaking & Vocabulary: Your inspiration; Reading: Picture description; Writing: Rewrite the sentences. **Money:** Grammar: Second conditional; Listening: radio programme; Speaking & Vocabulary: Talk about games; Reading & Writing: Fill in the blanks. **Things that changed the world:** Grammar: articles; Speaking & Listening: Talk about chewing gum; Reading & Writing: Read and write a book review	6
	Total Hours	**30**

Components for and Distribution of Marks for ESE (Theory)

Ability Enhancement Compulsory Course(AECC)

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

Semester-3

Semester – 3									
Course Code	**Part**	**Course Category**	**Course Name**	**Hours / Week**	**Examination**				**Credits**
					Duration in Hours	**Max Marks**			
						CIA	**ESA**	**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
24BMA33C	III	Core-V	Differential Equations and Laplace Transforms	6	3	25	75	100	4
24BMA34C	III	Core-VI	Statics	6	3	25	75	100	4
24BMA35P	III	Core Lab -III	Octave Programming	4	3	40	60	100	2
24BMA36A	III	Allied-III	Principles of Information Technology	4	3	25	75	100	3
24BMA37P	III	SEC-I	3D Visualization in Geogebra	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 - I

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: 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
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

Depart

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

Course Objectives

The course intends to

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

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 Objectives

The course intends

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

Course Learning Outcomes

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

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

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		

2.	Yves Loiseau, Régine Merieux (2009), Latitudes 1, Publisher: French and European Publications Inc.

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

Course Objectives

The course intends to cover

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

Course Learning Outcomes

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

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

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
24BMA33C	Differential Equations and Laplace Transforms	Core - V	6	4

Course Objectives

The Course intends to cover

- Methods to solve first, second and higher-order linear differential equations with constant coefficients.
- Partial differential equations and to solve through direct integration and other standard methods.
- Definition and fundamental properties of Laplace transforms to solve first order and second order differential equations with constant coefficients.
-

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Remember the methods used to solve first order differential equations.	K1
CLO2	Understand the methods to solve higher order linear ordinary differential equations.	K2
CLO3	Describe the standard methods to solve first-order PDEs and lagrange's linear equations.	K2
CLO4	Solve problems involving Laplace transforms of standard functions using linearity and the first shifting theorem.	K3
CLO5	Apply the concepts of laplace transforms and inverse laplace transforms to solve ODE with constant coefficients	K3
K1 - Remember; **K2** - Understand; **K3** – Apply		

CLO – PLO Mapping

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

Core - V: Differential Equations and Laplace Transforms

Unit	Content	No. of Hours
I	**Equations of the first order and of degree higher than one:** Equations solvable for p, x, y -Clairaut's Equation-Extended form of Clairaut's equation. **Applications of first order equations:** Growth, Decay and Chemical reactions.	18
II	**Linear equations of second and higher order:** Linear equations-Linear equations with constants co-efficient - Auxiliary equation with complex roots, Equal roots- Determination of a particular integral. **Simultaneous equations:** Simultaneous differential equations with constant co-efficient.	18
III	**Partial differential equations:** Formation of differential equations by eliminating arbitrary constants, arbitrary functions-Solution of partial differential equations by direct integration – Methods to solve the first order partial differential equations-Equations reducible to standard forms.	18
IV	**Laplace transforms:** Definition- Linearity Properties of Laplace and Inverse Laplace Transform-Laplace Transforms of some elementary functions and Special Function-Properties of Laplace Transform.	18
V	**Inverse Laplace transforms:** Inverse Laplace transforms- -Laplace transforms of derivatives and integrals-Initial value and Final value Theorem-The Convolution-Solution of Differential and Integral Equations.	18
	Total Hours	**90**

Text Books	
1	P.Kandasamy (2022), K.Thilagavathi , "Mathematics for B.Sc - Branch - I Volume III" (S. Chand and Company Ltd, New Delhi). Unit I: Chapter: I Page no: 1-15
2	S.Narayanan (2003), T.K. Manicavachagom Pillay," Differential Equations and its Applications", (S. Viswanathan Printers & Publishers PVT., LTD). Unit I: Chapter: III Page no : 29-37
3	P.Kandasamy (2022), K.Thilagavathi, "Mathematics for B. Sc – Branch - I Volume III", (S. Chand and Company Ltd, New Delhi). Unit II: Chapter: II Page no: 16-46 Chapter: III Page no: 41-46 Unit III: Chapter: I Page no: 117-149
4	T.Veerarajan (2020), "Differential Equations and Laplace Transforms", Yes Due Publishing Pvt. Ltd, Chennai. Unit IV: Chapter 5: Page no: 209-256. Unit V: Chapter 5: Page no: 302-375.
Reference Books	
1	S.Narayanan(1991), T. K Manickavasagam Pillai, "Calculus Volume III" (S.Viswanathan Printers and Publishers Pvt. Ltd, Chennai).
2	N.P .Bali (2004)," Differential Equations" (Laxmi Publication Ltd, New Delhi).
3	Shanthi Narayanan (2014), J.N Kapoor. " A Text book of Calculus", S. Chand & Co.,
Web Resources (Swayam / NPTEL)	
1	https://nptel.ac.in/courses/111105035/
2	http://www.nptelvideos.in/2012/11/mathematics-iii.html

Course Code	Course Name	Category	Hours / Week	Credits
24BMA34C	Statics	Core-VI	6	4

Course Objectives

The Course intends to cover

- The nature of forces and their resultant when more than one force acts on a particle.
- The conditions of equilibrium of couples and coplanar forces.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Recall the fundamental laws and theorems related to forces acting at a point.	K1
CLO2	Understand the concepts of forces and moments.	K2
CLO3	Discuss the concepts of equilibrium and moment of force.	K2
CLO4	Explain the theoretical concept involving couples and the equilibrium of three forces.	K2
CLO5	Demonstrate the basics of coplanar forces, equilibrium of forces acting on a rigid body and solve the problems.	K3
K1 - Remember; **K2** - Understand; **K3** - Apply		

CLO – PLO Mapping

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

Core-VI: Statics

Unit	Details	No. of Hours
I	**Law of Forces:** Forces acting at a point , Parallelogram law, Analytical expression for resultant of two forces acting at a point, Triangle law, Perpendicular triangle law of forces, Converse of triangle law, Polygon law of forces, Lami's theorem, Extended form of parallelogram law of forces.	18
II	**Resolution and Components of Forces** : Resolution of forces, Components of a force , Theorem on resolves parts, Resultant of any number of coplanar forces acting at a point (Graphical and Analytical methods) ,Conditions of equilibrium.	18
III	**Parallel Forces and Moments** : Resultant of two parallel forces (like and unlike), Conditions of equilibrium of three coplanar forces, Moment of a force, Geometrical representation, Sign of the moment, Unit of moment, Varignon's theorem on couples, Generalized theorem of moments, Moment of a force about an axis.	18
IV	**Couples & Equilibrium of Three Forces Acting on a Rigid Body** : Equilibrium of two couples, Equivalence of two couples, Couples in parallel planes theorem, Representation of couple by a vector, Resultant of couple and force theorem, Coplanar forces acting on a rigid body, Theorem on three coplanar forces in equilibrium, Two trigonometrical theorems.	18
V	**Coplanar Forces** : Reduction of a system of coplanar forces to a single force and a couple, Reduction of any number of coplanar forces, Equation to the line of action of the resultant, Necessary & Sufficient conditions of equilibrium, Solutions of problems.	18
	Total Hours	**90**

Text Book

1	M.K.Venkataraman (2011) , "Statics" , 14th Edition , Agasthiar Publications Unit I: Chapter 2 : Section : 1-10 Unit II: Chapter 2: Section : 11-16 Unit III: Chapter 3: Section : 1-3,5,7,9-14 Unit IV: Chapter 4: Section : 1-7 Chapter 5: Section : 1-3,5 Unit V: Chapter 6: Section : 1-3,5-13

Reference Books

1	A.V.Dharmapadam (2009) ."Statics" , S.Viswanathan Printers and Publishing Pvt., Ltd.
2	P.Duraipandian and Laxmi Duraipandian (1985) , "Mechanics".S.Chand and Company Ltd, Ram Nagar, New Delhi .

Web Resources (Swayam / NPTEL)

1.	https://nptel.ac.in/courses/111107118

Core Lab III: Octave Programming

Course Code	Course Name	Category	Hours / Week	Credits
24BMA35P	Octave Programming	Core Lab –III	4	2

S. No.	List of Practical Programs	
Introduction to Octave Programming.		
Write the program on		
1	Finding the basic arithmetic operations	
2	Computing the factorial of a number	
3	Generate the Fibonacci sequence up to n terms	
4	To perform matrix operation for 3 x 3 matrix	
5	Solving linear equations with three variables	
6	To find roots of a given polynomial of degree 4	
7	Solving numerical integration in trapezoidal rule	
8	Solving ordinary differential equations for second order	
9	To fit a straight line using least-squares method	
10	To find mean, median and mode of discrete type	
11	To calculate variance and standard deviation of discrete type	
12	To visualize the distribution of data using histogram	
13	Calculate the correlation coefficient between two datasets	
14	Simulate discrete time system	
15	To compute percentiles and quantiles of the given dataset	
16	Finding the Fourier transform of the given signal processing	
	Total Hours	**60**
Text Book		
1	Jesper Schmidt Hansen(2011) ,GNU Octave, Packt Publishing.	
Reference Book		
1	John W. Eaton, David Bateman ,Søren Hauberg ,Rik Wehbring ,(2025) GNU Octave, published by the Free Software Foundation, USA	
Web Resources		
1	https://onlinecourses.nptel.ac.in/noc22_me58	

Course Code	Course Name	Category	Hours / Week	Credits
24BMA36A	Principles of Information Technology	Allied -III	4	3

Course Objectives

The Course intends to cover

- The Basic Concepts in Information Technology
- Adaptability to emerging technologies used in the global marketplace.
- The implementation of personal and interpersonal skills.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Remember the Basics of Computers.	K1
CLO2	Understand the Operating System Concepts.	K2
CLO3	Understand the Fundamentals of Databases and Database Users	K2
CLO4	Comprehend basic concepts of telecommunication systems to real-world communication scenarios.	K2
CLO5	Interpret Virtual Reality (VR) technologies to build basic immersive environments.	K2
K1 - Remember; **K2** - Understand;		

CLO – PLO Mapping

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

Allied III: Principles of Information Technology

Unit	Details	No. of Hours
I	**Introduction to Computer :** Computer Basics- Algorithm- Simple model of Computer- Characteristics of Computer- Programming Language-Internet and World wide web	12
II	**Operating System Concepts :** Operating System Structures-Process Management-Memory Management-Storage Management-I/O System.	12
III	**Databases and Database Users :** Introduction-Characteristics of the Database Approach-Advantages of using the DBMS Approach. **Database System Concepts and Architecture :** Data Models, Schemas and Instances-Three schema Architecture and Data Independence-Database Languages and Interfaces- The Database System Environment- Centralized and Client/Server Architectures for DBMSs.	12
IV	**Telecommunication :** Telecommunication- Telecommunication Will Touch Everybody- Introductory Topics in Telecommunications- Quality of Service Standardization in Telecommunications. **Networks :** Local Area Networks (LAN) - Wide Area Network (WAN) - Metropolitan Area Network (MAN).	12
V	**Multimedia :** Introduction to Multimedia-Components of Multimedia- Multimedia: Past and Present- Multimedia software tools- Multimedia in the future. **Virtual Reality :** Introduction-Virtual Reality-Modern VR Experiences-Hardware-Software.	12
	Total Hours	**60**
Text Books		
1	Neeharika Adabala and V. Rajaraman(2014), Fundamentals of Computers. 6th edition, PHI Learning publication Unit I : Chapters 1: Section:1.1- 1.3, 9.1-9.4 and 13.6	
2	Abraham Silberschtz, Peter B.Galvin and Greg Gagne (2009), Operating System Concepts, 8th Edition, John Wiley & Sons, Inc., Publication. Unit II: Chapters: 2,3,8,12 and 13	
3	Ramez Elmasri and Shamkant B. Navathe (2017), Fundamentals of Database Systems, 7th Edition, Pearson India. Unit III: Chapter 1: Section: 1.1,1.3,1.6 Chapter 2: Section: 2.1-2.5	
4	Roger L.Freemn (2005),Fundamentals of Telecommunications, 2nd Edition, John Wiley & Sons, Inc., Publication. Unit IV: Chapter 1: Section: 1.1 – 1.5 Chapter 11: Section: 11.2 Chapter 12: Section: 12.1 Chapter 13: Section: 13.1	
5	Ze-Nian Li and Mark S.Drew (2004), Fundamentals of Multimedia, Pearson Education International. Unit V: Chapter 1: Section: 1.1 – 1.4 Steven M.Lavalle (2019), "Virtul Reality", Vikas Publishing House Pvt. Ltd. Unit V: Chapter 1: Section: 1.1-1.2 Chapter 2: Section: 2.1-2.2	

Reference Books	
1	Alexis Leon And Mathews Leon (2009), Fundamentals of Information Technology, Vikas Publishing House Pvt. Ltd.
2	Henry C. Lucas, Jr.(1999),Information Technology for Management, McGraw Hill (Part-III).
Web Resources (Swayam / NPTEL)	
1	https://onlinecourses.swayam2.ac.in/ini25_cs01/preview

SEC I: 3D Visualization using Geogebra

Course Code	Course Name	Category	Hours / Week	Credits
24BMA37P	3D Visualization using Geogebra	SEC-I	2	2

S. No.	List of Practical Programs	
1	Basic operations in Geogebra.	
2	Find the equation of the plane passing through three points.	
3	Find the angle between the given planes.	
4	Develop a program to find the non-symmetric form of equation of line	
5	Draw a sphere for the given centre and radius value.	
6	Create a program to check whether the given lines are skew or coplanar.	
7	Create a program to find the reflection of the given plane about any point.	
8	Find the centre and radius of the circle of intersection of the given sphere and the plane.	
9	Solve a given differential equation and plot its solution graphically by using the concept of Geogebra.	
10	Write a program to visualise 3D solid shapes for a given measurement.	
	Total Hours	**30**
Text Book		
1	Nivetha Martin., N.Ramila Gandhi., P.Pandiammal, (2023)"Planes in Geogebra", SK Research Group of Companies. Madurai.	
Reference Book		
1	Steve Phelps, (2015)Introduction to GeoGebra,,GeoGebra Institute of Ohio, Madeira High School, University of Cincinnali	
Web Resources (Swayam / NPTEL)		
https://onlinecourses.swayam2.ac.in/aic20_sp61		

Part – IV Foundation Courses

(All the Undergraduate Programmes)

Course Code	Course Name	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(IKS)-** Introduction - The Indian S & T Heritage - Metals and Metalworking Technology - Lost wax casting of Idols and Artefacts - Literary sources for Science and Technology - Technology in Ancient India - Significant Science and Technology Discovery in Ancient India - Council of Scientific and Industrial Research - Animal Science in Ancient India - Biodiversity and folk traditions.
5	**History of Trade and Commerce in Ancient India** - Introduction - Indigenous Banking System - Rise of Intermediaries - Transport - Major Trade Centres - Major Exports and Imports - Position of Indian Subcontinent in World Economy.
6	**Indigenous Agriculture and IKS** - Introduction - History of Indian Agriculture - Indigenous Knowledge - Organic Farming and Natural Fertilization - Mixed Cropping and Crop Rotation - Ecological and Socioeconomic Impacts of Indigenous Farming - Challenges and Future Directions.

Unit	Content
7	**Traditional Water Management Systems of India** - Introduction - Methodology - Traditional Water Management Systems - Northern Region - North Western Region - North Eastern Region - Central Indian Region - Southern Indian Region.
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
			Actual	Weightage	Actual	Weightage			
100	25	75	50	**5**	75	**10**	**5**	**5**	**25**

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
			Actual	Weightage	Actual	Weightage	Marks		
100	40	60	50	**10**	60	**15**	**10**	**5**	**40**

Examination Pattern

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

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

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

* FC-III – Indian Knowledge Systems – 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 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
24BMA43C	III	Core - VII	Dynamics	5	3	25	75	100	4
24BMA44C	III	Core - VIII	Programming in C	5	3	25	75	100	4
24BMA45P	III	Core Lab - IV	**Lab:**Programming in C Lab	4	3	40	60	100	2
24BMA46A	III	Allied - IV	Introduction to Web Technology	4	3	25	75	100	3
24BMA47P	III	SEC - II	**Lab:** SageMath Lab	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 & Co-Curricular	Liberal Arts	-	2	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

Course Code	Course Name	Category	Hours / Week	Credits
24BMA43C	Dynamics	Core - VII	5	4

Course Objectives:

The course intends to cover

- The principles of projectile motion, impulsive forces, collisions, Simple Harmonic Motions (SHM), and central force motion using mathematical models.
- The conservation laws and differential equations to solve problems involving motion, impact, energy loss, and orbital dynamics.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Understand the basic principles of projectile motions	K2
CLO2	Understand impulse, impact, and collisions using Newton's law and conservation of momentum.	K2
CLO3	Apply Newton's law and momentum principles to analyze direct and oblique impacts of smooth spheres and compute loss of kinetic energy.	K3
CLO4	Solve for displacement, period, and force in SHM, and analyze the composition of two SHMs.	K3
CLO5	Apply orbital paths and velocities in central force motion using polar and pedal equations.	K3
K2 – Understand; **K3 -** Apply		

CLO – PLO Mapping

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

Core Paper VII: Dynamics

Unit	Content	No. of Hours
I	**Projectiles**: Definitions – two fundamental principles – path of a projectile – characteristics of the motion of a projectile – projection of a particle at a certain height above the ground- maximum horizontal range –determine two possible directions of projection - range on an inclined plane.	15
II	**Impulsive forces:** Impulse - impulsive force –impact of two bodies – loss of kinetic energy in impact – impact of water on a surface. **Collision of elastic bodies**: Definitions - newton's experimental law – motion of two smooth bodies perpendicular to the line of impact – principle of conservation of momentum –impact of a smooth sphere on a fixed smooth plane.	15
III	**Collision of elastic bodies(continuous)** : Direct impact of two smooth spheres - loss of kinetic energy due to direct impact of two smooth spheres - oblique impact of two smooth spheres- loss of kinetic energy during oblique impact of two smooth spheres – dissipation of energy due to impact	15
IV	**Simple Harmonic Motion:** Simple Harmonic Motion in a straight line – amplitude, periodic time - general solution of the SHM equation – geometrical representation of a SHM – change of origin – composition of two simple harmonic motions of the same period and in the same straight line – composition of two simple harmonic motions of the same period in two perpendicular directions – force necessary to produce SHM	15
V	**Motion under the action of central forces:** Velocity and acceleration in polar coordinates – equation of motion in polar coordinates – equiangular spiral- motion under a central force –differential equation of central orbits –perpendicular from the pole on the tangent – pedal equation of the central orbit- velocities in a central orbit	15
	Total Hours	**75**
Text Book		
1	Dr.Venkataraman.M.K (2015), Dynamics, Agasthiar Publications, Trichy, 17th edition. Unit I : Chapter 6 Section – 6.2-6.8, 6.12 Unit II : Chapter 7 Section – 7.1- 7.6, 8.2-8.4 Unit III : Chapter 8 Section – 8.5 - 8.9 Unit IV : Chapter 10 Section – 10.2-10.8 Unit V : Chapter 11 Section – 11.2 -11.8, 11.10	
Reference Books		
1	Dharamapadam.A.V (2013), Dynamics, S.Viswanatham Printers and Publishers, Chennai.	
2	Viswanatha Naik.K and Kasi.M.S (1992), Dynamics, Emerald Publishers.	
Web Resources (Swayam / NPTEL)		
1	https://onlinecourses.nptel.ac.in/noc25_me176/preview	

Course Code	Course Name	Category	Hours / Week	Credits
24BMA44C	Programming in C	Core - VIII	5	4

Course Objectives:

This course intends to cover

- The fundamentals of C programming.
- The ability to design and implement programs.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Learn the fundamental concepts, constants, variables, and data types of C programming.	K1
CLO2	Understand the operators, expressions with Mathematical functions	K2
CLO3	Understand the input / output operations, program flow and decision-making statements.	K2
CLO4	Apply the concepts of arrays and strings to solve computational problems.	K3
CLO5	Apply the concept of function to design programs	K3
K1 - Remember; **K2 -** Understand; **K3 -** Apply		

CLO – PLO Mapping

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

Core Theory –VIII: Programming in C

Unit	Content	No. of Hours
I	**Constants, Variables, and Data Types:** Introduction- character set- C tokens- keywords and identifiers- constants- variables- data types- declaration of variables- declaration of storage class- assigning values to variables- defining symbolic constants- declaring a variable as constant- declaring a variable as volatile-overflow and underflow of data.	15
II	**Operators:** Introduction-arithmetic operators- relational operators- logical operators- assignment operators- increment and decrement operators- conditional operators- bitwise operators- special operators. **Arithmetic Expressions:** Evaluation of expressions-precedence of arithmetic operators- some computational problems- type conversions in expressions- operator precedence and associativity- mathematical functions.	15
III	**Managing Input and Output Operations:** Introduction- reading a character- writing a character- formatted input- formatted output. **Decision Making and Looping:** Introduction- decision making with if statement- simple if statement- if else statement- nesting if else statement- else if ladder- switch statement- conditional operator- goto statement- while statement- do statement- while do statement- for statement- jumps in loops.	15
IV	**Arrays and Strings:** Introduction- one-dimensional arrays- declaration - initialization - two-dimensional arrays- initialization - multi- dimensional arrays. declaring and initializing string variables- reading strings from terminal- writing strings to screen- arithmetic operations on characters.	15
V	**Functions and Pointers:** Introduction-need for user-defined functions- a multi-function program- elements of user-defined functions- definition of functions- return values and their types- function calls- function declaration- category of functions. Understanding pointers- accessing the address of a variable- declaring pointer variables- initialization of pointer variables- accessing a variable through its pointer.	15
	Total Hours	**75**
Text Book		
1.	Balagurusamy.E (2024), Programming in ANSI C, 9th Edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi.	
Reference Books		
1.	Ashok N.Kamthane (2003), Object Oriented Programming with ANSI and Turbo C, Pearson Education Publishers.	
2.	Herbert Schildt (2000), The Complete Reference C, 4th Edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi.	
Web Resources (Swayam / NPTEL)		
1.	https://onlinecourses.nptel.ac.in/noc25_cs114/	
2.	https://onlinecourses.swayam2.ac.in/imb25_mg158/preview	

Core Lab - IV: Programming in C

Course Code	Course Name	Category	Hours / Week	Credits
24BMA45P	Programming in C Lab	Core Lab - IV	4	2

S. No.	List of Practical Programs	
1.	Find the factorial of a given integer.	
2.	Print the fibonacci sequence up to n terms.	
3.	Test whether a number is prime or not.	
4.	Print all possible roots for a given quadratic equation.	
5.	Determine the sum of the first n terms of an arithmetic progression.	
6.	Compute the sum of the first n terms of a geometric progression.	
7.	Find the product of two matrices.	
8.	Sort a set of numbers.	
9.	Sort the given set of names.	
10.	Evaluate the determinant of a 2×2 matrix.	
11.	Find the eigenvalues of a 2×2 matrix.	
12.	Approximate the root of an equation using the bisection method.	
13.	Perform numerical integration using Simpson's 1/3 rule.	
14.	Calculate the mean and median of a given set of values.	
15.	Find the variance and standard deviation of a given data.	
16.	Fit a straight line to data using least squares regression.	
	Total Hours	**60**
Text Book		
1.	Balagurusamy.E (2024), Programming in ANSI C, 9th Edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi.	
Reference Books		
1.	Ashok N.Kamthane (2003), Programming with ANSI and Turbo C, Pearson Education Publishers.	
2.	Herbert Schildt (2000), The Complete Reference C, 4th Edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi.	
Web Resources (Swayam / NPTEL)		
1.	https://onlinecourses.nptel.ac.in/noc25_cs114/	
2.	https://onlinecourses.swayam2.ac.in/imb25_mg158/preview	

Course code	Course Name	Category	Hours / Week	Credits
24BMA46A	Introduction to Web Technology	Allied-IV	4	3

Course Objectives

The course intends to cover

- The fundamentals of the Internet, WWW, protocols, and client–server architecture.
- The application of HTML5 and CSS
- The Interactive web applications using JavaScript
- The Integrate advanced styling and scripting concepts

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 the Internet, WWW, protocols, and client–server concepts.	K1
CLO2	Understand the basic concept of HTML.	K2
CLO3	Understand the structured and semantic web pages using HTML5 elements	K2
CLO4	Apply CSS properties to design and style responsive and visually appealing web pages.	K3
CLO5	Apply interactive web applications using JavaScript for events, DOM manipulation, and form validation.	K3
K1 - Remember; **K2** - Understand; **K3** - Apply		

CLO – PLO Mapping

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

Allied - IV: Introduction to Web Technology

Unit	Content	No. of Hours
I	**Introduction to Web Concepts:** History and Evolution of Internet – ARPANET, World Wide Web, Web 1.0 to Web 3.0. Web architecture – clients, servers, requests, and responses. Protocols – HTTP, HTTPS, FTP, SMTP, IMAP, POP3. Domain Name System (DNS) – Domain names, IP addresses, URL structure. Browsers and search engines – components of a browser, rendering engine, and examples. Types of websites – static vs dynamic, single page applications, responsive websites. Overview of Web development stack – client-side technologies vs server-side technologies.	12
II	**HTML Fundamentals:** Structure of an HTML document (DOCTYPE, <html>, <head>, <body>) - headings, paragraphs, line breaks, text formatting tags – hyperlinks – absolute, relative, internal links - lists – ordered, unordered, definition lists - Tables – rows, columns, table headings, spanning rows & columns - Images – inserting and formatting with attributes - multimedia basics – <audio> and <video> tags.	12
III	**HTML Forms & Semantic Tags:** Forms: <form>, input types (text, password, checkbox, radio, dropdown, textarea, button, file upload) - Labels, fieldsets, legends, submit & reset buttons - Semantic elements – <header>, <footer>, <section>, <article>, <aside>, <nav> - Block-level vs Inline elements - Iframes and embedding content - introduction to canvas and simple graphics in HTML5.	12
IV	**CSS Fundamentals:** Introduction to CSS – role and importance - methods of adding CSS – inline, internal, external - Selectors – element, class, id, group selectors - colors and Backgrounds – basic color values (name, hex, rgb) - text and font styling – font family, size, style, alignment - The box model – margin, padding, border, content - basic page layout – simple positioning (static, relative, absolute).	12
V	**JavaScript Basics:** Introduction to JavaScript – embedding in HTML, console output - Variables and data types – numbers, strings, booleans - operators – arithmetic, relational, logical, assignment - control structures – if, if-else, switch - loops – for, while, do-while - functions – declaration, parameters, return values - events – on click, on mouse over, on change, on load - introduction to DOM – get Element By Id, changing text and styles.	12
	Total Hours	**60**

Text Books

1.	Kogent Learning Solutions Inc. (2011). Web technologies: HTML, CSS, JavaScript, PHP, XML, ASP.NET, JSP. Dream tech Press.

Reference Books

1.	Duckett, J. (2014). HTML and CSS: Design and build websites. John Wiley & Sons.
2.	Duckett, J. (2015). JavaScript and jQuery: Interactive front-end web development. John Wiley & Sons.

Web Resources (Swayam / NPTEL)

1.	https://onlinecourses.swayam2.ac.in/aic20_sp11/preview

SEC II: SageMath Lab

Course Code	Course Name	Category	Hours / Week	Credits
24BMA47P	SageMath Lab	SEC-II	2	2

S. No.	List of Practical Programs	
1.	Test factor polynomials over Q, R and finite fields is Irreducibility.	
2.	Explore the structure of S4 and D8 in terms of their subgroups, orders and cosets.	
3.	Study Eigen values, diagonalizability, SVD and condition numbers.	
4.	Numerically investigate limits and classify discontinuities of functions.	
5.	Display the taylor polynomial, the approximation, the true value, the numerical error, and the error bound.	
6.	Evaluate double integrals and apply change of variables using Jacobians.	
7.	Explore first- and second-order ordinary differential equations.	
8.	Analyze linear and nonlinear planar dynamical systems.	
9.	Compare root-finding methods for a nonlinear equation.	
10.	Formulate and solve a linear programming problem.	
	Total Hours	**30**
Text Book		
1.	Paul Zimmerman (2019), Computational Mathematics with SageMath, SIAM.	
Reference Book		
1.	Razvan A Mezei, (2015), An Introduction to SAGE Programming: With Application to SAGE Interacts for Numerical Methods, Wiley.	
Web Resources (Swayam / NPTEL)		
1	https://onlinecourses.nptel.ac.in/noc22_ma24/preview	

Course Code	Course Name	Category	Hours / Week	Credits
24IDT4AE	**Innovation & Design Thinking**	**AECC - IV**	**2**	2

Course Objectives

The Course intends to cover

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

Course Learning Outcomes

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

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

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

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

Course Code	Course Name	Category	Hours/Week	Credits
24IPR4AE	Intellectual Property Rights	AECC - IV	2	2

Course Objectives

This course intends to cover

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

Course Learning Outcomes

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

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

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
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyse		

Ability Enhancement Compulsory Course – IV : Entrepreneurship Development

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

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 V

Semester – 5									
Course Code	**Part**	**Course Category**	**Course Name**	**Hours / Week**	**Examination**				**Credits**
					Duration in Hours	**Max Marks**			
						CIA	**ESE**	**Total**	
24BMA51C	III	Core-IX	Mathematical Analysis	6	3	25	75	100	4
24BMA52C	III	Core-X	Complex Analysis-I	5	3	25	75	100	4
24BMA53C	III	Core-XI	Modern Algebra - I	5	3	25	75	100	4
24BMA54C	III	Core-XII	Discrete Mathematical Structures	5	3	25	75	100	4
24BMA55P	III	Core Lab –V	Lab: Data Analytics using Python	4	3	40	60	100	2
24BMA5AE	III	Elective I	Numerical Methods- **(Applied Mathematics)**	5	3	25	75	100	3
24BMA5BE			Astronomy-I **(Astrophysics)**						
24BMA5CE			Probability and Queuing Theory **(Probability Theory)**						
24BMA56I	III	SEC-III	Internship	-	-	50	-	50	2
Total				**30**				**650**	**23**

Course Code	Course Name	Category	Hours / Week	Credits
24BMA51C	Mathematical Analysis	Core – IX	6	4

Course Objectives

The course intends to cover

- The fundamental ideas of the real and complex number systems, along with the basics of set theory and point-set topology.
- The limits, continuity, connectedness, and uniform continuity of functions defined on metric spaces.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Recall and understand the fundamental properties and axioms of the real number system.	K1, K2
CLO2	Understand the fundamental concepts of set theory and functions.	K2
CLO3	Understand the concepts of point set topology including open and closed sets in R^n	K2
CLO4	Apply the concepts of limits and continuity to analyze properties of functions.	K3
CLO5	Analyze the properties of connectedness, uniform continuity, and fixed point results in metric spaces.	K4
K1 - Remember; **K2 -** Understand; **K3 –** Apply; **K4** – Analyze		

CLO - PLO Mapping

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

Core IX: Mathematical Analysis

Unit	Content	No. of Hours
I	**Real and Complex Number System** : The Field Axioms - The Order Axioms – Integers – Unique Factorization Theorem for Integers – Rational Numbers –Irrational Numbers – Upper Bounds, Maximum Elements, Least Upper Bound –The Completeness Axiom – Some Properties of the Supremum –Properties of the Integers Deduced from the Completeness Axiom- The Archimedean Property of the Real Number System –Rational Numbers with Finite Decimal Representation of Real Numbers – Absolute Values and the Triangle Inequality – The Cauchy-Schwarz Inequality – Plus and Minus Infinity and the Extended Real Number System	18
II	**Some Basic Notions of Set Theory** : Notations – Ordered Pairs –Cartesian Product of Two Sets – Relations and Functions – Further Terminology Concerning Functions –One–One Functions and Inverse – Composite Functions – Sequences – Similar Sets-Finite and Infinite Sets – Countable and Uncountable Sets – Uncountability of the Real Number System – Set Algebra – Countable Collection of Countable Sets	18
III	**Elements of Point Set Topology**: Euclidean Space R^n – Open Balls and Open Sets in R^n- The Structure of Open Sets in R^n – Closed Sets – Adherent and Accumulation Points - Closed Sets and Adherent Points–The Cantor Intersection Theorem –The Lindelof Covering Theorem	18
IV	**Limits and Continuity :** Examples of Continuous Function - Continuity and Inverse Images of Open or Closed Sets – Functions Continuous on Compact Sets –Topological Mappings –Bolzano's Theorem	18
V	**Limits and Continuity :** Connectedness - Components of a Metric Space – Uniform Continuity - Uniform Continuity and Compact Sets – Fixed Point Theorem for Contractions – Monotonic Functions- Convergence of Reinforcement Learning Algorithms using Contraction Mappings.	18
	Total Hours	**90**

Text Books

1.	T.M.Apostol (2024), "Mathematical Analysis", Narosa Publishing Company, Chennai, 2nd edition. Unit I: Chapter 1 Sections 1.2-1.15, 1.18-1.20 Unit II: Chapter 2 Sections 2.2 to 2.15 Unit III: Chapter 3 Sections 3.2 to 3.10 Unit IV: Chapter 4 Sections 4.11 to 4.15 Unit V: Chapter 4 Sections 4.16, 4.17, 4.19 - 4.21, 4.23.

Reference Books

1.	R.R.Goldberg (2024), "Methods of Real Analysis", John Wiley, New York, 2nd edition.
2.	H.G.Eggleston (2008), "Elementary Real Analysis", Cambridge University Press.

Web Resources (SWAYAM/NPTEL)

1.	https://nptel.ac.in/courses/111106142
2.	https://www.mdpi.com/2073-8994/17/5/750

Course Code	Course Name	Category	Hours / Week	Credits
24BMA52C	Complex Analysis - I	Core - X	5	4

Course Objectives

The course intends to cover

- The fundamental concepts of the complex number system and their representation in the complex plane.
- The understanding of complex functions, including limits, continuity, and differentiability.
- The theory of power series and their convergence properties.
- The properties of harmonic functions and their relationship with analytic functions.
- The concept of complex integration along curves in the complex plane.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Remember and recall the definition and basic properties of the complex number system.	K1
CLO2	Understand the concepts of continuity and uniform continuity of functions.	K2
CLO3	Apply the uniqueness of power series representation in solving problems involving analytic functions.	K3
CLO4	Analyze the concept of conformal mapping and its role in preserving angles in the complex plane.	K4
CLO5	Analyze the use of cauchy's integral formula and its derivative formulas for analytic functions.	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	2	2
CLO3	3	2	3	2	1
CLO4	2	1	3	3	1
CLO5	1	1	3	3	2
3-Substantial (high)		**2**-Moderate (medium)		**1**-Slight(low)	

Core X: Complex Analysis I

Unit	Content	No. of Hours
I	**Complex Number System and Complex Plane:** Complex Number System –Field of Complex Numbers–Scalar Multiplication af a Complex Number–Conjugation–Absolute Value of Complex Number–Inequalities in Terms of Moduli–Representation of a Complex Number by Points–N^{th} Roots of a Complex Number –Fixed Points.	15
II	**Analytic Functions:** Complex Functions – Limit of a Function–Continuity–Differentiability and Analyticity of Function–Necessary Conditions for Differentiability – Sufficient Conditions for Differentiability–Cauchy-Riemann Equations in Polar Coordinates.	15
III	**Power Series and Elementary Functions:** Power Series–Absolute Convergence–Uniform Convergence–Analyticity of the Sum of Power Series–Uniqueness of Representation–Elementary Functions–Exponential Functions.	15
IV	**Elementary and Conformal Mappings:** Bilinear Transformation – Transformation: $w = z^2$; $w = z^{1/2}$; $w = z + 1/z$; $w = e^z$; $w = \log z$; $w = \sin z$; $w = \cos z$; – Conformal Mapping – Examples- Conformal mapping in AI graphics	15
V	**Complex Integration:** Simple Rectifiable Oriented Curves–Integration of Complex Functions–Simple and Definite Integrals–Interior and Exterior of a Closed Curve–Simply Connected Region–Cauchy's Fundamental Theorem–Integral along an Arc Joining Two Points–Cauchy's Integral Formula and Formulas for Derivatives.	15
	Total Hours	**75**
Text Books		
1.	Duraipandian P and Kayalal Pachaiyappa, (Reprint 2022) "Complex Analysis" (For Undergraduate Students of Mathematics, Physics and Engineering), S Chand and Company Limited. Unit I: Chapter 1 Sections 1.1 to 1.3, 1.6 to 1.9 , Chapter 2 Sections 2.1,2.2,2.9,2.10 Unit II: Chapter 4 Sections 4.1 to 4.3 and 4.5 to 4.8, Unit III: Chapter 6 Sections 6.1 to 6.7 Unit IV: Chapter 6 Sections 6.12 to 6.13, Chapter 7 Sections 7.1,7.4 to 7.10 Unit V: Chapter 8 Sections 8.1 to 8.9	
Reference Books		
1.	Shanti Narayan. Dr. Mittal P.K.(2024), "Theory of functions of Complex Variable", S.Chand and Company, Meerut.	
2.	Sharma.J.N. (2019), "Functions of a complex variable", Krishna Prakashan Media.	
Web Resources (Swayam / NPTEL)		
1.	https://onlinecourses.nptel.ac.in/noc24_ma60/preview	
2.	https://onlinecourses.nptel.ac.in/noc26_me13/preview	
3.	https://dl.acm.org/doi/10.1145/2185520.2185523	

Course Code	Course Name	Category	Hours / Week	Credits
24BMA53C	Modern Algebra - I	Core - XI	5	4

Course Objectives

The course intends to cover

- The fundamental concepts of groups, rings and fields**.**
- The development of knowledge of the structure and properties of algebraic systems**.**

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Recall the fundamental concepts of groups and their properties**.**	K1
CLO2	Understand the concepts of subgroups, cyclic groups, normal subgroups, and quotient groups**.**	K2
CLO3	Apply homomorphisms, automorphisms, and Cayley's theorem.	K3
CLO4	Apply the properties of rings, integral domains, and fields in solving algebraic problems.	K3
CLO5	Apply the concepts of ideals and quotient rings and analyze their properties.	K3, K4
K1 – Remember; **K2** - Understand; **K3** - Apply; **K4** – Analyze		

CLO – PLO Mapping

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

Core XI: Modern Algebra – I

Unit	Content	No. of Hours
I	**Groups and its Basic Properties:** Groups: Abelian Group, Symmetric Group Definitions and Examples – Basic Properties.	15
II	**Subgroups and Normal Subgroups:** Subgroups – Cyclic Subgroup - Index of a Group – Order of an Element—Fermat Theorem - A Counting Principle - Normal Subgroups and Quotient Groups.	15
III	**Automorphisms:** Homomorphisms -Automorphisms – Inner Automorphism – Cayley's Theorem, and Permutation Groups- Pingala's Combinatorics and the foundations of Permutation Theory.	15
IV	**Rings:** Definition and Examples –Some Special Classes of Rings – Commutative Ring – Field – Integral Domain - Homomorphisms of Rings.	15
V	**Ideals and Quotient Rings:** Ideals and Quotient Rings – More Ideals and Quotient Rings – Maximal Ideal - The Field of Quotients of an Integral Domain.	15
	Total Hours	**75**
Text Book		
1.	I. N. Herstein (2022), *"*Topics in Algebra*"*, 2nd Edition, Wiley India Pvt. Ltd., New Delhi. Unit I: Chapter 2 Sections 2.1 to 2.3 Unit II: Chapter 2 Sections 2.4 to 2.6 Unit III: Chapter 2 Sections 2.7 to 2.10 Unit IV: Chapter 3 Sections 3.1 to 3.3 Unit V: Chapter 3 Sections 3.4 to 3.6.	
Reference Books		
1.	Surjeet Singh and Qazi Zameeruddin (2021), *"*Modern Algebra", 9th Edition, Vikas Publishing House Pvt. Ltd., New Delhi.	
2.	A.R. Vasishtha and A.K. Vasishtha (2023), *"*Modern Algebra", Krishna Prakashan Media Pvt. Ltd., Meerut.	
Web Resources (Swayam / NPTEL)		
1.	https://nptel.ac.in/courses/106/104/106104149/	
2.	https://nptel.ac.in/courses/111/106/111106113/	
3.	https://www.scribd.com/document/276461894/05-Pingala-MDS	

Course Code	Course Name	Category	Hours / Week	Credits
24BMA54C	Discrete Mathematical Structures	Core - XII	5	4

Course Objectives

The course intends to cover

- The mathematical foundations necessary to understand and construct mathematical arguments.
- The concepts of formal languages, automata, lattices, Boolean algebra, and graph theory.

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 relations and function with operations	K2
CLO2	Understand and apply the graph theory in systematic representation	K2,K3
CLO3	Apply Mathematical logics with its operations	K3
CLO4	Analyze boolean algebra in Karnaugh method and Lattices by the concept poset	K4
CLO5	Analyze formal languages using grammar and automata	K4
K2 - Understand; **K3** – Apply; **K4** – Analyze		

CLO – PLO Mapping

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

Core XII: Discrete Mathematical Structures

Unit	Content	No. of Hours
I	**Relations and Functions: Relations** and Digraphs- Introduction-Cartesian Product-Binary Relations-Set Operations on Relations- Types of Relation –Partial Order Relation-Equivalence Relation. **Functions** – Introduction –Definition and Notation– Types- Invertible Functions-Composition of Function- Identity Function.	15
II	**Graph Theory**: Basic terminology- Paths, Cycles and Connectivity- Subgraphs-Types- Isomorphic- Homeomorphic- Representation of Graphs-Eulerian and Hamiltonian Graphs- Planar Graph-Graph Colouring and Chromatic Polynomial. Trees, Binary Trees – Traversing Binary Trees	15
III	**Mathematical Logic** : Introduction-Basic Logical Operations- Statements Generated by a Set- Conditional Statements- Converse, Inverse and Contrapositive Statements- Biconditional Statements- Tauologies-Contradiction –Contingency-Argument-Method of Proof- Equilance and Implication- Quantifiers.	15
IV	**Boolean Algebra and Lattices**: Boolean Algebra, Boolean Functions, Boolean Expression – Minterm and Maxterm - Karnaugh Method - Digital AI circuits **Lattices**: Posets- Partial Ordering, Lattice.	15
V	**Formal Languages And Automata**: Language -Regular Expressions and Languages, Grammar- Finite State Machine- Finite State Automata	15
	Total Hours	**75**

Text Book	
1.	J.K.Sharma(2023), “Discrete Mathematics”, Laxmi Publications Pvt.,Ltd. Unit I **:** Chapter 3- Sections : 3.1 – 3.7 Chapter 4- Sections :4.1 -4.5 Unit II : Chapter 9 – Sections: 9.1-9.9,9.12 , Chapter 10: 10.1 – 10.3,10.6. Unit III **:** Chapter 12. Sections :12.1 -12.15 Unit III **:** Chapter 13- Sections 13.1 -13.5,13.9-13.11, Chapter 14- Sections: 14.1-14.7 Unit V : Chapter 15- Sections : 15.1-15.7.
Reference Books	
1.	J. P. Tremblay, R. Manohar (2016), “Discrete Mathematical Structures with Applications to Computer Science”, McGraw Hill International Edition.
2.	M. K. Venkataraman, N. Sridharan. & N. Chandarasekaran(2007), “Discrete Mathematics”, National Publishing Company, Chennai.
Web Resources (Swayam / NPTEL)	
1.	https://archive.nptel.ac.in/courses/111/106/111106086/
2.	https://www.allaboutcircuits.com/textbook/digital/chpt-8/karnaugh-maps-truth-tables-boolean-expressions

Core Lab V: Data Analytics using Python

Course Code	Course Name	Category	Hours / Week	Credits
24BMA55P	Lab: Data Analytics using Python	Core Lab - V	4	2

S. No.	List of Practical Programs
1	Calculation of the average of given data values.
2	Identification of the highest and lowest values in a dataset.
3	Sorting data in ascending and descending order.
4	Display of a bar chart for student marks.
5	Determination of the mean and median of mathematics marks using data analytics.
6	Analysis and visualization of a linear mathematical function.
7	Verification of convergence of a sequence.
8	Visualization of a continuous function.
9	Plotting complex numbers on the Argand plane.
10	Calculation of the modulus and argument of complex numbers.
11	Matrix multiplication, showing an application of algebraic operations in data analytics.
12	Classification of data into groups using modular arithmetic.
13	Representation of a social network using graph data and determination of the degree of each node.
14	Generation of all possible combinations of selected features.
15	Finding the root of a nonlinear equation using the Bisection Method.
16	Numerical differentiation using the Forward Difference Method.
	Total Hours **60**

Text Book

1	Agah, A. (2024), "Introduction to data science using Python", The Pennsylvania Alliance for Design of Open Textbooks.

Reference Book

1	Roch, S. (2026), "Mathematical methods in data science: Bridging theory and applications with Python", Cambridge University Press.

Web Resource

1	https://onlinecourses.nptel.ac.in/noc26_mg23/preview

Course Code	Course Name	Category	Hours / Week	Credits
24BMA5AE	Numerical Methods -I	Elective - I	5	3

Course Objectives

The course intends to cover

- The various methods for solving algebraic and transcendental equations, systems of linear equations, and interpolation techniques.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Recall the convergence criteria for Newton–Raphson Method	K1
CLO2	Understand the types of linear systems suitable for these methods.	K2
CLO3	Apply finite difference and interpolation techniques.	K3
CLO4	Apply the interpolation conditions for equidistant terms.	K3
CLO5	Analyze inverse interpolation to solve problems under suitable conditions.	K4
K1 - Remember; **K2** - Understand; **K3** – Apply; **K4**- Analyze		

CLO – PLO Mapping

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

Elective I: Numerical Methods -I

Unit	Content	No. of Hours
I	**The Solution of Numerical Algebraic and Transcendental**: Bisection Method – Iteration Method – Convergence Condition – Regular Falsi Method – Newton – Raphson Method - Convergence Criteria – Order of Convergence.	15
II	**Solution of Simultaneous Linear Algebraic Equations:** Gauss Elimination Method – Gauss Jordan Method – Method of Triangularization – Gauss Jacobi Method – Gauss Seidel Method.	15
III	**Finite Differences:** Differences – Operators – Forward and Backward Difference Tables – Differences of a Polynomial – Factorial Polynomial – Error Propagation in Difference Table.	15
IV	**Interpolation (for Equal Intervals):** Newton's Forward and Backward Formulae – Equidistant Terms with One or More Missing Values – Central Differences and Central Difference Table – Gauss Forward and Backward Formulae – Stirling's Formula. Data Approximation and Curve Fitting in AI	15
V	**Interpolation (for Unequal Intervals) :** Divided Differences – Properties – Relations between Divided Differences and Forward Differences – Newton's Divided Differences Formula – Lagrange's Formula and Inverse Interpolation.	15
	Total Hours	**75**
Text Book		
1.	Kandasamy. P, Thilagavathy. K and Gunavathy. K (2016), "Numerical methods", S. Chand and Company Ltd, New Delhi – Revised Edition. Unit I - Chapter 3 Section: 3.1-3.2.2, 3.3-3.4.3 Unit II - Chapter 4 Section: 4.1-4.2.1,4.4 ,4.8-4.9 Unit III - Chapter 5 Section: 5.1-5.5 Unit IV- Chapter 6 Section: 6.1-6.3, Chapter 7 Section: 7.2-7.5 Unit V - Chapter 8 Section: 8.1-8.8	
Reference Books		
1.	Venkataraman M. K.(2013)," Numerical Methods in Science and Engineering" National Publishing company V Edition.	
2.	Sankara Rao .K (2018), "Numerical Methods for Scientists and Engineers", Prentice Hall India 2nd Edition.	
Web Resources (Swayam / NPTEL)		
1.	https://onlinecourses.swayam2.ac.in/e-learning/preview/cec25_ma32	
2.	https://scikit-learn.org/stable/modules/impute.html	

Course Code	Course Name	Category	Hours / Week	Credits
24BMA5BE	Astronomy-I	Elective- I	5	3

Course Objectives

The course intends to cover

- The astronomical aspects and the laws governing planetary motion.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Remember and recall the Earth and Moon's motions and orbits.	K1
CLO2	Understand the time systems, conversions, and year determination	K2
CLO3	Apply celestial coordinate systems and concepts of dip and parallax	K3
CLO4	Analyze planetary motions, orbits, Kepler's laws, and artificial satellites.	K4
CLO5	Analyze stellar concepts in detail.	K4
K1 - Remember; **K2 -** Understand; **K3 –** Apply; **K4-** Analyze		

CLO – PLO Mapping

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

Elective I: Astronomy-I

Unit	Content	No. of Hours
I	**Earth, Moon and their Orbits**: The Earth - Angles - Motion of the Earth - Ellipses - Drawing an Ellipse - Earth's Orbit from First Principles – Moon	15
II	**Time:** Sidereal, Solar and Mean Time - Time-angle Conversion - Longitude and Time - Sidereal Mean Time Conversion - The Year	15
III	**The Celestial Sphere:** Co-ordinate Systems - Astronomical Triangle - Dip and Parallax - IKS Perspectives on the Celestial Sphere and Astronomical Coordinates	15
IV	**The Solar System:** apparent Motions - Period of a Planet - Kepler's Laws - Planetary Orbits - Orbit of a Comet Gravitation - Artificial Satellites	15
V	**Stellar Topics:** Star Charts - Stellar Magnitude - Stellar Parallax - Absolute Magnitude - Mass of Binary Star - Doppler Effect	15
	Total Hours	**75**
Text Book		
1.	E. A. Beet (2008) "Mathematical Astronomy for Amateurs", David & Charles Newton Abbot Unit I - Page No.1 -20, Unit II - Page No.21 -34, Unit III - Page No.35 - 50, Unit IV- Page No.51 -80, Unit V - Page No.81-98	
Reference Books		
1.	S. Kumaravelu and Prof. Susheela Kumaravelu (2013 Revised Enlarged Edition), "Astronomy", S. Chand	
2.	G. V. Ramachandran (2007), "A Text Book of Astronomy" (3rd ed.), De Nobili Press, Tiruchirappalli.	
Web Resources (Swayam / NPTEL)		
1.	https://nptel.ac.in/courses/121104006	
2.	https://en.wikipedia.org/wiki/Indian_astronomy	

Course Code	Course Name	Category	Hours / Week	Credits
24BMA5CE	Probability and Queuing Theory	Elective - I	5	3

Course Objectives

The course intends to cover

- The axiomatic approach to probability theory, to study some statistical characteristics.
- The concepts and applications of random processes in modeling stochastic systems.
- The evaluation of system performance and solve real-life waiting line problems.

Course Learning Outcomes

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

CLO	CLO Statements	Knowledge Level
CLO1	Remember the basic concepts of probability.	K1
CLO2	Understand conditional probabilities and apply Bayes' formula to solve probability problems.	K2
CLO3	Apply transformations of random variables to obtain new probability distributions.	K3
CLO4	Analyze different types of random processes**.**	K4
CLO5	Analyze the performance measures of queueing systems.	K4
K1 – Remember; **K2** – Understand; **K3** – Apply; **K4** – Analyze		

CLO – PLO Mapping

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

Elective I: Probability and Queuing Theory

Unit	Content	No. of Hours
I	**Axioms of Probability:** Introduction, Sample Space and Events, Axioms of Probability, Some Simple Propositions, Sample Space Having Equally Likely Outcomes, Probability as a Continuous Set Function	15
II	**Conditional Probability and Independence:** Introduction, Conditional Probabilities, Bayes' Formula, Independent Events, P (. /F) is a Probability - Baye's Theorem in AI-Educative	15
III	**Two-Dimensional Random Variables:** Introduction, Joint Probability Distribution, Joint Cumulative Distribution Function, Marginal Probability Distribution Function, Joint and Marginal Probability Density Function, Transformations of Random Variables	15
IV	**Random Processes:** Introduction, Classification of Random Processes, Probabilistic Structure, Stationarity, Time Averages, Ergodic Process, Markov Process, Poisson Process- Binomial Process	15
V	**Queueing Theory:** Introduction, Symbolic Representation of Queueing Model, Difference Equations Related to Queueing Models with Poisson Input-Exponential Service, Model I: (M/M/1) : ((∞/FIFO), Little's Formulae, Model II : (M/M/S) : (∞/FIFO), Model III (M/M/1):(K/FIFO), Model IV (M/M/S):(K/FIFO)	15
	Total Hours	**75**

Text Books	
1.	Sheldon Ross **(**2019). "A First Course in Probability" Tenth Edition, Pearson Edition Unit I: Chapter 2: Sections: 2.1-2.6 &Unit II: Chapter 3: Sections: 3.1-3.5.
2.	Dr.P.Kandasamy,Dr.K.Thilagavathi,Dr.K.Gunavathi(2014) "Probability and Queuing Theory" S.Chand Unit III: Chapter 4: Sections: 4.1-4.6,4.10 , Unit IV: Chapter 2: Sections: 5.1-5.9 Unit V: Chapter 6: Sections: 6.1-6.8
Reference Books	
1.	Dr.G.Balaj(2018), "Probability and Queueing Theory**"** (1st ed.), G.Balaji publishers.
2.	Gupta, P. K., & Hira, D. S. (2010), "Problems in operations research: Principles and solutions" (3rd ed.), S. Chand & Company Ltd.
3.	Kanti Swarup, P.K.Gupta, Man Mohan, (2015), "Operations Research", Sultan Chand & Sons.
Web Resources (Swayam / NPTEL)	
1.	https://nptel.ac.in/courses/111101004
2.	https://www.educative.io/answers/bayes-theorem-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				
	CIA	ESE	CIA		Model		Total
			Actual	Weightage	Actual	Weightage	
50	50	-	50	25	50	25	50

Question Paper Pattern

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

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

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

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**